Funded by the European Union

TOWARDS DEVELOPMENT/ STRENGTHENING OF THE NATIONAL GHG INVENTORY SYSTEM —

CONCEPTUAL FRAMEWORK FOR MONITORING, REPORTING AND VERIFICATION OF LAND USE, LAND-USE CHANGE AND FORESTRY (LULUCF) SECTOR IN GEORGIA

MRV LULUCF GEORGIA

ASSESSMENT REPORT

EU4Climate
Better Climate Policies for Eastern Partner Countries

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Conceptual Framework for Monitoring, Reporting and Verification of Land Use, Land-Use Change and Forestry (LULUCF) Sector in Georgia

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ASSESSMENT REPORT

COMPREHENSIVE REPORT ON ASSESSMENT OF CURRENT NATIONAL MRV SYSTEM, NATIONAL POLICY AND REGULATORY FRAMEWORKS IN THE CLIMATE CHANGE FIELD WITH REFERENCE TO LULUCF SECTOR

November 2022

WRITING

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EU4Climate
Better Climate Policies for Eastern Partner Countries

Outline

1. EU4CLIMATE PROJECT

The EU4Climate Project helps governments in the six EU Eastern Partner countries - Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine - to take action against climate change. It supports countries in implementing the Paris Climate Agreement and improving climate policies and legislation. Its ambition is to limit climate change impact on citizens lives and make them more resilient to it. EU4Climate is funded by the European Union (EU) and implemented by the United Nations Development Programme (UNDP).

The objective of the project is to support the development and implementation of climate-related policies by the Eastern Partnership countries that contribute to their low emission and climate resilient development and their commitments to the Paris Agreement on Climate Change. It identifies key actions and results in line with the Paris Agreement, the "20 Deliverables for 2020", and the key global policy goals set by the UN 2030 Agenda for Sustainable Development. The project will also translate into action priorities outlined in the Eastern Partnership Ministerial Declaration on Environment and Climate Change of October 2016.

The goal of the project is to contribute to climate change mitigation and adaptation and the development of a low-emissions and climate-resilient economy in line with the Paris Agreement.

2. OBJECTIVES OF THE ASSIGNMENT FOR LULUCF

The goal of this assignment is to design the most appropriate country-specific conceptual framework for monitoring, reporting and verification (MRV) of LULUCF sector-related actions in Georgia.

It will challenge the existing national GHG inventory system, taking into consideration relevant international requirements like the methodological framework for LULUCF reporting as defined by the related IPCC Guidelines, international obligations of Georgia for LULUCF GHG reporting as laid down by the UNFCCC, Paris Agreement and related decisions, existing national legal and institutional systems and capacities for required LULUCF activity data and emission factors as-well-as future needs related to the monitoring of these input data and the national system for LULUCF reporting.

The overall goal of the assignment is to assist UNDP and the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) in developing a robust Monitoring Verification and Reporting system in all sectors, consistent with the UNFCCC and Paris Agreement requirements.

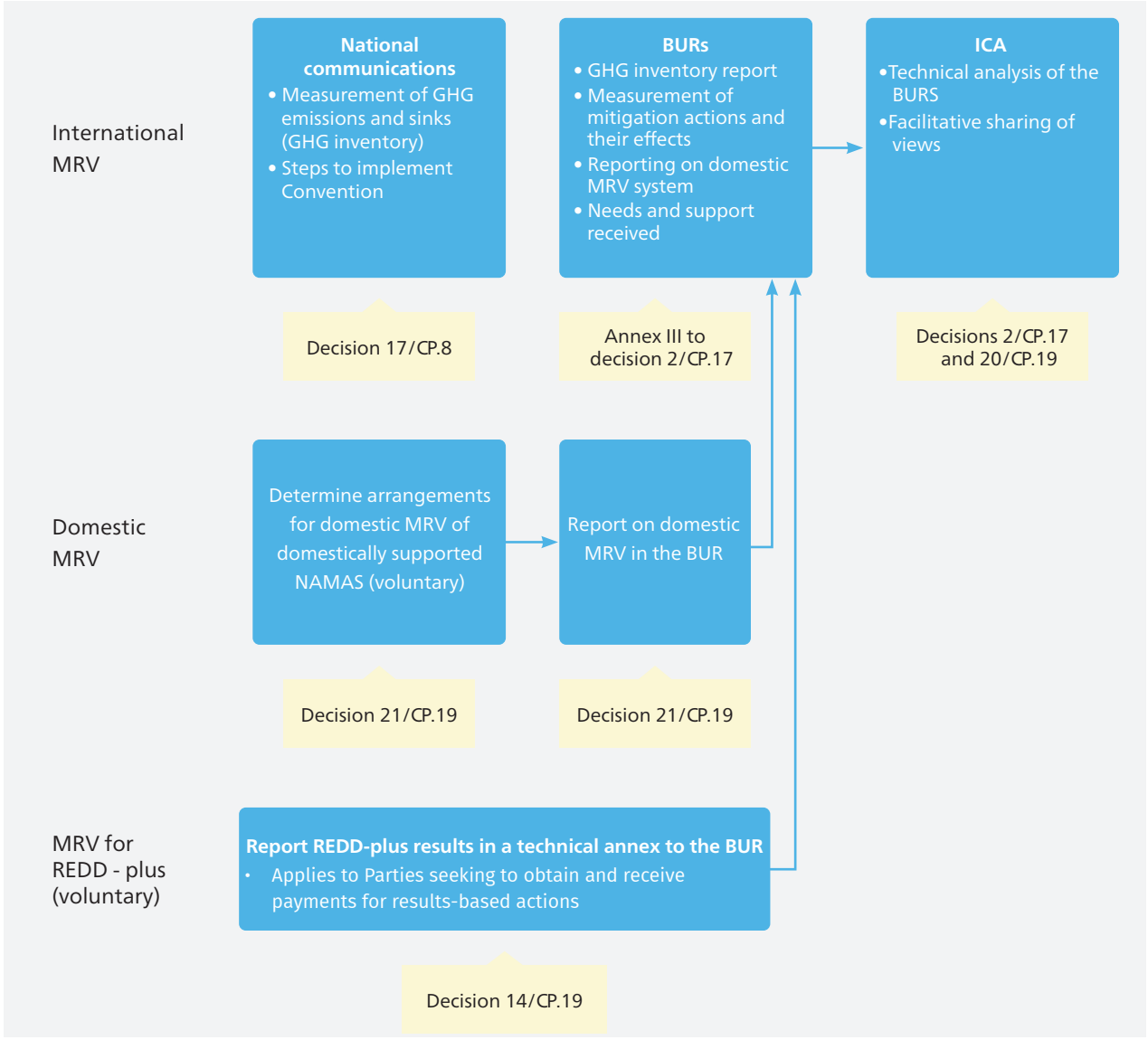
3. GENERIC KEY MRV ELEMENTS FOR NATIONAL AND LULUCF MRV SYSTEMS

3.1. KEY MRV ELEMENTS UNDER THE UNFCCC

The existing framework for MRV under the UNFCCC (*United Nations Framework Convention on Climate Change, hereafter "the Convention")* for developing country Parties consists of several elements, which have been put in place gradually through a set of decisions by the COP over the period 2004-2013.

At COP 13, through the Bali Action Plan, Parties agreed on the principle of applying measurement, reporting and verification (MRV) for developing country Parties, which laid the foundation for the subsequent elaboration of the existing comprehensive MRV framework for developing country Parties (see figure below).

FIGURE 1: KEY ELEMENTS OF THE MRV FRAMEWORK (*Source: 2014 UNFCCC.*)



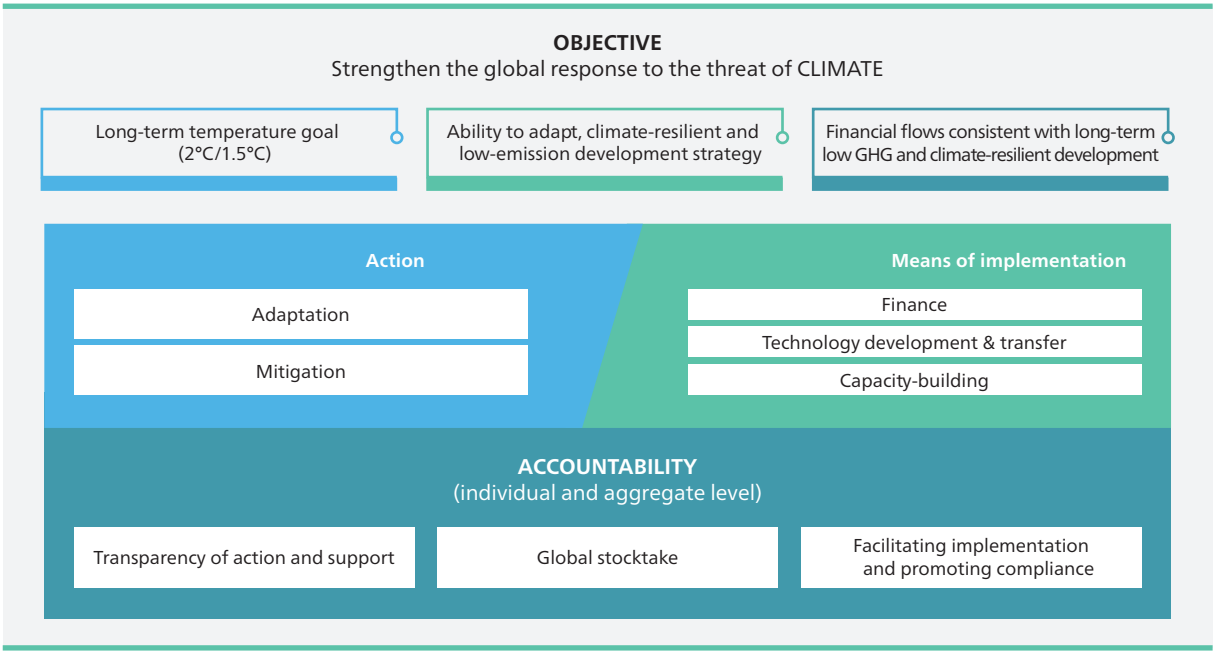
MRV occurs at the international level but can also be voluntary at the national level:

- **Measurement (M)** for non-Annex I Parties applies both to efforts to address climate change and to the impacts of these efforts, including the level of GHG emissions by sources and removals by sinks, emission reductions and other co-benefits. Such measurement occurs at the national level. Initially, it referred to the measurement of GHG emissions by sources and removals by sinks through the national GHG inventories, which are reported in national communications. Based on the decisions adopted at COP 16 and 17, non-Annex I Parties need to measure also the specific effects of national mitigation actions as well as the support needed and received, and to provide this information, including a national inventory report, as part of their BURs;
- **Reporting (R)** for non-Annex I Parties is implemented through the national communications and BURs (see sections below).
- **Verification (V)** is addressed at the international level through the international consultation and analysis (**ICA)** of BURs (see section BURs below). National communications are not subject to ICA.

3.2. KEY MRV ELEMENTS UNDER THE PARIS AGREEMENT

Aiming to strengthen the global response to the threat of climate change, Parties adopted the Paris Agreement in 2015. In aiming to enhance the implementation of the Convention, one of the primary goals of the Paris Agreement, as set out in its Article 2, is to hold the global average temperature increase to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels in order to significantly reduce the risks of climate change.

FIGURE 2: KEY ELEMENTS OF THE INTERNATIONAL CONSULTATION AND ANALYSIS PROCESS *(Source: 2020-2 UNFCCC)*



The goals embedded in the Paris Agreement also aim to increase countries' abilities to adapt to the adverse impacts of climate change and foster low GHG emission development pathways, making financial flows consistent with such pathways.

To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

Implementation of the Paris Agreement requires economic and social transformation, based on the best available science. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. With this in view, the Paris Agreement establishes a binding commitment for all Parties to prepare, communicate and maintain a **Nationally Determined Contribution (NDC)** and to pursue domestic mitigation measures to achieve the objectives of their NDCs. It is also required that Parties communicate their NDCs every five years and present the information necessary for clarity, transparency and understanding.

To better frame the efforts towards the long-term goal, the Paris Agreement also invites countries to formulate and submit by 2020 long-**term low greenhouse gas emission development strategies (LT-LEDS)**. LT-LEDS provide the long-term horizon to the NDCs. Unlike NDCs, they are not mandatory. Nevertheless, they place the NDCs into the context of countries' long-term planning and development priorities, providing a vision and direction for future development

Furthermore, the Paris Agreement establishes, through its Article 13, **an enhanced transparency framework (ETF)** for action and support designed to build trust and confidence and to promote effective implementation.

The information gathered through the ETF will feed into the **G**lobal stocktake which will assess the collective progress towards the long-term climate goals. This will lead to recommendations for countries to set more ambitious plans in the next round.

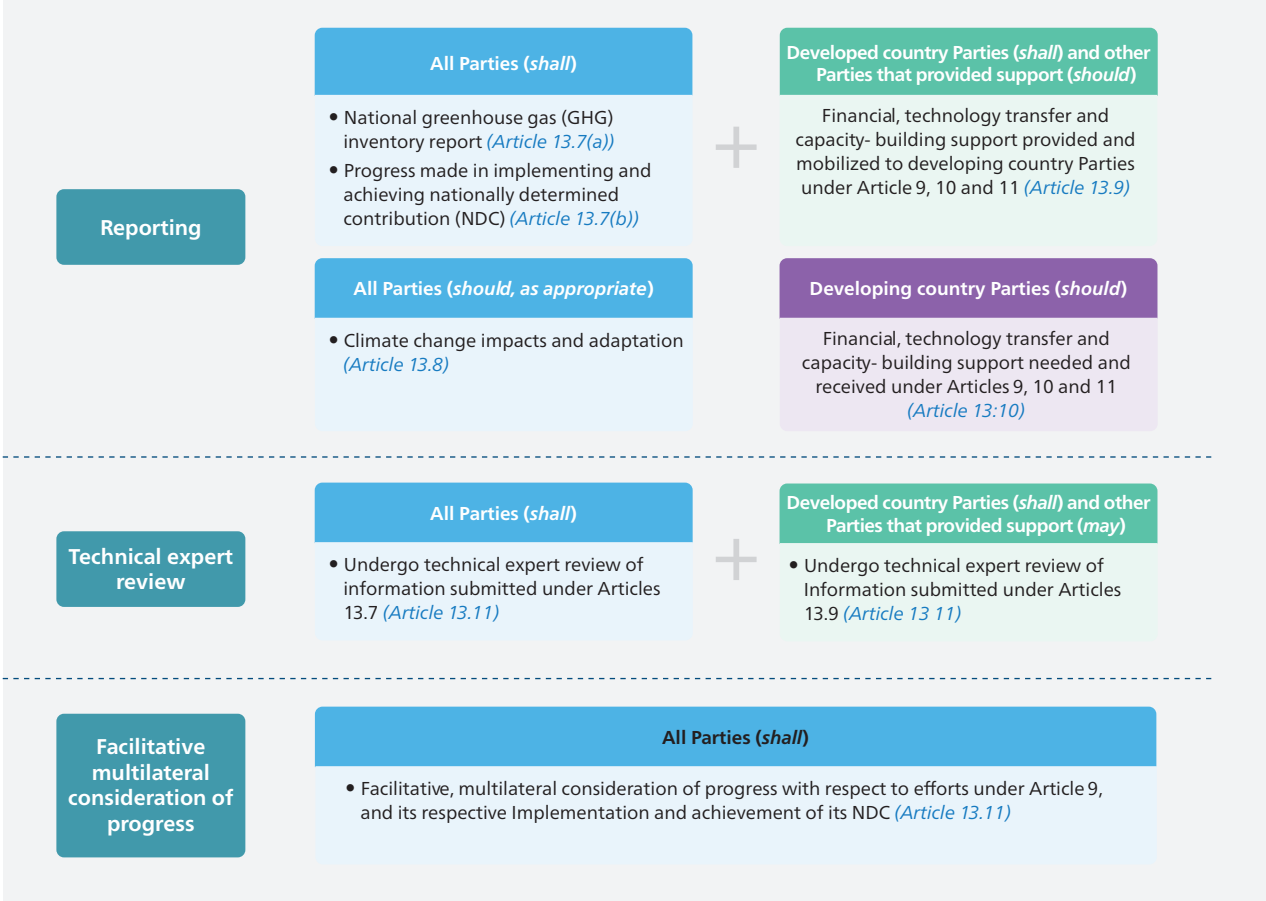
The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects.

Decision 18/CMA.1 clearly defines the rules to be applied in terms of GHG emissions inventory.

All Parties shall report their estimates of anthropogenic GHG emissions by sources and removals by sinks in the form of a national inventory report, consisting of a national inventory document (NID) and common reporting tables (CRT).

A Party can submit its national GHG inventory report as a stand-alone report, or as part of the BTR. If it is published as a standalone report, a summary of its GHG emissions and removals must still be provided in the BTR as part of the information necessary to track progress made in implementing and achieving its NDC.

FIGURE 3: ENHANCED TRANSPARENCY FRAMEWORK FOR ACTION AND SUPPORT ESTABLISHED BY ARTICLE 13 OF THE PARIS AGREEMENT (*source: 2020-1 UNFCCC*)



* The transparency framework shall provide flexibility in the implementation of the provisions of this Article to those developing country Parties that need it in the light of their capacities (Article 13.2);

* The transparency framework shall recognize the special circumstances of the least developed countries and small island developing States (Article 13.3).

3.3. KEY MRV ELEMENTS UNDER THE KYOTO PROTOCOL

Contrary to the UNFCCC, the Kyoto Protocol had defined mitigation objectives that had more legally binding effects. The Kyoto Protocol had a lot of additional expectations, in particular for LULUCF where accounting was made by activities. Considering that the Kyoto Protocol commitment periods (2008-2012 and 2013-2020) are now done, these requirements are not considered anymore and not presented in this report. However, these requirements had set a series of key concepts and approaches to consider the assessment of a Party's climate efforts regarding its LULUCF sector, which variations can be explained not only by policies and management but also by natural events and legacy effects. In particular, LULUCF reporting under the Kyoto Protocol, as defined in articles 3.3 and 3.4 used the following principles:

- Activity-based accounting (instead of land-use based accounting);
- A focus on crucial activities such as Afforestation and Deforestation, and Forest Management;

- Differentiation between the absolute results of estimation and the accounting with objectives defined with net-net, gross-net historical or projected reference approaches;
- In particular, for the forest sink, a historical or projected reference used to define the scenario upon which assessing the actual forest net result: the Forest Management Reference Level or FMRL – and the definition of his level is subject to expert review;
- The possibility to exclude emissions due to Natural Disturbances.
- The optional choice to include activities for which estimates are not as precise as for forest monitoring: Cropland and grassland management, rewetting, etc.

A large part of these requirements is still present under the EU LULUCF regulation.

3.4. KEY MRV ELEMENTS UNDER THE EU LULUCF REGULATION

In order to continue a more legally binding system after the end of the Kyoto Protocol commitment period, i.e. after 2020, the European Union has set up a new system for its member states to enhance their LULUCF mitigation policy. This system was mostly a continuation of the spirit of the rules of the Kyoto Protocol regarding LULUCF. This system also defined a EU-level objective of net neutrality for the LULUCF sector. This new reporting framework is described in the LULUCF regulation 2018/841. Compared to the Kyoto Protocol:

- Some changes of approaches had been made, such as the return to a land-use based accounting while keeping similar "activities";
- The principle of a reference level has been kept for the forest, the Forest Reference Level (FRL) with specific new rules and periods;
- The cropland and grassland management activities are now mandatory.

In July of 2021, within the "fit for 55" new climate package, the European Commission has proposed an update for this regulation, in order to increase its requirements and ambition. In particular, this proposal includes the obligation for all Parties to adopt a "spatially-explicit" (or "geographically-explicit") approach for land-use monitoring, corresponding to the IPCC approach 3 with, typically, wall to wall maps to track land use changes over time. This proposal also leads to the definition of a net neutrality objective not only for the LULUCF sector but for the AFOLU sector as a whole. The EU approach towards AFOLU's contribution to achieving carbon neutrality and related accounting requirements seems definitely relevant for Georgia, and consistent with the provisions of EU-Georgia association agreements.

4. DESCRIPTION AND ASSESSMENT OF NATIONAL MRV SYSTEM AND LULUCF MRV SYSTEM

4.1. DESCRIPTION OF CURRENT LEGAL AND INSTITUTIONAL FRAMEWORK

As a preliminary remark, it must be noted that climate change is addressed as an environmental issue in Georgia.

According to the Constitution of Georgia (article 29.2), the protection and rational use of natural resources shall be ensured by law. Therefore, it is it is the duty of the State to take appropriate measures to ensure that everyone can live in a healthy environment and receive full information about the state of the environment in a timely manner in accordance with article 29.1 of the Constitution.

Article 51.3 of the amended Law on Environment Protection of 1996 provides a legal basis for the adoption of specific rules for the protection of the Earth's climate, including the setting of GHG emission standards and/or limits as part the approach of integrated prevention and control of the pollution (article 51.1 and 51.2 of the amended Law on Environment Protection of 1996).

Within the Government, the supreme body of the States' executive power (article 54.1 of the Constitution), the Ministry of Environmental Protection and Agriculture (MEPA) is responsible for the development and implementation of climate change policies and measures in Georgia.

MEPA is the key ministry for the establishment and implementation of measurement, reporting and verification (MRV) requirements on the environment and about climate change, including for the MRV of actions and GHG emissions in the LULUCF sector. But there are a number of other institutions that can be involved in the MRV of climate action and GHG emissions in Georgia.

4.1.1. Ministry of Environmental Protection and Agriculture (MEPA)

Within MEPA, it is the Department of Environment and Climate Change (DECC) that is designated as the responsible service to deal with climate change policy.

According to the Decree of Government of Georgia n°112 of 6 March 2018 on approval of the Regulations on the MEPA, the DECC shall perform a number of tasks including the following that are relevant for the MRV of GHG emissions and climate action in all sectors:

- Participate in the development and implementation of state policy in the field of climate change;

- Participate in the organization of the state system of environmental monitoring;
- Defines and coordinates the mechanisms of protection of the air, ozone layer and water resources from the impact of natural or anthropogenic factors;
- Coordinate the implementation of multilateral environmental agreements (conventions, their protocols and agreements) and processes, including on climate change;
- Coordinate and organize the preparation of the national report on the state of the environment.

Within the DECC, it is the Climate Change Division that is tasked to coordinate the preparation of Georgia's official documents and reports to be submitted to the UNFCCC (National Communications -NatComs- and Biennial Update Reports -BUR- from non-Annex I Parties) and the Paris Agreement (Biennial transparency reports BTR), including the GHG emission national inventory report (NIR).

However, at the time of writing this report, there is no legal framework in Georgia specifying the rules, modalities and procedures for the implementation of COP/CMA Decisions on MRV and/or enhanced transparency that were adopted by under the UNFCCC or the Paris Agreement, notably its Rulebook for implementation.

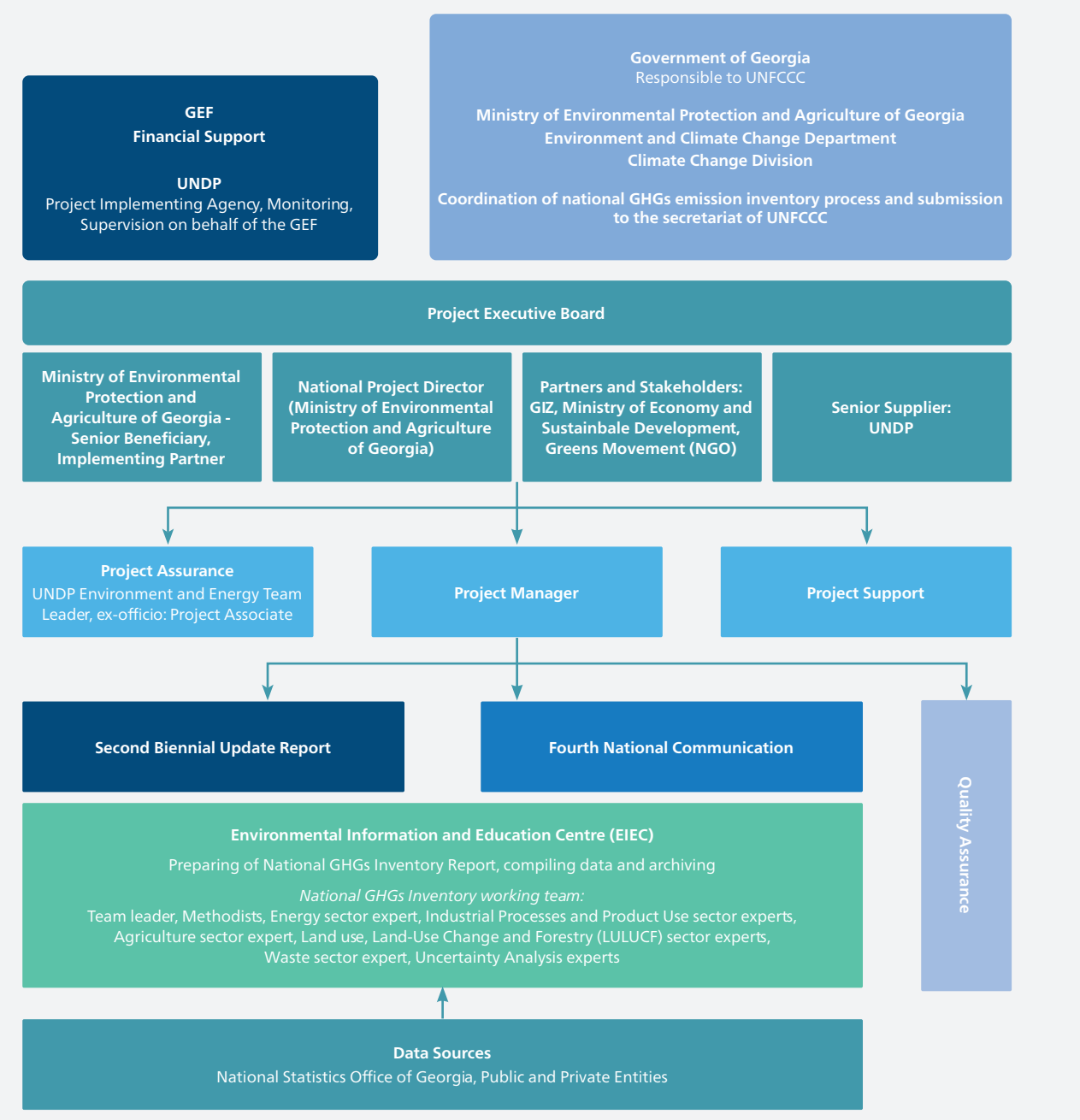
Actually, the most recent NIR of GHG emissions (1990-2017) to the UNFCCC was carried out through an international cooperation project and published in 2021. It was developed by the MEPA with the funding of the Global Environmental Facility (GEF) and support of the UNDP Georgia operating as an implementing agency within the framework of the project "Development of Georgia's Second Biennial Update Report and Fourth National Communication to the UNFCCC". The Climate Change Division of the MEPA led and coordinated the NIR, that was developed.by the Environmental Information and Education Centre (EIEC) with the assistance of independent international and local experts. According to the NIR (section 1.1.2) an executive council was formed by the project partners to follow its development (review and submission of the workplan and budget) and control its quality.

Besides the DECC, it is important to note the important prerogatives given to the Department of Environment Supervision (DES), a State sub-agency within the MEPA, to exercise the State control in the field of environment protection and rational use of natural resources, mainly through inspections and examinations (article 57 of the amended Law on Environment Protection of 1996). With regard to State control over forest management, the DES is supported by specialized agencies under the authority of the MEPA, namely the National Forestry Agency and the Agency of Protected Areas (articles 7 and 8 of the Decree of Government of Georgia n°112 of 6 March 2018), the respective functions of which are discussed below in section 4.

Finally, the National Environment Agency (NEA) (http://nea.gov.ge/), a Legal Entity of Public Law (LEPL) within the system of the MEPA set up in 2008, is mandated to carry out the monitoring of the environment, including atmospheric air pollution and the impacts of climate change. The scope of the agency's activities, among oth-

ers, includes the development and maintenance of environmental monitoring systems, the dissemination of environmental monitoring data and information, and the provision of meteorological services. Within its competence, the NEA produces short-, medium- and long-range forecasts and issue warnings on expected extreme natural events and provide this information to central and local authorities and mass media. It also monitors negative hydrometeorological and geological phenomena (snow avalanches, hail, fog, deficiency in precipitation, erosive/abrasive processes, landslide, debris flow, rock fall and others) and study physical processes of climate change. With this knowledge and expertise, the NEA participates in the elaboration of mitigation and adaptation policies and measures. However, it seems that the NEA is not directly involved in the GHG MRV system in Georgia.

FIGURE 4: INSTITUTIONAL FRAMEWORK AS PRESENTED IN LAST NIR



4.1.2. The Environmental Information and Education Centre (EIEC)

EIEC (http://eiec.gov.ge/) is a Legal Entity of Public Law (LEPL) within the system of the MEPA. Initially, EIEC was created in 2006 as a joint initiative of the OSCE and, at that time, the Ministry of Environment Protection and Natural Resources to establish the Aarhus Centre Georgia to facilitate implementation the UNECE Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters. In an effort to institutionalize the Aarhus Centre, it was transformed into a LEPL in 2013. Still nowadays, EIEC's daily work is guided by the principles of the Aarhus Convention.

EIEC's main tasks that are relevant for the establishment of a GHG MRV system are the following:

- Promote environmental and agricultural education and raise public awareness;
- Support public participation in decision-making process;
- Ensure access to the environmental and agricultural information;
- Introduce and implement integrated information technology policy of MEPA.

Supporting the MEPA in implementing the amended Law on Environment Protection of 1996 (notably its article 27 on environmental information), one of the functions of the EIEC is to create a unified database of environmental information.

As noted above, the EIEC has coordinated the elaboration the most recent NIR with the support of independent experts in the framework of the GEF/UNDP Project "Development of Georgia's Second Biennial Update Report and Fourth National Communication to the UNFCCC". Further to some exchanges with its Director, it seems that the EIEC should continue to play a central role in the coordination of institutions and stakeholders for the elaboration and submission of the first BRT of Georgia by end 2024.

4.1.3. The Climate Change Council (CCC)

The Executive Decree n°54/2020 2021 established the CCC and defined its composition and mission. Its core mission is to ensure the efficient implementation of the Paris Agreement. In that respect, the CCC is responsible for, among other tasks, discussing the national system for measurement, reporting and verification (MRV) within the Enhanced Transparency Framework (ETF), to implement the Paris Agreement in Georgia, and, in case it is approved, shall initiate the decision-making process by the Government. The CCC should also review the NatComs and BUR of Georgia and the reports on the fulfilment of the NDCs, and, if those are approved, shall initiate the decision-making process by the Government.

At the time of writing this report, it seems that the CCC has not initiated yet any decision-making process for the adoption by the Government of rules, modalities and procedures establishing a national MRV system within the ETF of the Paris Agreement.

In addition, the CCC should review the projects to be submitted to the Green Climate Fund (GCF), Convention Adaptation Fund (AF), Climate Technologies Centre and Network (CTCN) and other financial institutions working on the climate change issues, and, in case the project is approved, shall address the MEPA with the recommendation to support the projects. Given that the CCC was installed in 2021, it could not review the first GCF funded project called "ECO.Georgia" (implemented by the German Cooperation Agency GIZ and the Government of Georgia) that aims to mitigate GHG through improved nature-based and sustainable management of the country's forests but energy efficiency by reducing the demand for fuelwood. Noteworthy that the ECO.Georgia project should help facilitate the collection of data that are useful for the establishment of the National Forest Inventory (NFI), which could be relevant for the MRV of climate mitigation actions in the LULUCF sector.

Interestingly, the CCC can also establish and approve some task forces for relevant economic sectors. Eventually, this could facilitate the coordination of MRV efforts in those sectors concerned by LULUCF.

4.1.4. For land monitoring

The basis for a good LULUCF inventory is an effective monitoring of land use and land use changes. This is a key and difficult point and the organization most likely to implement this work is not clearly defined. Currently this monitoring is carried out from scattered data.

It appears that no institute currently has the skills and resources to respond to this challenge nevertheless, there is an agency dedicated to monitoring the territory in Georgia that could certainly be involved and participate in this work: Agency for Sustainable Land Management and Land Use Monitoring (https://land.gov.ge/En).

Yet it must be reminded that a land use monitoring consistent with IPCC expectation implies some constraints, it is thus not obvious that this agency should oversee such a work, other organizations in charge of agriculture or forest lands can also be indicated.

During the project, the role of this agency has been further explained by Mr. Giorgi Zakaidze[1]. It is a new agency with the mission to centralize all data on land management. It mostly focuses on data from cadastre. All areas of the country are not under the responsibility of the agency, but it should compile this information. It is assumed that this agency should be the relevant organisation for data provision on land uses. Yet it also appeared that this agency was not designed to be deeply involved in GHG inventories and it seems that it should only be proposed as inventory data provider and not as inventory compiler.

[1] Meeting on the 20/10/2022 with Mr. Giorgi Zakaidze, Head of Strategic Development Department in the Land Agency.

4.1.5. For LULUCF forest category

Since 2013 and the approval of its National Forest Concept (NFC), Georgia has developed a new legal and institutional framework for the forest sector reflecting upon the objectives of the so-called Forest Sector Reform Strategy (FSRS) that aimed at responding to the main challenges of forest management in the country (inadequate legal framework, lack of regulation for the provision of fuelwood and timber, illegal logging, lack of planning and monitoring of forest management, weak forest management institutions…etc.).

On the legal side, a new Forest Code has been developed to recognize the sustainable forest management (SFM) principles enunciated in the National Forest Concept (see article 4 of the new Forest Code).

Notably, sustainable forest management is now defined notably in relation to the forests' ecological functions at the local, national and global levels, both at present and in the future (article 2 v) of the Forest Code).

Assessment and reporting of SFM shall be carried out on the basis of criteria and indicators to be adopted through MEPA regulations. It is important to note that the granting of the status of a forest is made by a Governmental decision further to a proposal prepared by the MEPA (article 12.1 of the new Forest Code).

With regard to land use rights, article 5 of the new Forest Code affirms that the right of ownership of forest is inseparable from the right of ownership of a plot of land, while recognizing that forest can be owned by public (State, autonomous republic, municipalities) or private (natural or legal) entities.

Forests can be categorized differently depending on their assignment, notably in order to facilitate "*the preservation and restoration of soil protecting and (…) climate regulating functions of forests*" (article 6, b) of the new Forest Code). Taking account of that particular function, forests can be classified as "protected forest" according to article 7 of the new Forest Code. In that case, it is to be managed in accordance with the provisions of Article 8, which distinguishes between two categories of protected forests, including one that is granted the status of protected area, which is supervised by the Agency of Protected Areas (see below).

With respect to MRV of LULUCF, it must be noted that the Forest Code has given competence to the MEPA to organize a forest registration system, which consists in the national registration of forests but also forest planning and the information and monitoring system (article 18.1 d) and 24.1 of the new Forest Code). The Ministry is also competent to take measures allowing the fulfilment of obligations determined by international agreements ratified by Georgie in the field of forest management (article 18 of the new Forest Code). This competence covers the matters addressed by Paris Agreement, notably its articles 5 and 13.

For the development of a robust national MRV system, the most relevant provisions are laid down by article 27 (information and monitoring system of the forests, to be managed by the Ministry on the basis of information provided by forest management bodies and agencies) and article 28 (forest monitoring to determine the eco-

logical function of forests, which necessarily includes the measurement of carbon sources and sinks). Beyond the on-going development of the 1st National Forestry Inventory (NFI) on the basis of these provisions, they offer a legal basis to MEPA for the adoption of rules, modalities, procedures and guidelines for the MRV of climate action and GHG emissions in the forest sector. To do so, it would be interesting to discuss the possibility to link or integrate such rules, modalities, procedures and guidelines in the "*Procedures for the System of Registration, Categorization and Monitoring of the Forests of Georgia*" (see article 28.3 of the new Forest Code).

To conclude on the relevant legal aspects, it must be noted that the National Forest Concept expressed an interest in supporting the development of sustainable forest certification such as by FSC and/or PEFC. This is reflected in the Forest Code, which gives competence to the Ministry to facilitate the introduction of a process of voluntary and independent certification scheme (article 18.2). However, it seems that there has been no Georgian forestry standard for certification and no forest management unit has been certified, either by PEFC or FSC at the time of writing this report.

Regarding the institutional framework, the new Forest Code has separated more clearly the functions of policy making (=> the Biodiversity and Forest Policy Department of MEPA), supervision (=> the DES of MEPA) and management (the so-called "Forest Management Body", see article 21, basically the National Forest Agency and the Agency of Protected Areas). All these three functional levels are relevant for putting in place a robust MRV system in Georgia.

The Department of Biodiversity and Forestry of the MEPA is responsible for the elaboration of the forest policy and strategies, as well as the drafting of the legal framework on national level, but also for the monitoring of the forest status and the reporting at national and international levels.

The DES of MEPA is responsible for the control of forest management, of harvesting operations of the transportation outside of the forests, and of trade and exports of harvested wood products.

The "Forest Management Body" is actually the National Forestry Agency (NFA) (http://forestry.gov.ge/), established in 2010 within the system of the MEPA to manage State owned forests. Under the adoption of the new Forest Code, NFA's main action was guided by the provisions of the Law of Georgia on the Management of Forest Fund n° 4419 of 11 March 2011, which defines Forest fund as "*the state forest fund except for the protected territories of the state forest fund, forests of local significance, and forest funds located in the territories of the Autonomous Republics of Abkhazia and Adjara*". Now established as a Legal Entity of Public Law (LEPL) since the approval of the Statute of the National Forestry Agency of Georgia - Order No. 50 of 26 December 2016. Further to the National Forest Reform, the NFA has been reformed to become the forest management body, working particularly on forest maintenance and reforestation and caring about the sustainable use of components of biological diversity in the forest. It remains responsible for monitoring and control in the territory of the forest fund except for setting licensing conditions. Most importantly it is in charge of developing and implementing the first National Forest Inventory (NFI) for the next ten years.

During the project, the role of the agency was further explained by Mrs. Natia Iordanishvili[2]. The NFI is one of the main projects led by the agency which confirms its role as data provider for the GHG inventory. It seems that the agency could also be further involved in the GHG inventory of Georgia, at least for the areas that are under their responsibility.

As noted above, forest can be categorized as protected forests, which may be classified as protected areas. For data relating to those protected forests, it is the Agency of Protected Areas (APA) (http://apa.gov.ge/en/) that should be responsible for monitoring and reporting. Established under the authority of MEPA in 2008, the overall objective of the APA is to "improve the management of protected areas, ensure functionality of territorial administrations, supervise the process of following legally established regulations and to plan, create and develop new protected areas" (source, APA website).

During the project, no meeting could be organized with people from APA which limits the possibilities to propose a specific role in the GHG inventory.

4.1.6. For LULUCF non forest categories

While forest carbon emissions and removals represent the main focus of the LULUCF inventory, there are other elements that need to be addressed through a robust MRV system.

Firstly, land-use and land-use change areas estimations are a critical step and it is often a challenge for country to develop a robust approach to track land-use change, since several datasets can exist, and no datasets fits well all the requirements (spatial and temporal coverage, resolution, consistency of definition, consistency with forest data such as NFI, etc.). Moreover, there is often no official framework that defines one source to estimate land-use and land-use change areas for the purposes of the inventory.

Other LULUCF categories include: Cropland, Grassland, Wetlands, Settlements and Other Land. The monitoring framework required to estimates fluxes on these categories, in addition to the land-use areas monitoring, is mostly about:

- Mineral soil carbon stocks estimates
- Organic soil carbon stock estimates
- Living biomass carbon stock estimates
- Soil carbon stock change for cropland and grassland remaining cropland or grassland

Several technical or research institutes are certainly relevant on agricultural topics. These centers can be used to refine methods and parameters for the calculation of emissions and removals. In particular, the following institutes may be named:

- Scientific research center of agriculture (https://srca.gov.ge/en)
- State laboratory of agriculture (http://sla.gov.ge/En)

[2] Meeting on 13/10/2022 with Mrs. Natia Iordanishvili, Deputy Head of the National Forestry Agency

During the project, no meeting could be organized with people from these organisations which limits the possibilities to propose a specific role in the GHG inventory.

In this context, institutional arrangements are helpful and even often necessary to:

a) Ensure data acquisition, surveys, collecting and disseminating etc.
b) Ensure research
c) Ensure rules and incentives to avoid emissions and encourage management practices that lead to removals i.e in the agricultural soils;
d) Ensure protection of carbon-rich land so that they are not subject to land use conversion and subsequent emissions.

In Georgia, some mitigation measures have been developed:

Example of c): *Sustainable management of pastures in Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities. The action aims Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities. Implemented (2013-2016). 4,000 ha of degraded pastures and 300 ha of sheep migratory routes have been fully rehabilitated. (BUR 2019, p.75)*

example of d) : *Establishment of Javakheti Protected area in Georgia. Area includes mostly high mountains and wetland territories (CO2 sink). Implemented (2010-2011). Javakheti protected area 16,614 ha has been established, infrastructure and legislative bases were created. (BUR 2019, p.75)*

The NC4 (2021) highlights that „*unfortunately, the current statistics do not show any land use categories or changes in them in terms of category change, however, a high rate of pasture and meadow degradation is evident.*".It seems that there is a lack of policy framework to monitor, study and protect grasslands.

However, it must be noted that the 2019 Law of Georgia on the Determination of the Designated Purpose of Land and on Sustainable Management of Agricultural Land established the National Agency for Sustainable Land Management and Land Use Monitoring, as a LEPL operating within the governance of the MEPA. The functions and powers of the Agency have been specified by the Ministerial Order n° 2-1258 of 26 December 2019 on the Approval of the Statute of the Legal Entity under Public Law called the National Agency for Sustainable Land Management and Land Use Monitoring. Noteworthy that the Agency shall register agricultural land resources and create an integrated database, and carry out state monitoring of land use and ensure the availability of relevant information. To do so, the powers of the Agency has some powers hat are relevant for MRV of non-forest LULUC activities, in particular:

- To participate in the preparation and implementation of state policy for designated use and protection of agricultural land resources, and of relevant designated state programmes;
- To participate in the preparation and implementation of state policy for the sustainable management of agricultural land;
- To participate in the planning of activities to fight against desertification and land degradation, and to restore soil fertility;

- To participate in the planning and carrying out of activities related to the management of windbreak belts (shelter belts);
- To prepare thematic maps related to land use
- To store, maintain and ensure access to documents submitted to the Agency (…)

Other pools or carbon stock change are often not estimated and are not crucial when developing a MRV system. They can be estimated at later stages when improving the estimations.

The section below presents some institutions that are relevant also for these non-forest categories.

4.1.7. Other institutions that are relevant for the development of a robust MRV system

a) The Ministry of Economy and Sustainable Development (http://www.economy.ge):

The Ministry of Economy and Sustainable Development (MESD) can be an important player to promote climate policy integration, coherence with other policies and intragovernmental coordination, including for undertaking MRV of climate action and GHG emissions.

It is important to note the role that can be played by the Technical and Constructions Supervision Agency placed under the authority of the MESD for the implementation of the procedure and modalities for conducting environmental impact assessments: this Agency is the statutory authority for the implementation of with the Environmental Assessment Code of 2018. In addition, the MESD is also involved in urban planning, which is key for deciding upon land use changes.

b) National Statistics Office (https://www.geostat.ge/en):

The National Statistics Office (NSO) is regulated by the Law on Official Statistics of 2018. (https://www.geostat.ge/media/20817/latest-Law-of-Georgia_2018.pdf). It is involved in the collection of environmental data (water, waste, energy, transport), including on fertilizer and pesticide consumption and timber production and exports.

Its environment statistics are based on information provided by the MEPA services, and they are published in the annual report of the NSO. Notably, the NFA share its monitoring data with the NSO and it seems that the two institutions have signed a memorandum of understanding to specify the modalities of their collaboration.

During the project, no meeting could be organized with people from GeoStat which limits the possibilities to propose a specific role in the GHG inventory. But their scope and knowledge in statistics of the countries indicates that they are data providers for the LULUCF GHG inventory. Moreover, it is possible to imagine a system where Geostat could have additional responsibilities in the LULUCF GHG inventory.

c) Public authorities at sub-national level:

The Local Self-Government Code (2014) defines the legal basis for exercising local self-governance, it specifies the powers of local authorities, provides for clear rules for their establishment and operation, regulates their finances and property, their relations with citizens, with public authorities and with entities under public or private law, and sets forth the rules for carrying out state supervision and direct state administration of the activities of local authorities.

In particular, municipalities ("local self-governing units") have the power to manage local natural resources, including the forest and land resources owned by the municipality (article 16.2, c) of the Local Self-Government Code of 2014). Moreover, they are in charge of preparing and approving spatial planning schemes, master and development plans, but also grant the status of a plot of land (article 16.2, e) and m) of the Local Self-Government Code of 2014). Therefore, municipalities may be requested to collect information and data on LULUCF within their boundaries.

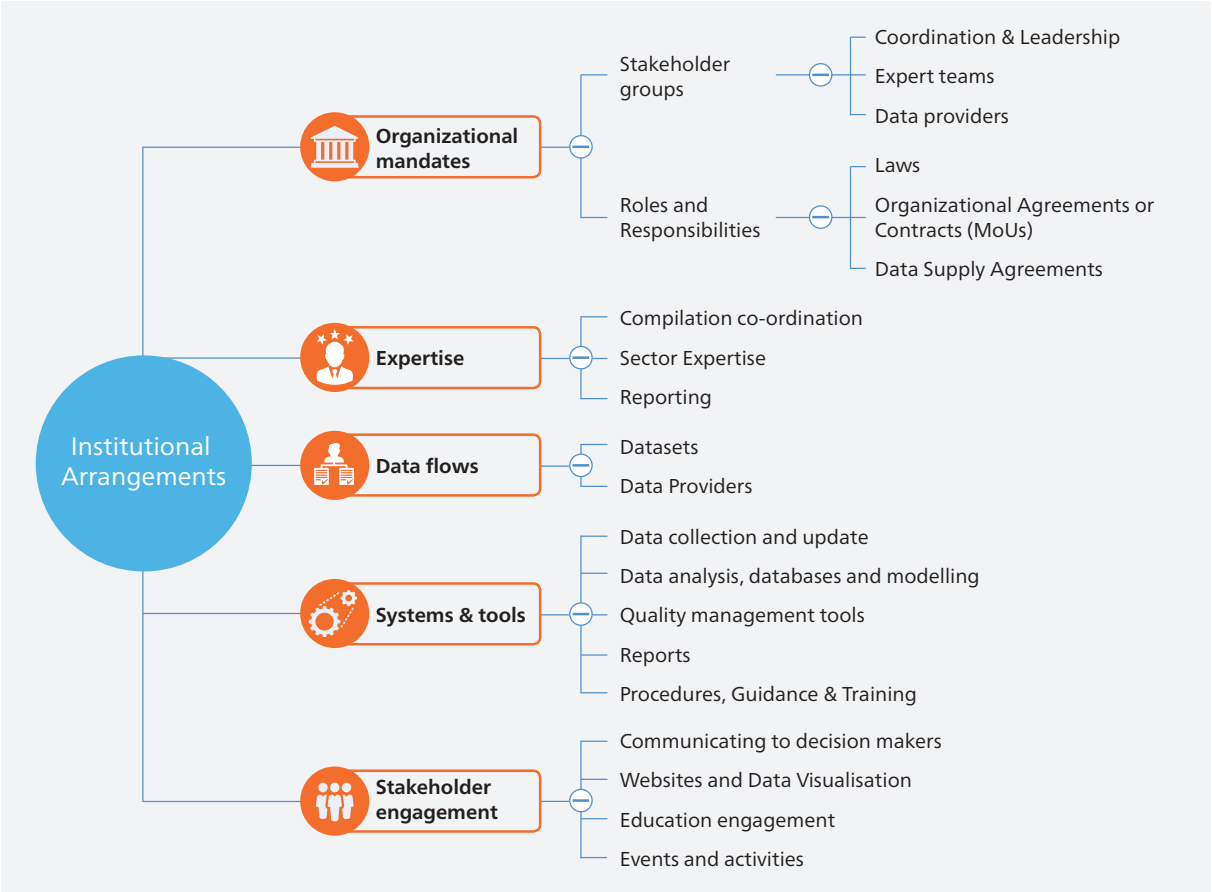
4.2. ASSESSMENT OF CURRENT LEGAL AND INSTITUTIONAL FRAMEWORK

Institutional arrangements will vary among countries depending on the national circumstances, priorities for action and demands for informing stakeholders involved in the implementation of action and reporting. In some countries, a single organizational structure may be responsible for all themes, objectives and outputs, whereas in other countries these responsibilities may be divided among different independent organizations.

Institutional arrangements can be organized around five separate components (see figure 1). These are:

1. Organizational mandates;
2. Expertise;
3. Data flows;
4. Systems and tools;
5. Stakeholder engagement
6. Structuration of institutional arrangements?

FIGURE 5: KEY COMPONENTS OF INSTITUTIONAL ARRANGEMENTS (SOURCE: 2020-3 UNFCCC)



4.2.1. Organizational mandates

Organizational mandates should include terms of reference designed to guarantee that the human, financial and data resources needed are made available and to clarify the decision-making process. Critically, these organizational mandates facilitate collaboration between experts and expert organizations and are required to, for example, ensure a regular supply of new data, manage data confidentiality, guarantee access to data and engage private sector organizations to provide data or consultancy.

#Check 1: It the leading structure clearly identified?

The Ministry of Environmental Protection and Agriculture (MEPA) is clearly the leading entity.

Within MEPA, it is the Department of Environment and Climate Change (DECC) that is designated as the responsible service to deal with climate change policy.

Within the DECC, it is the Climate Change Division (CCD) that is tasked to coordinate the preparation of Georgia's official documents and reports to be submitted to the UNFCCC including the GHG emission national inventory report (NIR).

The EIEC, under State control via the MEPA, is the coordinating entity for the collection and management of data and information.

#Check 2: Are all the structures involved in the GHG inventory clearly identified?

Until now, the LEPL Environmental Information and Education Centre (EIEC) has been preparing National GHG Inventory reports with the assistance of independent international and local experts. The core of the technical teams is composed by external consultants hired project by project.

Other ministries and services are part of the system. They are mostly data providers. The complete list of data providers for LULUCF is not identified yet, it will be seen in detail in the specific assessment of current data flows for LULUCF.

The involvement of the following structures in the GHG inventory system should be considered:

- Climate Change Council (CCC)
- National Environment Agency (NEA)
- National Forestry Agency (NFA)
- Agency of Protected Areas (APA)
- Agency for Sustainable Land Management and Land Use Monitoring
- National Statistics Office (NSO)
- Land monitoring service

#Check 3: Is the system well described in NC or NIR (for instance with a clear picture)?

A clear picture shows the main entities involved in the process, it is presented in the latest national communication and inventory report (and copied in this report under paragraph 2.1.1). It mixes entities and products to better reflect the system which is based on a project basis. The picture is not exhaustive in the naming of data providers, but main ones are presented. Notably, the existing process is driven by international funded projects (GEF/UNDP), it is not regulated or described in institutional arrangements.

#Check 4: Are there terms of reference (official documents) designed to guarantee that the human, financial and data resources are made available?

No official document was identified as designed to guarantee that the human, financial and data resources are made available for GHG inventories.

- The mandate to ensure the production of GHG inventories is given to the Department of Environment and Climate Change (DECC) at MEPA by Decree (Decree of Government of Georgia n°112 of 6 March 2018).
- The implementation of GHG inventories is made thanks to financial resources from United Nations Development Programme (UNDP) and the Global Environmental Facility (GEF).
- Most of human resources are from Georgia, with internal or external experts. International consultants were also hired in the past but not for the latest NIR.
- A specific assessment on data resources is led in paragraph 2.3.

One note that, in view of the realization of the next BTR, the EIEC, in charge of the implementation of the inventory work, has begun the recruitment of the experts necessary to carry out the work.

#Check 5: Have the system been working efficiently for the latest GHG inventories?

Three editions of inventories have been led and the most recent one is published recently in 2021. Globally it seems that it responds to international expectations.

#Check 6: Does a national strategic ministerial-level steering committee exist for GHG inventories?

It was not identified as such. There was an executive project board for the latest GHG inventory. And, so far, it is not clear whether national inventories have been formally endorsed at the Governmental level before their submission to the UNFCCC.

#Check 7: Were specific difficulties or challenges identified in terms of human, financial and data resources for LULUCF in latest inventories?

No specific challenges were mentioned by EIEC in the implementation of LULUCF inventory. But, it can be noted that a few categories of the LULUCF inventory were let as non-estimated. It does not mean that the results are not good insofar as all categories are not priorities but there is place for improvement in terms of completeness.

FIGURE 6: SCOPE OF THE LULUCF INVENTORY PRESENTED IN THE NIR

GHG Source and Sink Categories	CO_2		CH_4		N_2O		NO_x		CO	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
5.A Forest land	D,T1	D,PS	D,T1	D	D,T1	D	D,T1	D	D,T1	D
5.B Cropland	D,T1	D,PS	NE	NE	NE	NE	NE	NE	NE	NE
5.C Grassland	D,T1	D,PS	NE	NE	NE	NE	NE	NE	NE	NE
5.D Wetlands	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5.E Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5.F Other land	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

D: IPCC default, T1-T3: IPCC Tier 1-3, PS: plant specific.|

It appears that there are no many resource people capable to implement a LULUCF inventory in Georgia. The resources seem limited for the next exercise, and it is obvious that the sector is demanding in terms of expertise and data. the calculations were

made on Excel spreadsheets with limited disaggregation of data. Land monitoring is a bit basic. Estimates are not estimated for all pools of carbon. No estimation is made on harvested wood products. National forest inventory will soon be available but won't solve all the issues. So, there are gaps that would justify the focus on this sector. On the other hand, these challenges exist in all countries whatever their level of resource.

4.2.2. Expertise

The team of national experts should be capable of regularly gathering and processing data in order to produce the agreed outputs in a timely manner. The team should have suitable back-up expertise and access to relevant training materials.

There should also be effective recruitment, retention and succession procedures in place that motivate the long-term and active involvement of experts in the reporting process. These aspects depend on suitable organizational mandates, as described above.

National experts are responsible for collecting, processing, and arranging the data and information for reporting of transparency themes. In general, national experts should:

- Have good relationships with data providers.
- Be comfortable with data analysis and calculations, and associated science and methods, including IPCC guidelines.
- Have a good understanding of the benefits and limitations of the data sets.

#Check 8: Does the system ensure the implication of people trained for IPCC methods?

Experts involved in inventories have followed specific trainings on inventories in particular for the latest inventories that was based for the first time on 2006 IPCC guidelines.

#Check 9: How do government agencies and departments cultivate, and retain in-house experts?

Technical expertise for inventory production is currently dependent on external consultants recruited project by project. Yet the team leader of the latest inventory, Mr.Giorgi Mukhigulishvili, was involved in the 3 exercises of inventory from Georgia. There is thus a form of continuity.

In the UNFCCC advises it is noted that in the early phases of developing institutional arrangements, it may be helpful to contract external support to train and mentor the team of national experts. The team of national experts may also wish to bring in temporary additional support for new developments from time to time. Yet, in Georgia, according to the Director of EIEC, Ms. Tamar Aladashvili, it is not planned to internalize these activities in a short term.

#Check 10: How do government agencies and departments manage direct/ advise consultants actively?

All the process is managed as a project with a team leader who manages the consultants implied.

#Check 11: How do experts in non-government organizations contribute to the transparency system?

No participation of NGOs was noted for the moment.

#Check 12: Are there existing knowledge management and training resources for archiving information and documenting processes to ensure work builds from existing efforts and also facilitates work of future staff?

The national inventory report is transparently published and contain most of the methodological explanations on the GHG inventory. It is the main document that is available for future teams.

No specific procedure, nor tool, was identified to facilitate the work and the training of consultants allowing effective increased skills.

4.2.3. Data flows

Reliable, regular data flows are essential for well-functioning institutional arrangements and the delivery of a national transparency framework. This includes defining the need for and uses of data, managing the delivery of the required datasets from a range of data providers on a regular basis and continuously improving data and reducing uncertainty.

The data sets include national statistics and government data, various forms of measurement data, company and trade association reports, and censuses and surveys that have already been undertaken and reported.

They also include new data specifically developed to fill gaps in knowledge where existing data does not exist, including new surveys, measurements and other statistical data collected on specific anthropogenic activities (e.g. forestry, agriculture, use of fluorinated gases), climate risks and vulnerabilities as well as on the costs, benefits and co-benefits of adaptation and mitigation actions, and information on financial, technology and capacity-building support for action. Identifying and engaging with stakeholders who hold, produce and could supply this data will be important.

#Check 13: Are key data providers clearly identified?

For LULUCF, forest sector is often prioritized and so forest stakeholders are rather well identified: the national forest division of MEPA, the National Forest Agency and the Agency of Protected Areas. Yet it is not fully clear how all these organizations work together for the GHG inventory. It seems that they are involved in the production of the national forest inventory which is one of the main data sources for LULUCF forest sector. For forest, in LULUCF, the boundary between data provider and inventory compiler is tiny.

In practice, the single national forest inventory (NFI) was led recently and could not be used for the latest GHG inventory. Field data are currently analyzed for publication.

This forest inventory is essential because it may offer the possibility to update all knowledge on health of forest in a context of climate change and anthropogenic

pressure. It may also offer the possibility to get new activity components on harvesting. Currently illegal logging creates difficulties for getting an accurate picture of forest harvesting and its impacts. Yet one must be cautious as this forest inventory is the first comprehensive one it does not offer a complete view of changes in stocks. Additional exercises will be necessary for that and the time slots between NFIs is expected to be every ten years.

For the lands that are not forest, the stakeholders and data providers are not so clear as far as estimates on these lands are not so complete. It remains that most of LULUCF expertise and data, including on agricultural lands, are certainly at MEPA (which is also in charge of agriculture).

#Check 14: Is there a clear picture showing all data flows for LULUCF?

Such picture was not found.

#Check 15: Does the system ensure free, easy, regular exchange with data providers?

National forest inventory is new in Georgia and could not be used by inventory compiler for the latest inventory. As this inventory is led by a division of MEPA there should not be any difficulty to access NFI data for the GHG inventories.

#Check 16: Are there legislative and policy instruments, as well as tools and modalities facilitating data flows between government agencies and the private sector?

No data flux between agency and private sector was identified for LULUCF. It could be raised for municipalities which are in charge in particular of forest management… At EIEC level it was indicated that existing MoU (Memorandum of Understanding) with data providers were useful to facilitate the work. For the LULUCF inventory it was not obvious, yet at which steps it was helpful. It should be further investigated.

#Check 17: What role do national statistics offices, environment and sustainability departments and environment agencies play in the provision, analysis and QA/QC of data?

According to the latest NIR (paragraph 2.3) the QC activities are carried out by a team of experts involved during the preparation of the GHG NIR and by the project coordinator during the compilation and development of the GHG NIR of Georgia. In terms of quality assurance (QA), an external review of this NIR was coordinated by the UNDP-UNEP Global Support Programme (GSP) and was conducted from 16 to 22 March 2020 by Dr. Carlos Lopez, consultant in national GHG emissions inventories.

It seems that national offices and agency mostly play a role for the provision of data but were maybe not actively involved in QA/QC process.

#Check 18: Are there any overlap between departments in data-collection activities?

Most data and expertise is at MEPA or in agencies dependent from MEP for LULUCF no clear overlap or conflict was noted.

4.2.4. Coordination, systems and tools

Coordination, systems and tools are important for the smooth functioning of the transparency system. This encompasses managing the collection, analysis, QA/QC, summarizing and archiving of data. Institutional arrangements need to provide for the development and maintenance of workplans, engagement tools, databases, data analysis, indicators and reports.

#Check 19: Are previous editions of GHG inventory (including calculation files) completely archived and available?

Official documents are available (NIR, NC, BUR). The data collected and calculation tools used for previous inventories are not centralized by MEPA nor by EIEC, they were compiled by the team leader and by consultants.

#Check 20: Are the same tools used from one to another edition of inventory?

In the last inventory calculations were made thanks to the Excel spreadsheets of the 2006 IPCC guidelines (The IPCC tool (v2.54 July 2017) was only used for the energy sector).

#Check 21: Is there a regular update of new requirements, templates, methodologies?

The latest inventory follows the 2006 IPCC guidelines which is in line with requirements. The following 2013 IPCC guidelines on wetlands and the refinement of 2019 were not used but it is consistent with international requirement which does not impose these guidelines.

In terms of global warming potentials, the values from the 2nd Assessment report from the IPCC were used which correspond to old values but there is no strong obligation in terms of reference for the moment.

#Check 22: Is there planification and team setup for report preparation?

Planification of the work of teams is linked to the projects and are managed at this level.

#Check 23: Is there an uncertainty assessment GHG estimates?

The national inventory report presents a section on uncertainties and one of the authors is presented as expert in uncertainties.

In the NIR (page 1-15 and 1-16) details are provided on how uncertainties were estimated. It is also completed by Annex C of the NIR on uncertainties.

#Check 24: Is there a follow-up of recalculations of GHG estimates?

Recalculation compared to previous inventory was done in last national inventory report and presented in chapter 8.

Yet, few information on the changes are provided ("Activity data and the emissions factors has been updated and specified"). It can be noted for these last invento-

ry IPCC2006 guidelines were used (and also 2003 good practice guidance for LULUCF). I may lead to large differences that are not easy to comment. Nevertheless, most data used for forest are old data that were certainly already used in the past. The new forest National inventory was not available yet.

#Check 25: Is there an improvement plan that is used and completed over the years?

No improvement plan was found in the NIR.

#Check 26: Are there automatic controls of GHG estimates?

The tools are not clearly identified and automatic controls unknown.

#Check 27: Is the system efficient to produce reporting tables?

Although the calculations are made with 2006 IPCC guidelines and sometimes with Good Practice Guidance of the IPCC, the reporting tables are those corresponding to former 1996 revised IPCC guidelines.

It is important to note that for next BTR, the reporting format will be much more detailed and similar to the format used by Annex I countries.

#Check 28: Are the official communication submitted on time?

National communications are to be submitted every four years and prepared following the guidance contained in the revised guidelines for the preparation of national communications from non-Annex I Parties contained in the annex to Decision 17/CP.8.

BURs are to be submitted every two years, providing an update of the information presented in National communications, in particular on national GHG inventories, mitigation actions, constraints and gaps, including support needed and received (Decision 2/CP.17, annex III.)

The dates of submissions from Georgia are:

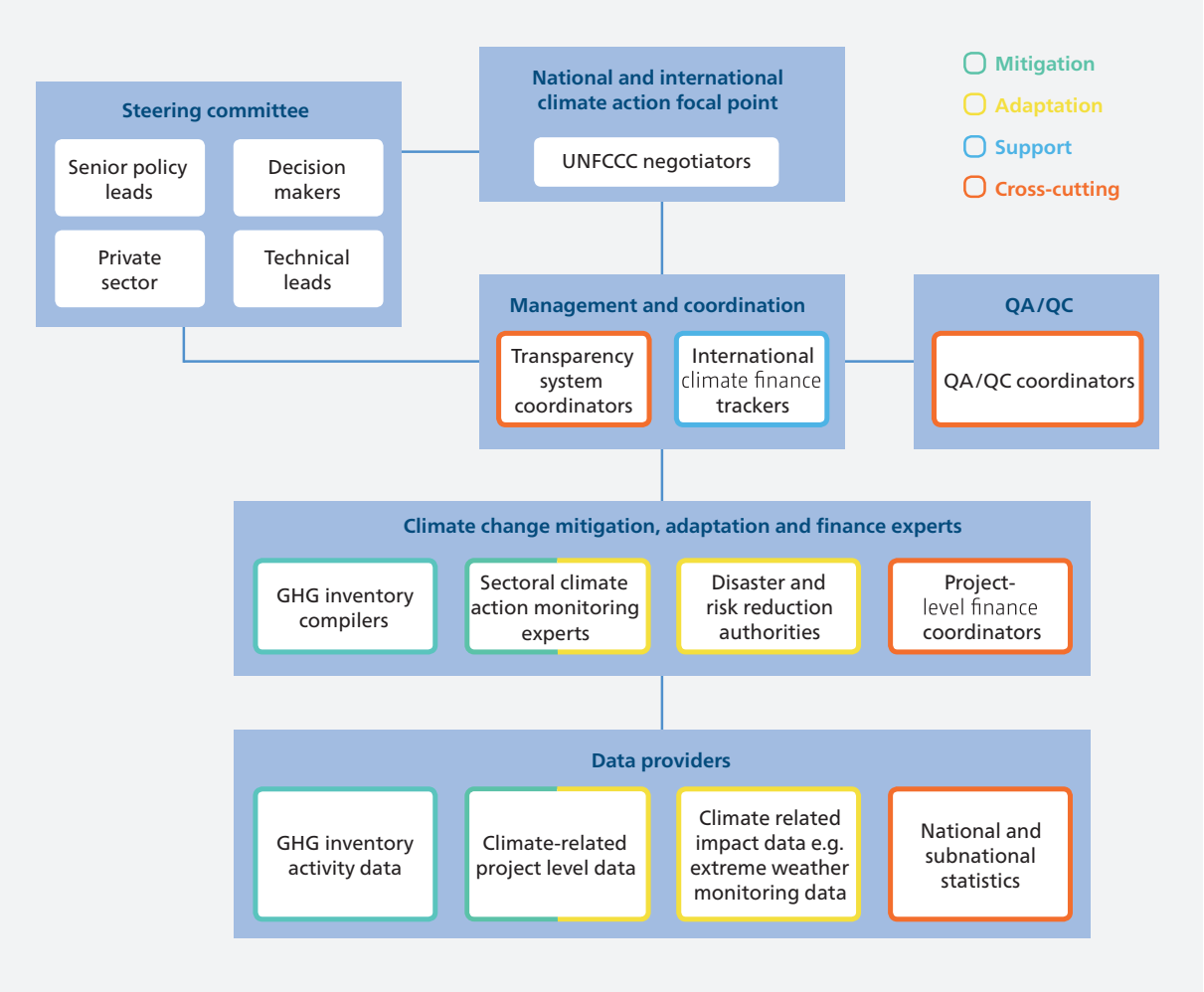
- NC1: 10 Aug 1999
- NC2: 2 Oct 2009
- NC3: 24 Feb 2016
- NC4 : 3 Apr 2021
- BUR1: 18 Jul 2016
- BUR2 : 13 Jun 2019

#Check 29: Are there documents confirming quality control/assurance on inventory?

QC and QA are mentioned in the NIR but no clue of the effective controls was seen.

The report of the quality assurance conducted from 16 to 22 March 2020 by Dr. Carlos Lopez, consultant in national GHG emissions inventories was not consulted.

FIGURE 7: MODEL STRUCTURE OF INSTITUTIONAL ARRANGEMENTS WITH OPTIONAL COMPONENTS (SOURCE: 2020-3 UNFCCC)



4.2.5. Stakeholder engagement

Collecting data and making use of the outputs requires stakeholder engagement, including the public, local governments and communities, businesses and other decision makers. The greater the engagement the better (and more useful) the transparency system will be for evidence-based decision-making and the production of reports. Stakeholder engagement involves seeking out key individuals and organizations and offering benefits in exchange for their involvement (e.g. providing data, insights and resources) with the transparency system.

#Check 30: Does the system ensure a multi-stakeholder and consultative process?

There is an executive board for the project, but not permanent multi-stakeholder committee was identified.

#Check 31: Does the system ensure the implication of people with knowledge of relevant existing datasets during the allowed time of an edition?

National inventory reports are cautiously produced. Recruited consultants for LULUCF are acknowledged resource people in Georgia.

#Check 32: Are there conflicts of interest of stakeholders in the LULUCF MRV process?

Currently, no conflict of interest was identified.

4.2.6. Structuration of institutional arrangements

Structuring institutional arrangements helps to define coherent roles and responsibilities among the involved organizations. Describing the structure of the institutional arrangements in an organization chart offers a visual summary of the organizational linkages.

#Check 33: Are there written procedures to structure the system?

Not so clear for the moment.

The MoU of 2014 to facilitate the transfer of data is known by stakeholders but it is not easy to assess whether it is efficient.

At the time of writing this report, it seems that the CCC has not initiated yet any decision-making process for the adoption by the Government of rules, modalities and procedures establishing a national MRV system within the ETF of the Paris Agreement.

4.3. SPECIFIC ASSESSMENT OF CURRENT DATA FLOWS FOR THE LULUCF GHG INVENTORY

Inventories are not limited to the question of data, but this is a recurrent issue which justifies a detailed look on it. In practice, lack of data is often pointed as the major limit to produce inventories of high quality.

4.3.1. Land monitoring

Land use monitoring is one of the main challenges of LULUCF inventories. **T**he IPCC guidelines propose 3 approaches of increasing precision and difficulty to assess land use change:

- Approach 1: representation of land without monitoring the evolution of each land category,
- Approach 2: use of land use change matrices on a sample and extrapolation to the whole territory,
- Approach 3: Use of land use change matrices with comprehensive coverage and the ability to spatially represent a map of land use change. Approach 3 is most often the result of work from satellite images but can also in theory be implemented from statistical sampling.

Nowadays land monitoring is based on satellite imagery, but remote sensing does not make all difficulties disappear. For instance it remains very difficult to compare maps made from satellite imagery.

#Check 34: Are land use and land use change data available for GHG inventories? What type of data is used?

In the NIR (p 5-62), it is written that land monitoring is mainly based on data from the National Statistics Office and the Ministry of Environmental Protection and Agriculture and is completed by FAOSTAT for missing data.

Considering the land use changes that are reported, the land use monitoring is certainly based on several datasets and not using maps of land use and land use changes. The land use change matrixes do not show any changes in settlement for instance which is unlikely.

#Check 35: Is the land use monitoring of the whole country?

In Georgia, an additional difficulty of monitoring is due to the territories of Abkhazia and South Ossetia which are not controlled By Georgia but included in the area reported by Georgia in its LULUCF inventory.

#Check 36: Is there a unified system ensuring consistency for all land use categories?

It is not so clear how the land use changes are estimated, but some elements of consistency are present like the fact that the area is kept constant over time.

#Check 37: Does the system cover accounting for of all land use categories?

All land uses are estimated, but many of them are not concerned by land use changes and consequently there are no carbon changes on it.

FIGURE 8: TABLE PRESENTED IN THE NIR SHOWING A L LOT OF NON ESTIMATED CATEGORIES

GHG Source and Sink Categories	CO_2		CH_4		N_2O		NO_x		CO	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
5.A Forest land	D,T1	D,PS	D,T1	D	D,T1	D	D,T1	D	D,T1	D
5.B Cropland	D,T1	D,PS	NE	NE	NE	NE	NE	NE	NE	NE
5.C Grassland	D,T1	D,PS	NE	NE	NE	NE	NE	NE	NE	NE
5.D Wetlands	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5.E Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5.F Other land	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

D: IPCC default, T1-T3: IPCC Tier 1-3, PS: plant specific.|

#Check 38: Are managed and unmanaged land distinguished?

In NIR (p 5-65) It is noted that forests were carried out on an entire forest area, regardless of forest management regime (active or passive) […] Exceptions are forests in areas not controlled by Georgia (Abkhazia, South Ossetia), which are not included in the calculation due to the lack of relevant data".

It means all forest is reported under managed forest excepted those in areas not controlled by Georgia.

#Check 39: Are there stratifications with country specific land subcategories?

For cropland, arable and perennial crops are distinguished.

For forest, distinctions are made for West Georgia, East Georgia and AR of Ajara by type of forest (coniferous/deciduous) and type of climate (humid continental/dry continental/humid subtropical).

But (NIR 5.73), "unfortunately, it is impossible to carry out inventory of greenhouse gases on forest areas per separate climatic zones, due to unavailability of necessary statistical or taxation data".

FIGURE 9: SUBCATEGORIES OF FOREST KNOWN FOR THE ENTIRE PERIOD WITH THEIR AREAS

Year	Forest land (National Forestry Agency), ha										
	West Georgia					East Georgia					Total
	humid continental climate (Upper Svaneti -Mestia)		humid continental climate		Total	dry continental climate		humid continental climate (Borjomi-Bakuriani)		Total	(6+11)
	coniferous	deciduous	coniferous	deciduous		coniferous	deciduous	coniferous	deciduous		
1	2	3	4	5	6	7	8	9	10	11	12

Year	Ajara AR, ha			Abkhazia and South Ossetia, ha	Forest areas that exist on the protecterd sites	Total area of forest of Georgia (12+16+17+18). thousand ha)
	coniferous	deciduous	Total			
13	14	15	16	17	18	19

#Check 40: Does the system monitor land use and land use changes for all subcategories and all possible conversions?

In the NIR (p5-62) it is written that "changes in land use areas are minimal. It is noteworthy that the small change in the total forest area of Georgia is due to the fact that no clear cut is carried out there and the tendency to transfer forest lands to other land use categories is insignificant."

The table on land areas only shows the land areas by year and not the converted areas with initial and final use. It is not clear whether an approach 1 or an approach 2 is used for land monitoring.

#Check 41: Is there a specific tracking for deforested areas?

Not clearly.

#Check 42: Is there a specific tracking for afforested areas?

Not clearly.

#Check 43: Is there a specific tracking for urbanized areas?

Not identified.

#Check 44: Are land use change monitored for a long period, for recent years?

In the GHG inventory the entire time series was built from 1990 to 2017.

#Check 45: Are annual land use change areas monitored?

Not really.

#Check 46: Is there a verification process for land monitoring?

Not known.

#Check 47: Does the land monitoring system respect national definition of forest thresholds?

A lot of attention is paid to forest definition to delimitate the forest domain.

#Check 48: Is forest area from GHG inventories, consistent with NFI forest area?

There is no NFI yet.

4.3.2. Forest monitoring

In forest the main objective is to quantify carbon stock changes. It can be done with two different methods:

- The Gains-Losses method (for biomass, this method requires a monitoring of carbon fluxes like forest increment, mortality and wood harvest)
- The Stock change method (for biomass, this method requires to estimate the stocks of carbon at 2 different times)

#Check 49: Does the system ensure access to forest data?

GHG inventories and forestry issues are managed in the same ministry. Data is easily communicated from one to another service. It can be noted that in 1990 forest area is similar in NIR and in FRA2020, but different for more recent years. It often occurs when different data sets are used.

Experts on LULUCF (Koba Chiburdanidze and Giorgi Kavtaradze) are acknowledged as forest experts.

#Check 50: Are there easy and regular interaction with NFI and relevant organizations?

GHG inventories and NFI inventories are managed in the same ministry.

#Check 51: Are increment and mortality monitored?

In the NIR (5-75) its is written that increments are coming from Unified Forest Inventory data,2003 NIR Table 5-16).

But, mortality was not explicitly considered.

The future NFI should provide updated and more reliable data on it.

#Check 52: Is annual harvest monitored?

Roundwood and firewood are provided by the Georgian Statistical Yearbook of Forestry 1990-2017 (NIR Table 5-17).

NIR (5-71) With regard to the value of volume weight used in calculations of biomass losses, it was obtained taking into account the main species of timber produced in Georgia. Since volume of timber produced by cutting are not identified by species on a national scale in Georgia, therefore expert estimation has been used to determine percentage values of the main species, used by population as timber and firewood.

#Check 53: Does the system allow the estimate of non-legal or informal harvest?

Not fully clear, the label of the table 5-17 of the NIR is unclear: “Firewood and Timber Produced (in their number, by illegal logging) in Georgia”.

#Check 54: Are natural disturbances monitored?

Forest fires are covered. Recent weather events, drought, pests are not reflected in LULUCF inventory

#Check 55: Are some key parameters country specific?

Basic wood densities are coming from national references.

The biomass expansion factors are coming from the Good practice guidance 2003 and not the 2006 which facilitates the use of specific basic wood densities.

#Check 56: is there data on forestry practices?

No quantitative information on management was identified in LULUCF

4.3.3. Wood monitoring

The category harvested wood products was not estimated in the latest inventory report. It requires a lot of data on wood products.

#Check 57: Is there data on harvested wood products?

No information on available data on wood products was found.

#Check 58: Are imports and exports of wood available?

No information on available data on wood products export was found (imports are not really useful if the reporting is following a production approach)

4.3.4. Dead organic matter monitoring

The pool of dead organic matter is often not monitored in forest because it represents low financial interest. Yet it can correspond to large stocks although the IPCC guidelines give few elements on it.

In the latest NIR, no estimate was done on dead wood, nor litter.

#Check 59: Is there data on dead wood pool, stocks or stock changes?

No country-specific data identified.

#Check 60: Is there data on litter pool, stocks or stock changes?

No country-specific data identified.

4.3.5. Soil monitoring

Soils represent large carbon stocks and are therefore crucial issues for GHG inventories. Soils are difficult to monitor, even Tier 1 is data intensive. All proposed IPCC method remain very uncertain for soils.

#Check 61: Does the system allow access to soil data?

Few data on soils seem available, the values used were obtained on the basis of the research carried out in Georgia ("Carbon stock in the region of Inner Kartli", Gizo Gogichaishvili). NIR (5-87)

For croplands, estimates are made on mineral soils, considering the balance between cultivated areas and temporary set aside of annually cropland. The methodology used is not fully clear because no explanation was found how FLU and FMG are changing over time for each type of land.

For grassland, estimates are mode on mineral soils, considering two subcategories: grasslands and hay land. By assuming degradation on some of the grassland on the covered period the parameter FMG is modified.

"Since an essential degradation of grasslands is noted in Georgia, a stock change factor corresponding to abrupt degradation has been taken for Eastern Georgia117 for the regime of areas management (FMG), and a factor envisaged for average degradation - for Western Georgia." NIR (5-87)

#Check 62: Are soil maps available?

No soil map was identified in the NIR.

But, in the NIR (5-87) it is indicated that "for calculations in croplands the reference value of carbon stock has been used (for soils), was obtained on the basis of the

research carried out in Georgia ("Carbon stock in the region of Inner Kartli", Gizo Gogichaishvili). In particular, based on the research carried out in Eastern Georgia, according to the type of soil dominating on croplands in Georgia (Cambisols and Calcic Kastanozems) it has been identified that the carbon stock is 52 ton 1 ha C (soil depth 0-30 cm.). It should be noted here that by the classification of soils provided in the respective Table of the IPCC methodology, and taking into account the types of soils spread in Georgia, the reference carbon stock for Georgia is 38 t C/ha"

#Check 63: Is there a monitoring of carbon stocks in mineral soils?

No monitoring identified on soils.

Some specific data on soils are presented in the report on desertification PRAIS 2018, but they are very different from the common ranges and should thus be considered cautiously.

#Check 64: Are organic soils monitored?

Investigations were led on organic soils in the NIR although no estimate was produced.

4.3.6. Agriculture land monitoring

Large biomass changes can occur on agricultural lands, on perennial crops, but also in hedges or agroforestry systems. Then agricultural lands are essential because their soils large stocks of carbon that can increase or decrease depending agricultural practices. Depending on the type data, it can be obtained by surveys or by direct measurement (like remote sensing).

#Check 65: Are perennial crops specified?

Perennial crops are identified and calculations of carbon fluxes on biomass are made. The calculation is not fully clear because gains and losses are not calculated with the same scope which gives overestimated gains compared to losses.

No specific data on biomass from perennial crops were identified.

#Check 66: Is data on agricultural practices available (tillage, residue management, fertilization management)?

No monitoring was identified on tillage, residue management, fertilization management.

Only set-aside data was clearly identified.

#Check 67: Is data on hedges or isolated trees out of forest available?

No national monitoring was identified.

4.3.7. Wetlands monitoring

Specific emissions of CO_2, CH_4 and N_2O are related to wetlands. It can be linked to peat extraction, to flooded areas or to drainage.

#Check 68: Is data on wetlands available?

Areas of wetlands are presented with details (lake, swamps, etc.) but are considered constant overtime in the NIR. No calculation is made for this area.

NIR (5-90) No calculations were performed for this source category due to lack of relevant data.

4.3.8. Fire monitoring

Emissions from Wildfires are estimated thanks to the monitoring of burnt areas combined with estimates biomass present on burnt areas.

#Check 69: Is data on fires available?

Burnt areas of forest are provided in the Georgian Statistical Yearbook, Ministry of Environment Protection and Agriculture of Georgia, National Forestry Agency.

(NIR 5-72) Data obtained from the National Forestry Agency and Forestry Agency of Adjara, forest fires of various intensity were registered on forest areas during the period of inventory. As a result, various volumes of biomass have been burnt on these areas.

5. OVERVIEW

With the introduction of the enhanced transparency framework, all countries are being pushed to improve the quality of their inventory systems. The LULUCF sector is specific:

- it mobilizes significant resources,
- it is often assumed to be difficult to manage
- it has significant political weight because of the magnitude of the emissions and removals that are generally estimated
- the uncertainty associated with these emissions is high.

This uncertainty tends to pay close attention to this sector.

In this document the analysis focused on the documents published so far but also on the interviews carried out with different actors currently identified in the system in place. The overview of this assessment is presented in the following table of strengths and weaknesses:

TABLE 1: STRENGTHS AND WEAKNESSES FOR MAIN COMPONENTS OF THE LULUCF MRV SYSTEM IN GEORGIA

	Strengths	Weaknesses
Organizational mandates	Updated forest regulation A system that was effective for former exercises A lot of departments included in MEPA Extended mandate for EIEC on BTR Rather clear picture of existing system	No real documents for mandates Project dependent Limited resources
Expertise	A few experts involved in the process for a long time Experts trained to IPCC methods Agricultural research centres exist and could be involved A forest department involved	Few experts identified Few transfers of expertise No training procedure Inventory experts mostly external consultants
Data flows	Basics on references are available A few parameters are country-specific	Explanation on the use of data very detailed Some data missing Limited resources
Land monitoring	All lands estimated Global consistency ensured Land estimate by climate type A land monitoring agency exist and could be involved	Approach 1 is used (still a bit unclear) Few data on land uses Some differences with FRA 2020 on forest area Some land use changes are missing

	Strengths	Weaknesses
Forest monitoring	NFI in progress Comprehensive forest regulation	No real NFI available A unique temporal reference on increment is used Unclear picture on illegal loggings Dependence on biomass expansion factors from IPCC
Wood monitoring	The forest survey is supposed to gather information on wood	No survey on wood products Unclear picture on illegal loggings
Dead organic matter monitoring	NFI in progress	No monitoring
Soil monitoring	Agricultural research centres exist and could be involved	Large differences with PRAIS reporting on soils No soil maps No estimate for organic soils
Agriculture land monitoring	Agricultural research centres exist and could be involved	Unclear estimate on perennials Unclear application of IPCC tier 1 for soils under croplands and grasslands No monitoring on agricultural practices No monitoring on trees out of forest
Wetlands monitoring	Agency of Protected Areas exist and could be involved	No monitoring
Fire monitoring	Burnt areas are provided by national statistics	
Coordination, systems and tools	MEPA gather most of the stakeholders MEPA and EIEC are working well together Recent publications exist and fits with the standards The NIR is well organised A recent review (QA) with relevant recommendations	Mix of Excel spreadsheets and IPCC tool for inventory Difficult coordination for reporting Unclear archiving of previous editions Few resources for next exercises
Stakeholder engagement		Project dependent
Structuration of institutional arrangements	Some MoU exist	Few procedures clearly identified

ANNEX ON PARIS AGREEMENT

Common rules

Chapter II of the MPGs defines common elements to the National Inventory Report of Anthropogenic Emissions by sources and removals by sinks of greenhouse gases.

Definitions (paragraph 17)
The definitions of the GHG inventory principles used shall be as provided in the 2006 IPCC Guidelines, volume 1, chapter 1, section 1.4.

National circumstances and institutional arrangements (paragraphs 18 et 19)
Parties should implement and maintain national inventory arrangements, including institutional, legal and procedural arrangements that can support the continued estimation, compilation and timely preparation and submission of their national inventory reports. Such arrangements will vary by Party depending on their national circumstances and preferences and will change over time.

Methods (paragraphs 20 à 36)
Guidelines: In preparing their national inventory report, all Parties shall use the 2006 IPCC Guidelines, and any subsequent version of or refinement to these IPCC guidelines agreed upon by the CMA. Further, each Party is encouraged to use the Wetlands Supplement.15 In this chapter, the term "the IPCC guidelines" refers to the 2006 IPCC Guidelines and the Wetlands Supplement together.
Use of nationally appropriate methodologies: The MPGs also provide that a Party should use nationally appropriate methodologies if they better reflect its national circumstances and are consistent with the IPCC guidelines. For such cases, the Party must transparently explain the national methods, data and/ or parameters selected.
Tiers: Each Party should make every effort to use a recommended method (tier level) for key categories. A Party may be unable to apply a higher tier method for a particular key category owing to a lack of resources. In such cases, the Party may use a tier 1 approach, and shall clearly document why the methodology used was not in line with the corresponding decision tree of the IPCC guidelines. The Party should prioritize for future improvement any key categories for which the good practice method elaborated in the IPCC guidelines cannot be used.
Country-specific emission factors and activity data: Parties are encouraged to use country-specific and regional emission factors and activity data, where available, or to propose plans to develop such emission factors and activity data in accordance with the IPCC guidelines.
Key category analysis: Each Party must identify key categories using IPCC approach 1, whereby key categories are identified using a predetermined cumulative emissions threshold20 for the starting year and the latest reporting year of its GHG inventory with and without LULUCF categories for both level and trend assessment. Those developing country Parties that need flexibility in the light of their capacities have the flexibility to identify key categories at a lower threshold value, no lower than 85 per cent, in place of the 95 per cent threshold defined in the IPCC guidelines. This flexibility is intended to allow Parties that apply it to focus on improving fewer categories and prioritizing resources.

Time series consistency and recalculations: The same methods and approach to underlying activity data and emission factors should be used consistently for each reported year. In cases when there are missing emission values resulting from a lack of activity data, emission factors or other parameters, surrogate data, extrapolation, interpolation and other methods consistent with splicing techniques contained in the IPCC guidelines should be used to fill in data gaps and ensure a consistent time series.23 In the event there are any changes in the methods and/or assumptions, it is important to recalculate the complete time series to ensure that changes in emission trends are not introduced as a result of changes in methods or assumptions across the time series, in accordance with the IPCC guidelines.

Uncertainty assessment: Parties must quantitatively estimate and qualitatively discuss the uncertainty of the emission and removal estimates for all source and sink categories, including inventory totals, for at least the starting year and the latest reporting year of the inventory time series. It is also essential to estimate the trend uncertainty of emission and removal estimates for all source and sink categories, including totals, between the starting year and the latest reporting year of the inventory time series, using at least approach 1 contained in the 2006 IPCC guidelines. Those developing country Parties that need flexibility in the light of their capacities have the flexibility to instead provide, at a minimum, a qualitative discussion of uncertainty for key categories in the event that quantitative input data are unavailable to quantitatively estimate uncertainties. At the same time, these Parties are encouraged to provide a quantitative estimate of uncertainty for all source and sink categories of the GHG inventory.

Assessment of completeness: If the national inventory report does not consider some sources and sinks (categories, pools and gases) for which estimation methods are included in the IPCC guidelines, the Party should clearly indicate those sources and sinks, and explain the reasons for their exclusion. When completing common reporting tables, notation keys (see Box 1) must be used where numerical data are not available, and reasons must be provided as to why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported.27 Once emissions or removals have been estimated for a category, these must be reported in subsequent submissions if they continue to occur.

QA/QC: All Parties must elaborate an inventory QA/QC plan in accordance with the IPCC guidelines, including information on the inventory agency responsible for implementing QA/QC. They must implement and provide information on general inventory QC procedures in accordance with their QA/QC plan and the IPCC guidelines. However, flexibility is offered in this reporting area to those developing country Parties that need flexibility in the light of their capacities; they are instead encouraged to elaborate an inventory QA/QC plan in accordance with the IPCC guidelines and implement and provide information on general inventory QC procedures in accordance with their QA/QC plan and the IPCC guidelines.

Metrics (paragraph 37)

Metrics: The value of the global warming potential to be used for expressing emissions and removals of GHGs in CO2 eq shall be a 100-year time-horizon from the IPCC Fifth Assessment Report,33 or 100-year time-horizon global warming potential values from a subsequent IPCC assessment report, as agreed by the CMA. In addition, other metrics, such as global temperature potential, may be used to report supplemental information on aggregate emissions and removals of GHGs, expressed in CO2 eq. In such cases, the Party shall provide in the national inventory document information on the values of the metrics used and the IPCC assessment report they were sourced from, in addition to the estimates of GHG emission and removal.

A. Information to be reported: Sectors and gases (paragraphs 38 à 58)

Regarding information on methods, Parties must communicate:

- Information on methods and cross-sectoral elements
- Sectors and gases
- Time series

Flexibility provisions

Specific provisions that offer flexibility to those developing country Parties that need it in the light of their capacities in relation to reporting anthropogenic emissions by sources and removals by sinks of GHG in the national inventory report are presented below:

TABLE 5. OVERVIEW OF SPECIFIC FLEXIBILITY PROVISIONS FOR THOSE DEVELOPING COUNTRY PARTIES THAT NEED IT IN THE LIGHT OF THEIR CAPACITIES IN RELATION TO A NATIONAL INVENTORY REPORT (SOURCE: 2020-1 UNFCCC)

REFERENCE IN THE MPGs (ANNEX TO DEC. 18/CMA.1)	PROVISION IN THE MPGs	FLEXIBILITY PROVISION FOR THOSE DEVELOPING COUNTRY PARTIES THAT NEED IT IN THE LIGHT OF THEIR CAPACITIES
Paragraph 25 *Key category analysis*	Parties shall implement the key category analysis consistent with the IPCC guidelines (i.e. apply the 95 per cent threshold defined in the IPCC guidelines).	Identify key categories using a threshold no lower than 85 per cent in place of the 95 per cent threshold defined in the IPCC guidelines.
Paragraph 29 *Uncertainty assessment*	Parties shall quantitatively estimate and qualitatively discuss the uncertainty of the emission and removal estimates for all categories, including inventory totals, for at least the starting year and the latest reporting year of the inventory time series, and shall also estimate the trend uncertainty for these same categories/ inventory totals for the entire time series.	Provide, at a minimum, a qualitative discussion of uncertainty for key categories, using the IPCC guidelines where quantitative input data are unavailable to quantitatively estimate uncertainties. Parties are also encouraged to provide a quantitative estimate of uncertainty for all source and sink categories of the GHG inventory.
Paragraph 32 *Use of the notation key "NE" (not estimated)*	A category should only be considered insignificant if the likely level of emissions is below 0.05 per cent of the national total GHG emissions, excluding LULUCF, or 500 kt $_{CO2}$ eq, whichever is lower. The total national aggregate of estimated emissions for all gases from categories considered insignificant shall remain below 0.1 per cent of the national total GHG emissions, excluding LULUCF.	Consider emissions to be insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. The total national aggregate of estimated emissions for all gases from categories considered insignificant, in this case, shall remain below 0.2 per cent of the national total GHG emissions, excluding LULUCF.
Paragraph 34 *QA/QC*	Parties shall elaborate an inventory QA/QC plan in accordance with the IPCC guidelines, including information on the inventory agency responsible for implementing QA/QC.	Encouraged to elaborate an inventory QA/QC plan in accordance with the IPCC guidelines, including information on the inventory agency responsible for implementing QA/QC.

Paragraphe 35 *QA/QC*	Parties shall implement and provide information on general inventory QC procedures in accordance with the QA/QC plan and the IPCC guidelines.	Encouraged to implement and provide information on general inventory QC procedures in accordance with the QA/QC plan and the IPCC guidelines.
Paragraph 48 *Gases*	Parties shall report on seven gases: CO2, CH4, N2O, HFC, PFC, SF6 and NF3.	Report at least three gases (CO_2, CH_4 and N_2O) as well as any of the additional four gases (HFCs, PFCs, SF_6 and NF_3) that are included in the Party's NDC under Article 4 of the Paris Agreement, are covered by an activity under Article 6 of the Paris Agreement or have been previously reported.
Paragraphe 57 *Time series*	Parties shall report a consistent annual time series starting from 1990.	Parties may report data covering, at a minimum, the reference year/period for their NDC under Article 4 of the Paris Agreement and, in addition, a consistent annual time series from at least 2020 onward.
Paragraphe 58 *Reporting year*	The latest reporting year shall be no more than two years prior to the submission of the national inventory report.	The latest reporting year shall be no more than three years prior to the submission of the national inventory report.

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TOWARDS DEVELOPMENT/ STRENGTHENING OF THE NATIONAL GHG INVENTORY SYSTEM —

CONCEPTUAL FRAMEWORK FOR MONITORING, REPORTING AND VERIFICATION OF LAND USE, LAND-USE CHANGE AND FORESTRY (LULUCF) SECTOR IN GEORGIA

MRV LULUCF GEORGIA

DETAILED REPORT

EU4Climate
Better Climate Policies for Eastern Partner Countries

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Conceptual Framework for Monitoring, Reporting and Verification of Land Use, Land-Use Change and Forestry (LULUCF) Sector in Georgia

MRV LULUCF GEORGIA

DETAILED REPORT

DETAILED REPORT ON LULUCF MRV SYSTEM INSTITUTIONAL AND METHODOLOGICAL ARRANGEMENT COMPONENTS

November 2022

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EU4Climate
Better Climate Policies for Eastern Partner Countries

Outline

INTRODUCTION

This report aims to propose organizational options for carrying out LULUCF sector of the national GHG inventory. These options are thought based on the elements received during the project, the assessment carried out in the first part of the project and the interviews conducted with the national actors whose role could be relevant for the implementation of a LULUCF inventory.

The report presents the following chapters:

1. Proposed options for LULUCF inventory system
2. Proposed procedures to ensure that organizations and individuals will participate and collaborate
3. Proposed workplan for LULUCF inventory
4. Simplified guidelines and information for national experts to process LULUCF inventory

1. PROPOSED OPTIONS FOR LULUCF INVENTORY SYSTEM

1.1. GENERAL PICTURE FOR A LULUCF INVENTORY SYSTEM

In the options presented below, a general picture was designed to fully understand the different organization options (cf. Figure 1). In this picture, voluntarily, no arrow has been added to specify the roles because when arrows are added it often becomes too complex.

Four major responsibilities are identified:

- Political responsibility of GHG Inventory
- Technical responsibility of GHG Inventory compilation and coordination
- Technical responsibility of LULUCF GHG Inventory implementation
- Technical responsibility of data provision for LULUCF GHG Inventory

The political responsibility and the technical responsibility of the GHG inventory covers a wider scope than the LULUCF inventory alone. As it seems that the general structure seams quite clear in Georgia, the options detailed below do not vary regarding the general organization:

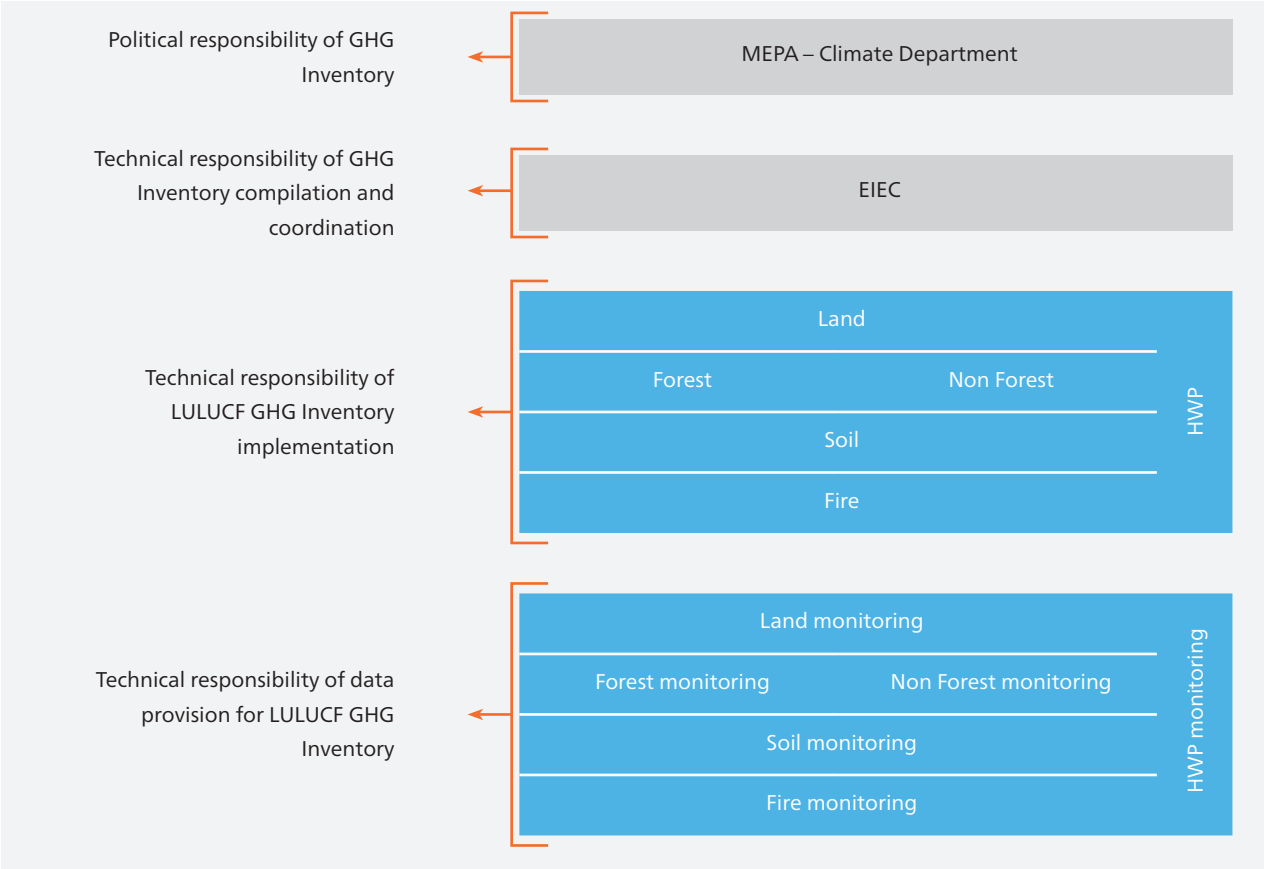
- Political responsibility of GHG Inventory = MEPA's climate division
- Technical responsibility of GHG Inventory compilation and coordination = The EIEC is entrusted by the MEPA with the technical realization of the inventory
- Technical responsibility of LULUCF GHG Inventory implementation = several options are proposed in this report
- Technical responsibility of data provision for LULUCF GHG Inventory = 1 picture is presented in this report, it cannot show all effective contributions in terms of data provision, only major data providers are explicitly mentioned but it does not mean that others do not exist.

In this study, the LULUCF sector is presented as 6 independent bricks, that can be considered from inventory compiler or from data provider point of view:

- Land (estimates of land-use and land-use change area)
- Forest (estimates of emissions and removals for biomass and dead organic matter in forest land and land converted to forest)
- Non-forest (estimates of emissions and removals for biomass and dead organic matter in all other land categories)
- Soil (estimates of emissions and removals for soils)
- Fire (estimates of emissions due to wildfires)
- HWP (estimation of carbon stock change within harvested wood products).

Variations may be specified on each brick of the LULUCF sector.

FIGURE 1: GENERAL SCHEME FOR A LULUCF INVENTORY



1.2. EXPERTISE AND RESOURCES FOR EACH ENTITY OF THE SYSTEM

The different options will be based on expected skills, resources, and tools for each brick of the LULUCF system.

1.2.1. Political responsibility for entire inventory

The political responsibility requires a solid institutional anchoring. It is most often carried by a ministry or an inter-ministerial body. The main requirement is the legitimacy of the institution at national level. This political mandate can be strengthened by an independent committee including representatives from different horizons.

In Georgia, the climate division of the Ministry of Environmental Protection and Agriculture (MEPA) has currently the political responsibility for GHG inventories. The Climate Change Council (CCC) may or could act as a steering committee for the national inventory.

The project aims to analyze the LULUCF system, without focusing on the more global system of the GHG inventory that appears quite clear. There is no reason to change this organization.

1.2.2. Technical responsibility for entire inventory

Technical coordination of the inventory is essential. It can cover the logistical organization with the recruitment of experts for example or the elaboration of working agreements and the work of verification of inventories produced.

Coordination should ensure:

- verification of the estimates made by sectoral experts,
- the proofreading of the reports by the sectoral experts,
- the analysis in key categories,
- the analysis of uncertainties,
- the follow-up of the improvement plan,
- the follow-up with internal and external reviews,
- the follow-up of compliance with deadlines,
- the follow-up of international requirements.

The technical responsibility for the inventory is entrusted to the Environmental Information and Education Centre (EIEC) by the MEPA. This was already the case in previous inventory exercises, but the scope of the EIEC has recently increased with the new responsibility[1] given to EIEC for producing the biennial transparency report (BTR).

The project aims to analyze the LULUCF system, without focusing on the political responsibility of the global system of the GHG inventory. The political responsibility seems rather clear, there is no reason to change this organization.

1.2.3. Technical responsibility for LULUCF inventory

As presented above, the implementation of a LULUCF inventory can be carried out with a division of tasks according to the topics. Each topic requires different technical and scientific skills that can be difficult to find in a single team. Nevertheless, it must be noted that the multiplication of actors has many negative effects: it requires much more human resources and can generate problems of consistency.

1.2.3.1. LAND

Land monitoring is the backbone for a good LULUCF inventory. Nowadays, almost all the inventories are betting on satellite imagery. This makes sense as the accuracy can be very good and is rather cheap compared to a „traditional" tracking system.

It should also be reminded that there are many ways to process satellite information and these tasks are complex. Most often, satellite image processing activities are not directly related to inventory activity for LULUCF sectors but are the result of dedicated programs.

[1] Information provided by interviews from Ms. Maia Tskhvaradze (MEPA) and Ms.Tamar Aladashvili (EIEC)

In the current inventories of Georgia, land monitoring is done by assembling a lot of data, but the result is partial, some land use changes are not covered.

A few requirements on land monitoring are presented below:

- Consistency of the time series of land monitoring.
- Consistency with the sources of information deemed reliable (e.g. forest area)
- Estimates of land use changes between major land categories.
- Estimates of change matrices with annual time step and 20 year time step.

To ensure the correct incorporation of cartographic products and other data on land monitoring, it is useful to have solid knowledge in information systems, but also to know the specific requirements of the IPCC in terms of definition. IPCC guidelines (mostly IPCC 2006, and as far as possible IPCC 2013 supplement and IPCC 2019 refinement) must be mastered.

For example, the IPCC makes the distinction between land-use and land-cover. IPCC considers land-uses. Therefore, a land without trees can be classified as a forest under the IPCC. On the contrary, maps (from satellite data or photo interpretation…) often considers land covers, and therefore do not classify areas without trees as forests.

The resources required to process land use data are more important when the products are numerous and heterogeneous.

The effort is dependent on the size of the territory but not proportional to the area covered. The installation of an efficient land use monitoring may take months of work even when rough data is available.

TABLE 1: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON LAND

Resources	Estimates for Georgia
Human resources	1-3 people (2-6 months per year in routine, much more for development)
Technical skills	GIS, geography, data treatment, IT, IPCC guidelines
Tools	GIS software (QGIS…), database software (PostgreSQL…), data treatment software (Excel)…

1.2.3.2. FOREST

Forest is a key element in a LULUCF, because forest are often large carbon stocks in biomass and soils.

The work to carry out the forest part of the LULUCF inventory may be closely related to the production of forest data but not necessarily. Indeed, forest data normally aimed at monitoring the volumes of markeTable and exploiTable wood while the LULUCF inventory covers the total biomass of trees. One of the crucial points is also to succeed in distinguishing forest land from non-forest land that can also have trees and similar logging operations. The temporal expected resolution for LULUCF

is annual which is rarely the case for forest inventory. The split between forest management and deforestation is essential which is rarely the case for forest inventory.

It is therefore a work specific to the LULUCF inventory that must be carried out for the forest part which should not be confused with the forest inventory work.

Main challenges for forest responsibility:

- Filter data regarding their value for LULUCF inventories
- Master the IPCC guidelines
- Convert existing forest data into carbon gains from forest growth for total living biomass
- Convert existing forest data into carbon losses due to harvests or mortality for total living biomass
- Manage dead organic matter pools (litter and dead wood), soil organic matter may be covered apart
- Reconcile harvest and wood consumption data across the territory
- Compile specific factors for the forests of the territory, for instance wood densities
- Know the existing forest inventories
- Ensure consistency with the non-forest parts of the LULUCF inventory.

TABLE 2: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON FOREST

Resources	Estimates for Georgia
Human resources	1-2 people (1-5 months per year in routine)
Technical skills	Scientific engineer, forest background, IPCC guidelines
Tools	data treatment software (Excel), database software (SQL…)

1.2.3.3. NON-FOREST

This is one of the organizational difficulties of this sector, the LULUCF does not only deal with forests. A large part of the sector concerns agricultural land, but also urbanized land, wetlands...

It is possible to have the treatment of these lands carried out by a generalist structure or a structure that also manages forestry issues. But, in the case of significant split of the work, it is relevant to entrust this activity to a structure with agricultural missions.

Indeed, most of the non-forest land with carbon is agricultural land.

It should also be noted that in countries where wetlands are important, these lands can justify significant work because of the large carbon stocks presents in soils and the possible greenhouse gas emissions. However, it does not seem essential to in-

volve structures whose main mission would be the monitoring of these wetlands in the LULUCF inventory.

Main challenges for non-forest responsibility:

- Master the IPCC guidelines
- Work in collaboration with the structure in charge of monitoring the land (when different)
- Cover all non-forest carbon fluxes from major carbon pools (soil organic matter may be treated separately)
- Use agricultural statistical data to estimate biomass gains and losses, especially for perennial crops
- Ensure consistency with the agriculture sector of the GHG inventory
- Ensure consistency with the forest part of the LULUCF inventory.

TABLE 3: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON NON-FOREST

Resources	Estimates for Georgia
Human resources	1 people (1-2 months per year in routine)
Technical skills	Scientific engineer, agriculture or generalist background, IPCC guidelines
Tools	data treatment software (Excel), database software (SQL…)

1.2.3.4. SOIL

Soils can be an important part of greenhouse gas inventories because they are significant carbon stocks, particularly in forests and agriculture. They can be processed by a dedicated structure that would have sharp skills on soils.

In agriculture, soil is essential because it constitutes both very large carbon stocks but also the working tool of farmers. Soil fertility is indeed a major criterion for the economic health of farms. However, this fertility is linked to the organic matter of the soil and therefore to carbon. This is a sensitive but rather consensual topic: it is necessary to preserve the organic matter of the soil or to restore it. It removes carbon from the atmosphere and keep agricultural soils healthy.

Be careful, however, not to mix soil and land in the sense of the IPCC, soil science is not at all the most appropriate skill to monitor land. The interest of involving a specific structure expert in soils seem relevant only when complex models on soils are used in the LULUCF inventory. For basic treatment of soils generalist or agricultural experts are much more indicated.

Main challenges for non-forest responsibility:

- Master the IPCC guidelines
- Mobilize soil carbon evolution models
- Link to land use change
- Know the evolution of agricultural and forestry practices impacting soil carbon stocks
- Mobilize statistical resources to feed models
- Have knowledge of soil characteristics.

It should also be remembered that difficulties depend on the level of ambition of the inventory. There is no quality standard for an inventory. For example, it is not imperative to do a complex modeling of soil carbon to have a good LULUCF inventory. On the other hand, the soil part of the inventory must be managed in a consistent way, weighted according to the real impacts in terms of carbon.

TABLE 4: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON SOIL

Resources	Estimates for Georgia
Human resources	0-2 people (0-5 months per year in routine) (depending on the complexity)
Technical skills	Scientific engineer, agriculture or soil background, IPCC guidelines, modelling (if models)
Tools	IT development (Python, R…) (if models), data treatment software (Excel), database software (SQL…)

1.2.3.5. FIRE

Fires can affect all types of land and are often followed by a different structure than the traditional statistical system. For the LULUCF inventory, it is important to correctly account for the fires, but it does not seem very relevant to have a structure dedicated to the calculations of fire emissions for the LULUCF inventory. Of course, it depends on the overall organization.

Usually, fire emissions can be estimated by a generalist manager also in charge of the forest or non-forest part.

Main challenges for fire responsibility:

- Master the IPCC guidelines
- Compile data on burned surfaces
- Intersect this information with vegetation data
- Ensure consistency with the forest and non-forest parts of the inventory

TABLE 5: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON FIRE

Resources	Estimates for Georgia
Human resources	0-1 people (a few days per year in routine)
Technical skills	Scientific engineer, agriculture or forest background, IPCC guidelines,
Tools	data treatment software (Excel), GIS (if complex)

1.2.3.6. HWP

The harvested wood product (HWP) sector is linked to the LULUCF sector because it works the same way and is often linked to the forestry sector, which produces wood. It remains that the result on wood products concerns wood once harvested but the use of wood is therefore not closely related to the land of production.

To make a good inventory of the wood product sector, it is necessary to have accurate statistics on the activity of sawmills and on exchanges (imports / exports of wood). Then, to better estimate the lifetime of wood products, dedicated studies are necessary. Otherwise, IPCC methods are available with lifetime default factors.

Main challenges for HWP responsibility:

- Master the IPCC guidelines
- Process data on wood processing activity in the country
- Process data on wood harvests
- Process wood trade data (import/export)
- Know the wood processing activity

Usually, HWP emissions/removals can be estimated by a generalist manager, but it is relevant to have specific knowledge in wood production or forest stakeholders for this specific work.

TABLE 6: EXPECTED RESOURCES FOR THE TECHNICAL RESPONSIBILITY ON HWP

Resources	Estimates for Georgia
Human resources	0-1 people (a few days per year in routine)
Technical skills	Scientific engineer, forest background, IPCC guidelines
Tools	data treatment software (Excel), IPCC tool on HWP

1.2.4. Technical responsibility for data provision

The responsibility for data provision should be included in the system. The technical work for inventory production cannot be efficient without any data provision. Yet it must be reminded a few generic but important elements:

- there are several ways to implement a correct inventory for LULUCF and it cannot be expected very specific data on all topics. For instance, inventories require data for the past that cannot be collected anymore. The resolution of the inventory can be very different from a country to another…
- Usually, the LULUCF inventory is adapted to the data provision structure, not the contrary. But, for some categories, data provision can evolve to better respond to LULUCF expectations.
- Some of the possible changes concern the questionnaires that are used for survey. They can integrate new questions, keeping it mind that questions must be cautiously built to be useful for a LULUCF inventory. Experts in statistics are always needed to modify efficiently questionnaires.
- The data collection is an expensive activity (compared to inventory production), it requires much more budget because of the work of preparation, surveyors, data treatment, etc. LULUCF inventory cannot be the only purpose of a statistical activity. In practice LULUCF inventory exist in many countries, because it is based on existing statistical data.

In the following paragraphs, the skills, resources, and tools needed for each data provision won't be detailed, because it is too difficult to assess. Data collection is based on a large panel of actors and on developments that are often existing for years.

The main objective of this work is to identify the structures involved in the data collection useful for LULUCF inventories. There may be some overlaps or gaps for data collections that can be clarified in the LULUCF system, but global missions for structures should not be changed according to new data collection purposes.

TABLE 2: POSSIBLE DATASET FOR LAND-USE MONITORING

theme	Typical datasets or assumptions needed	
Land	• Land use map, land cover map, land cover change map • Land use change statistics	• Annual area of IPCC land use category • Annual area of land use change for all conversions and from 1990
Forest	• Forest carbon stocks • Increment – annual values • Mortality losses – annual values • Harvest losses (direct losses and indirect losses)	• Litter carbon stocks • Deadwood carbon stocks • Litter and deadwood carbon stock variation • Commercial and illegal loggings • Expansion factors
Non-forest	• Annual crop biomass stocks • Grassy grassland biomass stocks • Woody grassland biomass stocks	• Perennial crops biomass stocks • Perennial crops biomass increment • Annual crop yields

Soils	• Stocks per climate zone and per land use category • Organic soil area	
Fires	• Annual areas of fires	• Fraction of burnt biomass
HWP	• Commercial wood statistics	• Imported and exported wood

1.2.4.1. LAND MONITORING

The expectation in terms of land monitoring is the availability of products (maps, statistics) on land use and land use changes for long times series. Ideally since 1970, but hopefully since 2000.

It may be produced by different data producers but ideally it is made by a unique producer for all land uses.

Land monitoring data may require a lot of resources to deal with satellite imagery for instance. But in fact this monitoring may be much cheaper than any other survey only based field measurement. Classical skills for such data producer are IT skills for imagery treatments. It is time consuming but often already in preparation or prepared in many countries, there is a lot of pressure to use satellite imagery and a lot of expectations.

The distribution of work between the inventory team and the data producer must be adjusted according to skills and the missions of the data producer.

TABLE 3: TYPICAL DATA NEEDS

Dataset	Data provider	Potential issues
Land balance	Land agency	➡ compatibility with IPCC land-use categories ➡ mixed areas issues ➡ Lack of consistency with NFI ?
NFI – pre-classification of all country sampling points	NFA	➡ Not enough details for land use categories ➡ Need of reclassification of past years
ESA CCI LC	ESA	➡ No data for past years ➡ Lack of consistency with NFI
CLC	Copernicus & specific project	➡ Only pilot project ➡ No data for past years ➡ Lack of consistency with NFI
Other land cover map	Specific national or international project	➡ Temporal and spatial resolution ➡ Lack of consistency with NFI

Other statistic dataset	Specific national or international dataset	➡ Not spatially explicit ➡ Lack of consistency with NFI
Mix of data – integration model	Several + Expert	➡ Lack of expertise, lack of resources ➡ High complexity

1.2.4.2. FOREST MONITORING

Forest monitoring mostly means forest inventory. It exists for a long time in many developed countries, but it is absent in most developing countries. The forest inventory is often the main objective of forest agencies, it cannot be easily replaced by a simplified data collection. Additional data can be also collected through land management plans, but it remains more challenging to produce a homogenous monitoring of the entire territory.

In Georgia, the data collection for the first real forest inventory is ongoing. Data are not available yet.

Expected data from a forest inventory may be:

- Increment (volumes of commercial wood or tonnage of total biomass)
- Stocks of trees (volumes of commercial wood or tonnage of total biomass)
- Harvest (volumes of commercial wood or tonnage of total biomass)
- Mortality (volumes of commercial wood or tonnage of total biomass)
- Stock of dead wood (volumes or tonnage)
- Stock of litter (volumes or tonnage)

The forest inventory usually gives a lot of information that are not always very useful for LULUCF inventory but depending on the ambition a lot of additional detail can be used for modelling more accurately emissions and removals.

The resources for such forest inventory are high, because it requires a lot of time from foresters. It is usually expected for long periods (like every 10 years in Georgia). In practice, very abrupt changes can occur in forest due to special events like windfalls, droughts, fires… But few countries have the capacity to produce annual results from forest inventories.

In countries where only one forest inventory is available, dynamics cannot be easily estimated and this one of the major differences between LULUCF and other sectors: in most cases annual information on current situation is not enough. Temporal information is required.

Other forest data can be considered in statistics like volume of harvest, areas of plantations, wood consumptions… the list of possible data provision is not fixed, if many sources are used it is necessary to be very cautious to avoid gaps and overlaps.

1.2.4.3. NON-FOREST MONITORING

This section brings together a wide range of statistical data but in fact mainly data relating to agricultural land. The classic data of agricultural statistics (areas, yields, productions) can be mobilized for LULUCF inventories. These data provision requires a lot of resources but are usual already in place in countries.

Data on agroforestry systems, orchards, hedgerows can also be useful for the LULUCF inventory. The statistics usually present areas for each crop cultivation but may be limited for mixed crops like agroforestry systems and of course with hedgerows which are very rarely covered.

It is most often for estimates of soil emissions and removals that agricultural statistics are used. Indeed, soil carbon variations are most often estimated from changes in land use and land practices. For soils, statistics on agricultural practices will be more useful than data specifically on soils. The statistics mentioned to evaluate the soils remain quite difficult to produce, they concern tillage, the levels of organic and inorganic inputs, the presence of intermediate crops, the use of crop residues, the rotation of crops ...

On wetlands, including peat extraction zones, data on areas, productions, type of extraction are required for LULUCF inventories.

On urban and other land, few estimates are expected but sometimes there may be estimates related to urban trees or non-agricultural fertilization. Low efforts are assumed on these areas.

1.2.4.4. SOIL MONITORING

A key message of inventories is that estimating carbon stocks in soils is not a real objective, it is the variation of these carbon stocks that is targeted. Soil science is an expertise that is not easily mobilized in LULUCF inventories. Most of the expectations correspond to the realization of a pedoclimatic map allowing the use of IPCC references. This map, if it exists, is useful for adjusting carbon flux calculations but it is not a statistic. It does not offer the dynamic elements necessary for a LULUCF inventory.

In rare cases, territory-specific data can be used to refine soil carbon dynamics. Dynamic soil carbon monitoring systems are very rarely put in place.

Specific soil surveys are sometimes used in inventories, they cannot be considered as key for the inventory system.

On soils, one of the main ways is modelling and therefore the use of soil models. But large-scale modelling is mainly based on agricultural data. Climate data can also be considered, but these complex models are not possible in the short term for the GHG inventory in Georgia. It must be carried by the entities in charge of the inventory.

1.2.4.5. FIRE MONITORING

Data on areas burnt are required for the LULUCF inventory. Usually, this data exists, they are collected by a structure in charge of civil protection.

1.2.4.6. HWP MONITORING

Data on wood products may exist in national statistics, or not. It can be obtained by surveys on sawmills for instance.

For the LULUCF inventory it would be necessary to know the quantity of wood products for at least the following categories of wood:

- Long-lived wood (wood frames, panels)
- Short-lived wood (packaging)
- Paper
- Wood energy

One of the major difficulties is that wood is exchanged a lot between countries as logs or finished products, which makes the monitoring difficult.

For current inventories the rule is (in theory) to follow of all wood products made from trees which have grown in the territory. Imported timber is not included in the country reporting.

Wood products may be made from different origins but usually it comes mostly from forests, this statistic may be linked to forest statistics.

1.3. POSSIBLE OPTIONS FOR A LULUCF INVENTORY SYSTEM

Technical responsibility of LULUCF inventory:

Many options are possible for a LULUCF system, in particular for the technical responsibility of LULUCF inventory. Basically 2 extreme options may exist (with a lot of possible intermediate options):

- 1 structure in charge of all bricks of a LULUCF inventory
- 1 structure per brick of the LULUCF inventory

The technical responsibility for LULUCF inventory is modulated depending on the strategy of the country. For instance, it is strongly recommended to avoid the multiplication of actors for the technical responsibility of LULUCF as far as needed resources would be very high and consistency difficult to ensure. There is an implicit leadership when 2 organizations are involved. The leadership comes to the entity in charge of land, because this is the basis for a good LULUCF inventory.

Options with more than 2 organizations involved in technical responsibility for LULUCF were analyzed but finally not kept. Coordination of work becomes very challenging when several organizations are involved.

It is important to note that the land agency that was initially proposed as technical inventory compiler for some options is finally not proposed anymore as far as they explicitly consider theme selves as data providers only.

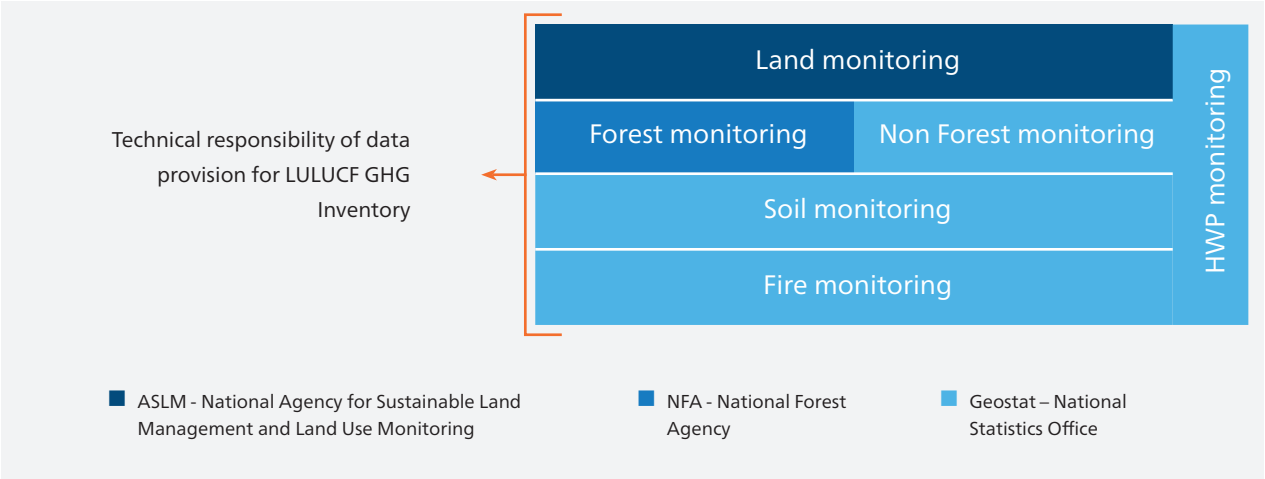
It also appeared that there is no organization that is naturally involved in the non-forest issues for the LULUCF GHG inventory. For forest, both the National Forest Division of MEPA and the National Forest Agency look very interested in GHG inventory issues. For non-forest issues it was not possible to really find an organization that could be involved. The SCRA (Agricultural Scientific - Research Center) and the SLA (State laboratory of agriculture) were contacted but without feedback during the project time frame. They were not kept as potential stakeholders.

Technical responsibility for data provision

It is assumed that the technical responsibility for data provision is much linked to existing structures. It is not modulated according to the options.

The responsibility currently identified in terms of data provision may be:

FIGURE 4: DISTRIBUTION OF RESPONSIBILITIES FOR DATA PROVISION



This simplified representation of data providers may mask the contribution of different stakeholders. But, the data provision is not the main object for this specific project mostly focusing the technical responsibility for LULUCF inventory.

The following options are examples of what the system could look like. They don't present a definitive picture of possible systems, and in many cases, all structures could be replaced by another which would finally be considered as more appropriate.

1.3.1. Option 1(a)

The option 1(a) gives the entire responsibility of LULUCF inventory to the forest division of MEPA. It implies that:

- The LULUCF inventory is made internally by a division of MEPA
- The LULUCF inventory is made by one team
- The LULUCF inventory is made by a structure that encompass its usual scope of work

FIGURE 5: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 1(A)

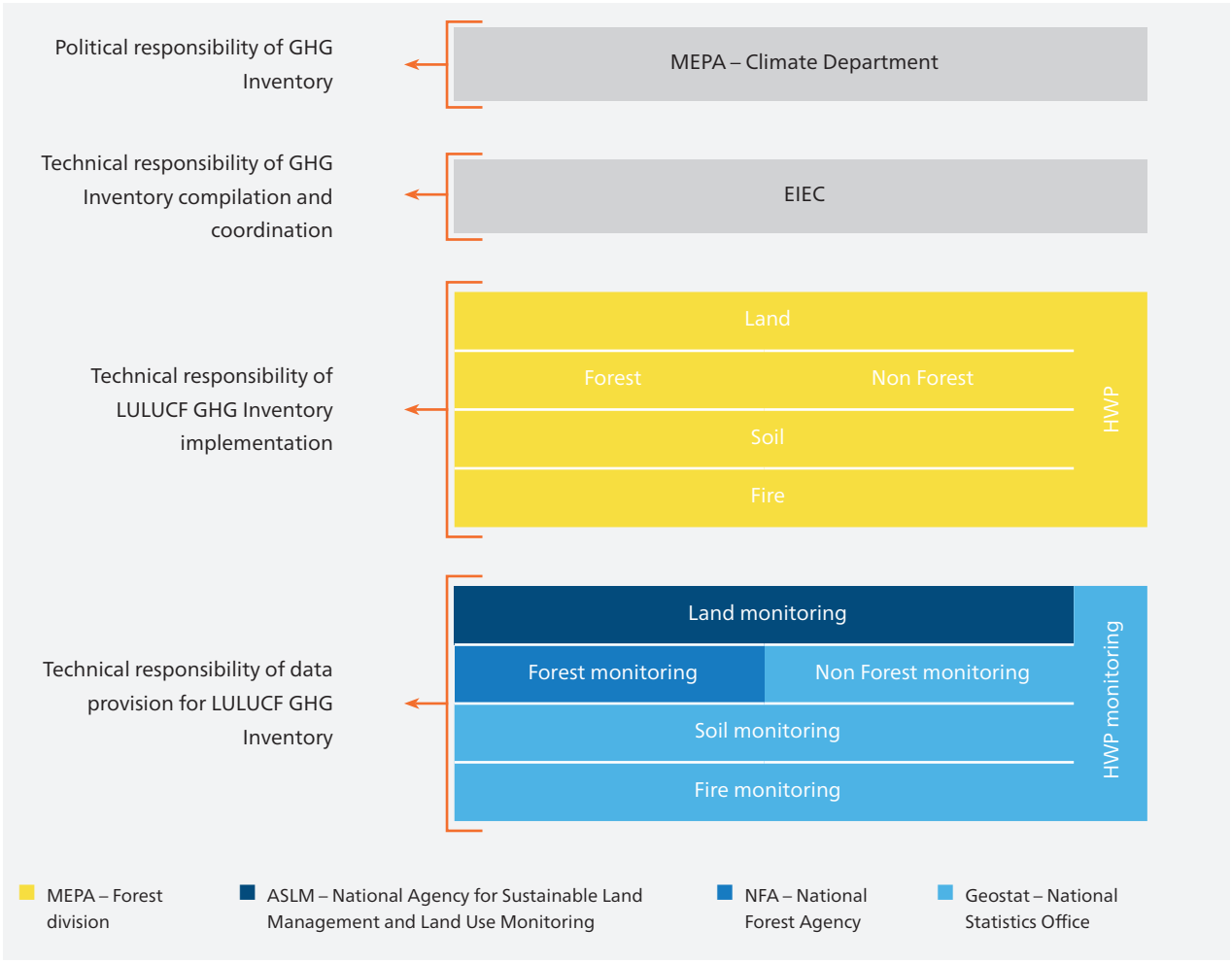


TABLE 7: STRENGTHS AND WEAKNESSES OF OPTION 1(A)

Strengths	Weaknesses
• High guarantee of consistency among subcategories of LULUCF • High involvement of the team (responsibility is not scattered) • Good linkage with the rest of the GHG inventory • Good connection with forest data providers • Good expertise in forest issues • Saving of resources	• Possible low involvement in non-forest issues • Possible conflict with other structures which were legitimately interested in this task • Possible lower expertise in land monitoring and lower focus on land use changes • Possible lower expertise in agriculture issues • Possible difficulty to dedicate human resources from MEPA (if managed as a project)

1.3.2. Option 1(b)

The option 1(b) gives the main responsibility of the LULUCF inventory to the forest division of MEPA. Yet the agriculture division of MEPA oversees non-forest issues. It implies that:

- The LULUCF inventory is made internally by MEPA.
- The leadership is given to the forest division (the land responsibility gives the leadership)
- The LULUCF inventory is made by 2 structures that fits quite well their usual scope

FIGURE 6: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 1(B)

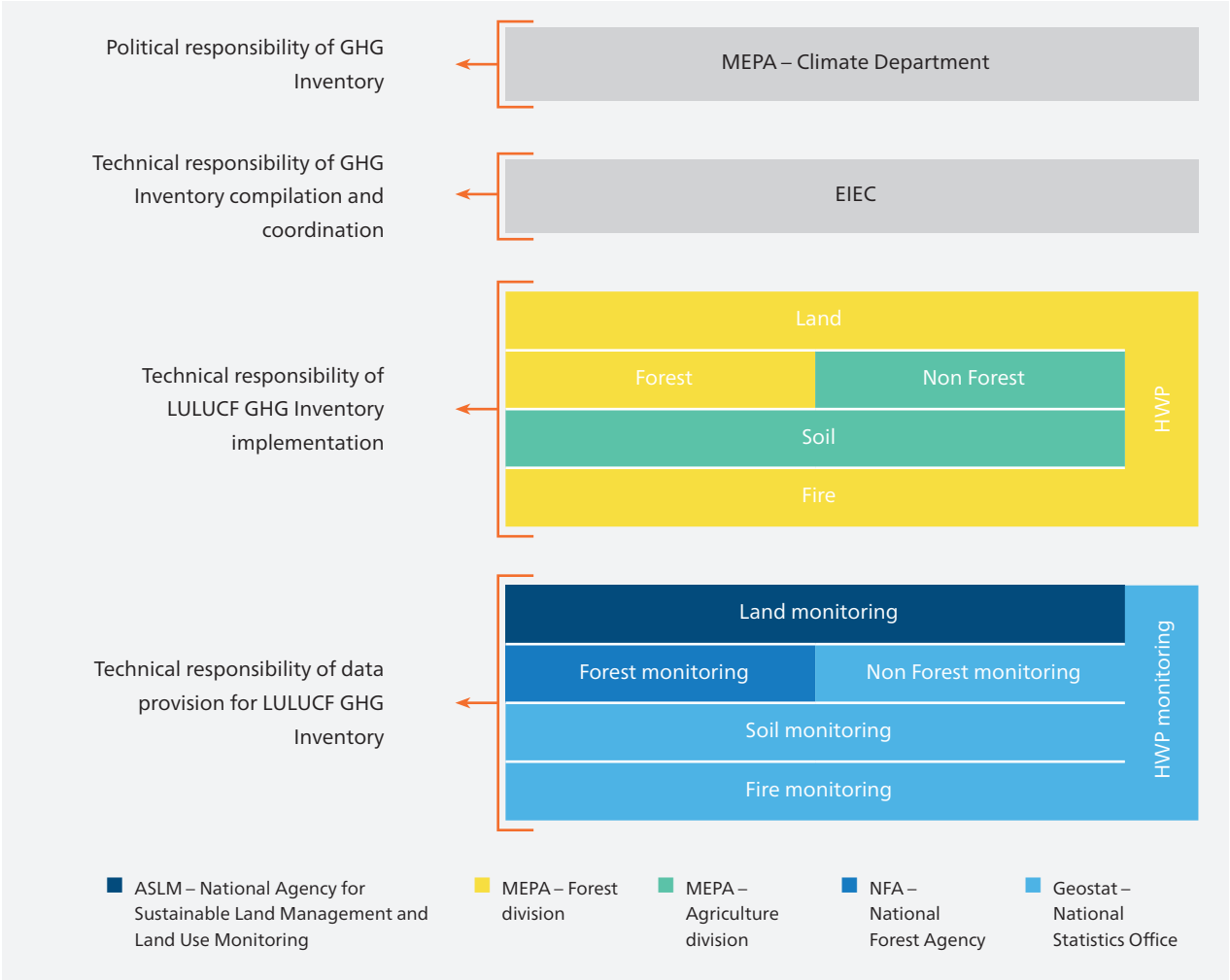


TABLE 8: STRENGTHS AND WEAKNESSES OF OPTION 1(B)

Strengths	Weaknesses
• Good guarantee of consistency among subcategories of LULUCF • Good linkage with the rest of the GHG inventory • Good connection with forest data providers • Good connection with agriculture data providers • Good expertise in forest issues • Importance given to soil management in agriculture	• Possible concurrency in the leadership • Possible low involvement of agriculture division (No clue on possible involvement from agriculture division) • Possible gaps in consistency between subcategories • Possible lower expertise in land monitoring and lower focus on land use changes • Possible difficulty to dedicate human resources from MEPA (if managed as a project)

1.3.3. Option 2(a)

The option 2(a) gives the entire responsibility of LULUCF inventory to the agriculture division of MEPA. It implies that:

- The LULUCF inventory is made internally by a division of MEPA
- The LULUCF inventory is made by one team
- The LULUCF inventory is made by a structure that encompass its usual scope of work

FIGURE 7: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 2(A)

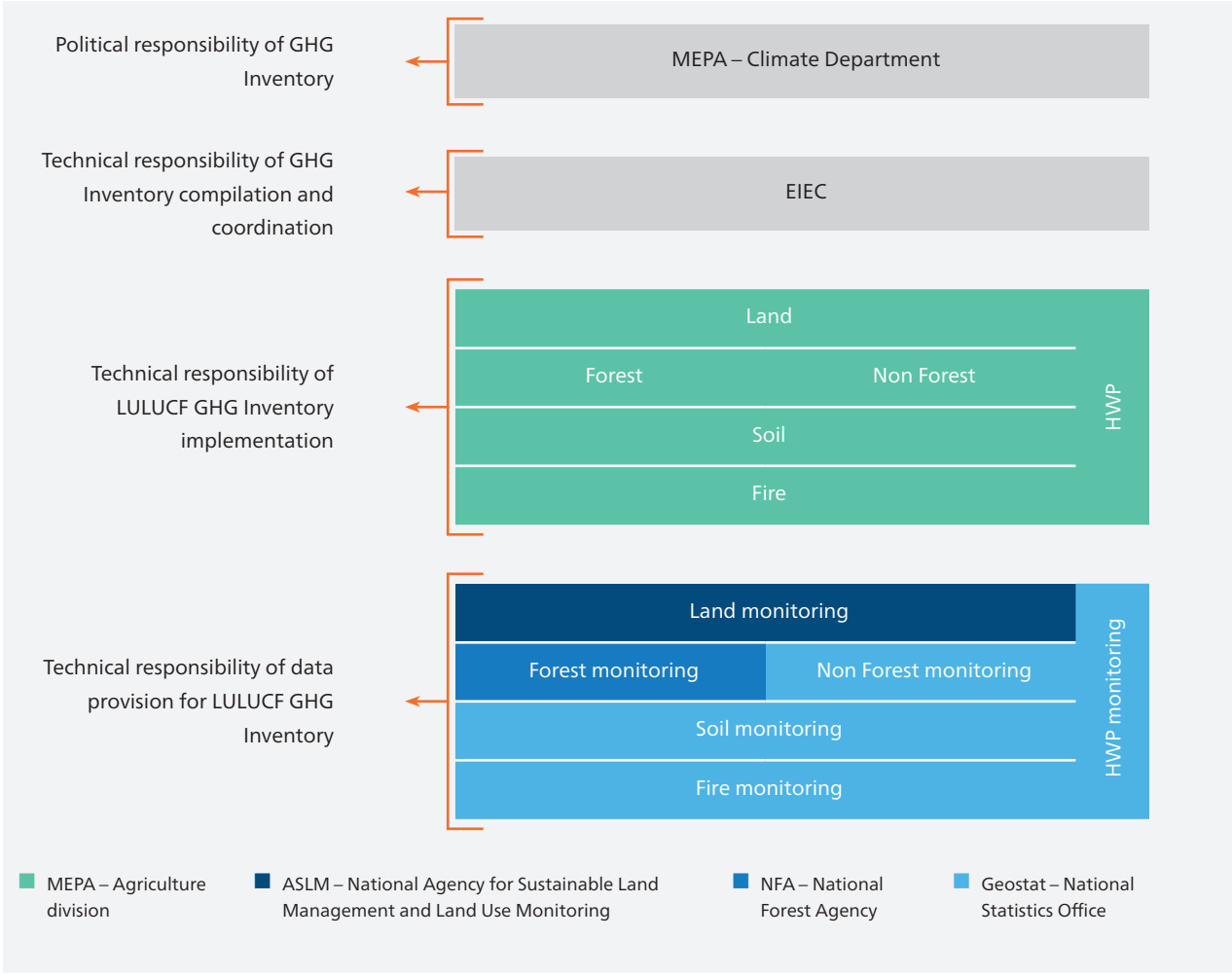


TABLE 9 : STRENGTHS AND WEAKNESSES OF OPTION 2(A)

Strengths	Weaknesses
• High guarantee of consistency among subcategories of LULUCF • High involvement of the team (responsibility is not scattered) • Good linkage with the rest of the GHG inventory • Saving of resources	• Possible low involvement in forest issues • Possible conflict with other structures which were legitimately interested in this task • Possible lower expertise in land monitoring and lower focus on land use changes • Possible lower expertise in forest issues • Possible difficulty to dedicate human resources from MEPA (if managed as a project)

1.3.4. Option 2(b)

The option 2(b) gives the main responsibility of the LULUCF inventory to the agriculture division of MEPA. The forest division of MEPA oversees forest issues. It implies that:

- The LULUCF inventory is made internally by MEPA.
- The leadership is given to the agriculture division (the land responsibility gives the leadership)
- The LULUCF inventory is made by 2 structures that fits quite well their usual scope

FIGURE 8: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 2(B)

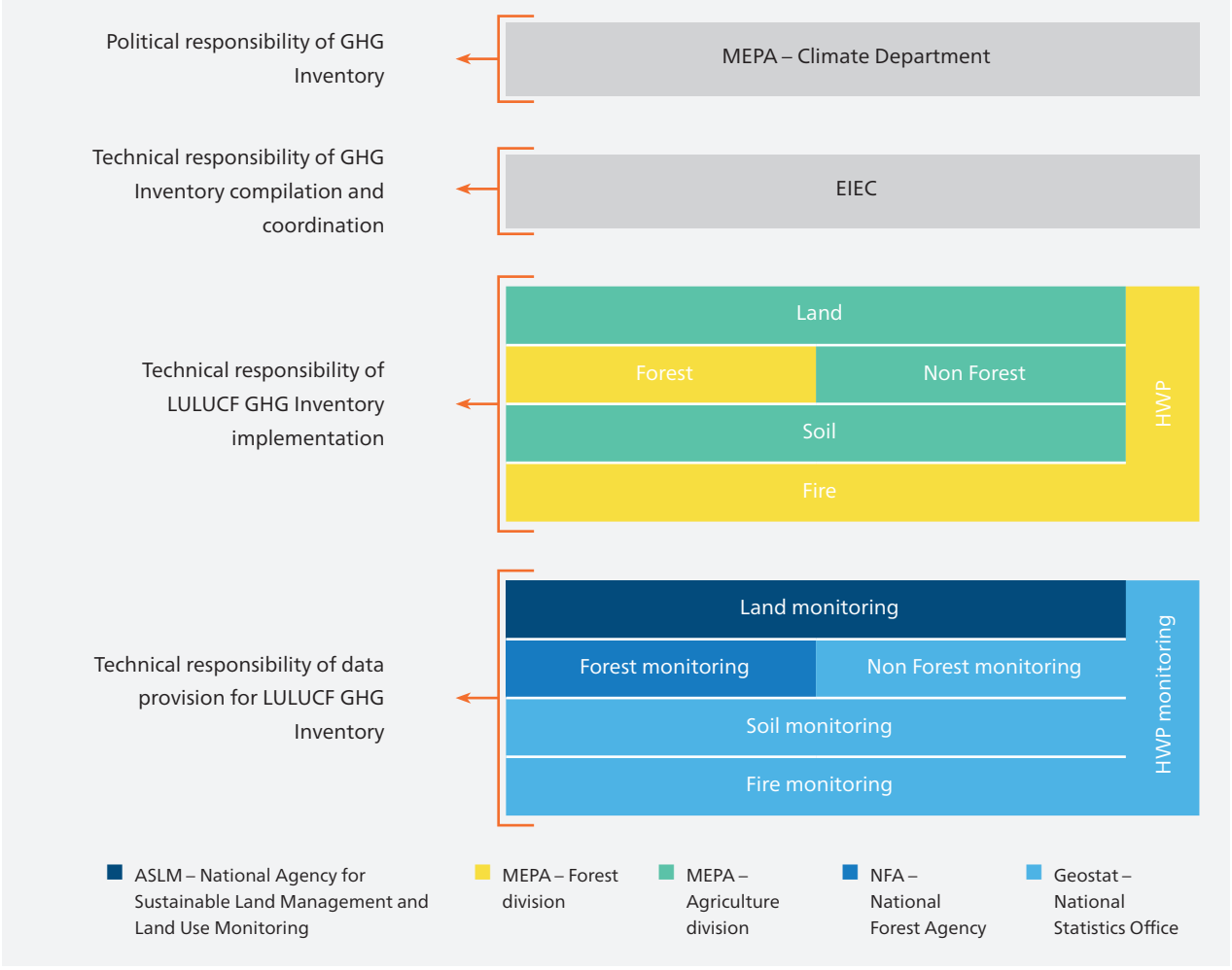


TABLE 10: STRENGTHS AND WEAKNESSES OF OPTION 2(B)

Strengths	Weaknesses
• Good guarantee of consistency among subcategories of LULUCF • Good linkage with the rest of the GHG inventory • Good connection with agriculture data providers • Good connection with forest data providers • Importance given to soil management in agriculture	• Possible concurrency in the leadership • No guarantee on agriculture's division of MEPA (No clue on possible involvement from agriculture division) • Possible low involvement of forest division • Possible lower expertise in land monitoring and lower focus on land use changes • Possible difficulty to dedicate human resources from MEPA (if managed as a project)

1.3.5. Option 3(a)

The option 3(a) gives the responsibility of the LULUCF inventory to Geostat, the National Statistics Office. It implies that:

- The LULUCF inventory is made externally by an agency partially dependent of MEPA.
- The LULUCF inventory is made by 1 structure that have high connection with data.

FIGURE 9: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 3(A)

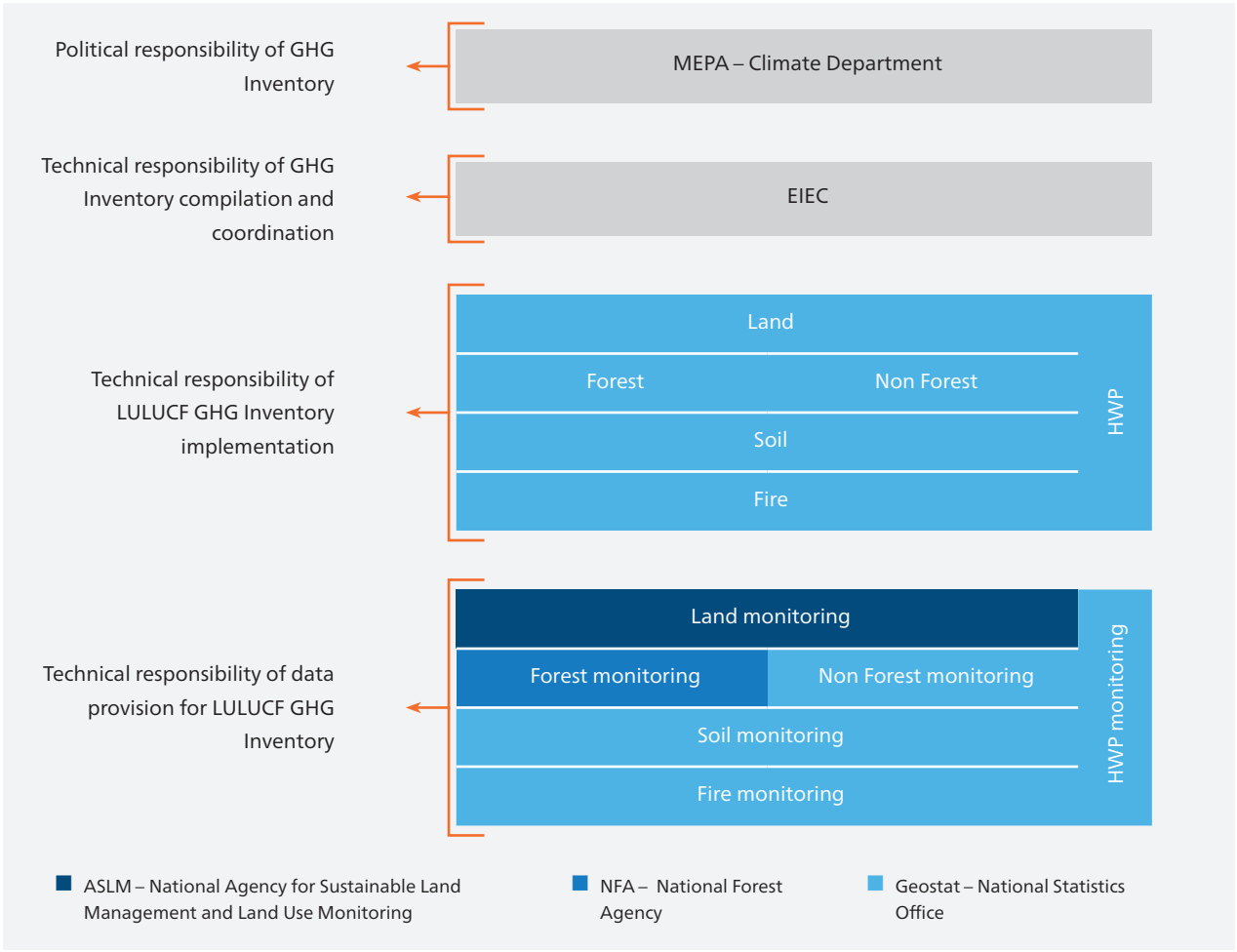


TABLE 11: STRENGTHS AND WEAKNESSES OF OPTION 3(A)

Strengths	Weaknesses
• High connection with data • High consistency of the inventory • Rather neutral position in administration • Easier mobilization of human resources (compared to MEPA staff)	• Possible low knowledge on IPCC procedures • Possible low involvement (no clue on Geostat involvement) • Lower expertise/knowledge in forest and agriculture • Low availability of technical teams

1.3.6. Option 3(b)

The option 3(b) gives the main responsibility of the LULUCF inventory to Geostat, the National Statistics Office, except for forest issues given to the National Forest Agency. It implies that:

- The LULUCF inventory is made externally by agencies partially dependent of MEPA.
- The LULUCF inventory is made by 2 structures that have high connection with data
- The forest part is made by 1 structure with high expertise for forest

FIGURE 10: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 3(B)

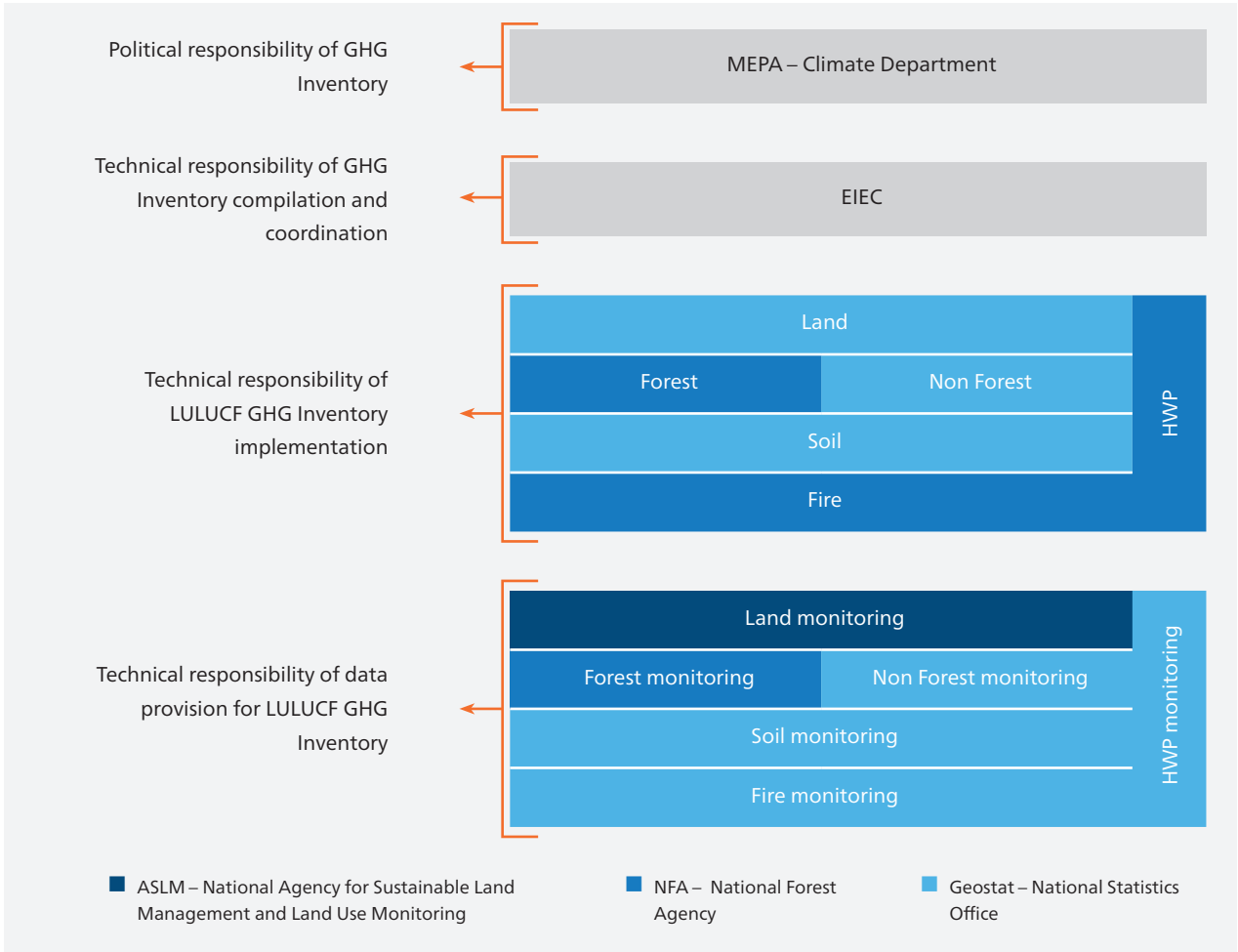


TABLE 12 : STRENGTHS AND WEAKNESSES OF OPTION 3(B)

Strengths	Weaknesses
• High connection with data • High connection with forest data • Easier mobilization of human resources (compared to MEPA staff)	• Possible concurrency in the leadership • Possible low knowledge on IPCC procedures • Possible low involvement (no clue on Geostat involvement) • Lower expertise/knowledge in agriculture

1.3.7. Option 4(a)

The option 4(a) gives the responsibility of the LULUCF inventory to the national forest agency. It implies that:

- The LULUCF inventory is made externally by an agency partially dependent of MEPA.
- The LULUCF inventory is made by 1 structure that have high connection with forest data.
- The LULUCF inventory is made by a structure that encompass its usual scope of work

FIGURE 11: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 4(A)

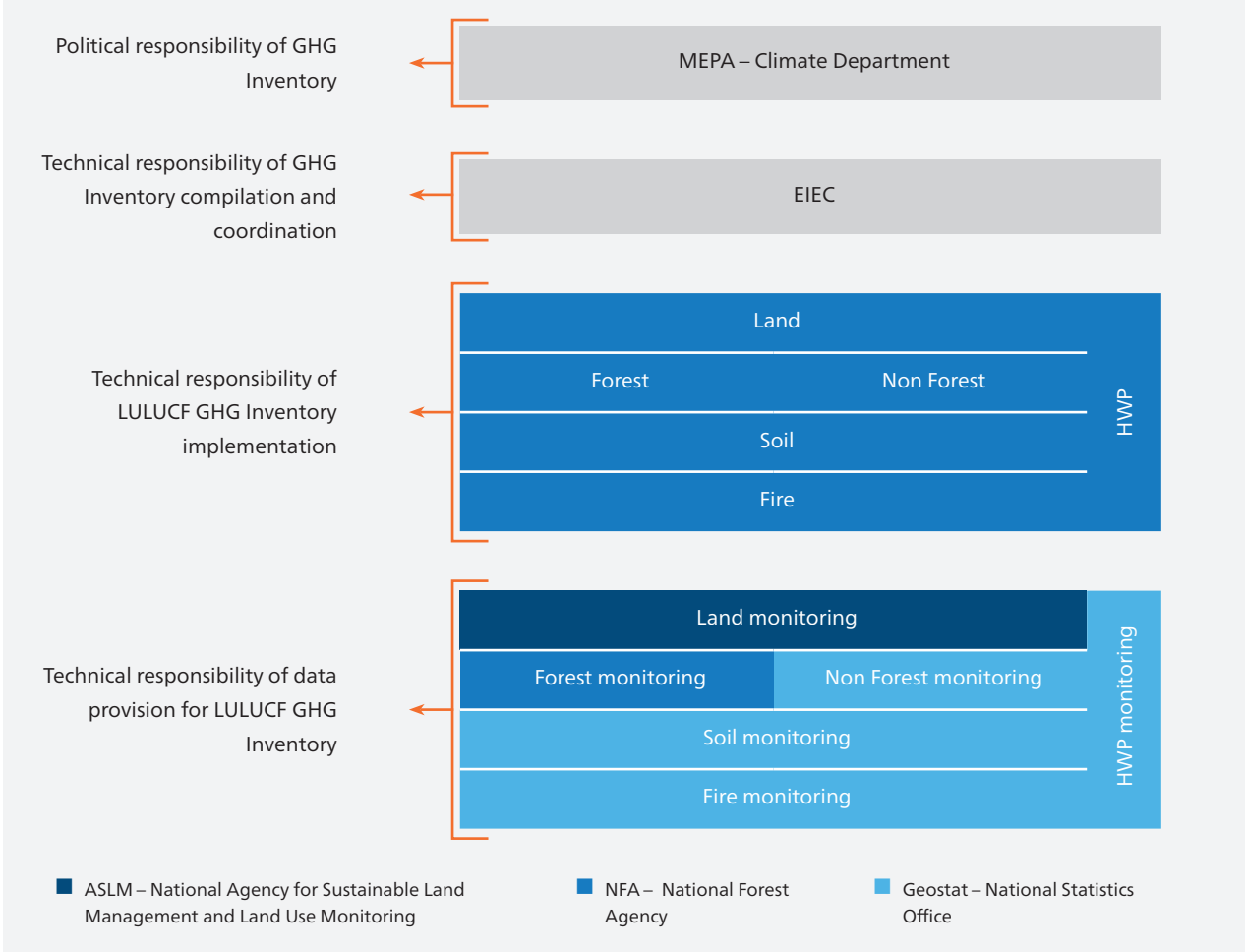


TABLE 13 : STRENGTHS AND WEAKNESSES OF OPTION 4(A)

Strengths	Weaknesses
• High connection with forest data • High consistency of the inventory • Technical teams • Easier mobilization of human resources (compared to MEPA staff)	• Possible conflict with other structures which were legitimately interested in this task • Possible low knowledge on IPCC procedures • Possible low involvement in agriculture issues • Lower expertise/knowledge in agriculture

1.3.8. Option 4(b)

The option 4(b) gives the main responsibility of the LULUCF inventory to the national forest agency, except for non-forest issues given to the National Statistics Office. It implies that:

- The LULUCF inventory is made externally by agencies partially dependent of MEPA.
- The LULUCF inventory is made by 2 structures that have high connection with data
- The forest part is made by 1 structure with high expertise for forest

FIGURE 12: DISTRIBUTION OF RESPONSIBILITIES IN OPTION 4(B)

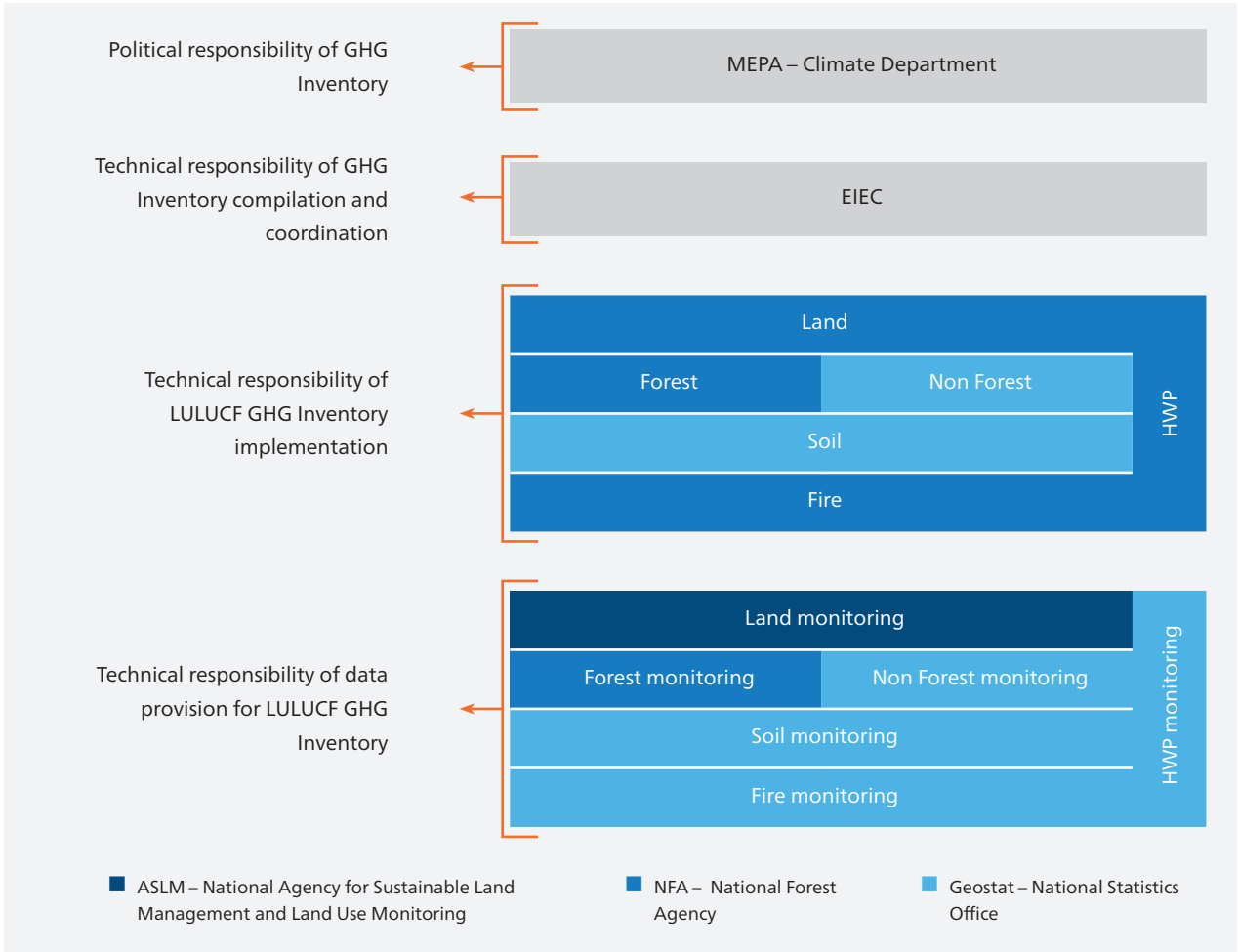


TABLE 14: STRENGTHS AND WEAKNESSES OF OPTION 4(B)

Strengths	Weaknesses
• High connection with forest data • Technical teams • Easier mobilization of human resources (compared to MEPA staff)	• Possible conflict with other structures which were legitimately interested in this task • Possible low knowledge on IPCC procedures • Possible low involvement in agriculture issues • Lower expertise/knowledge in agriculture • Possible gaps in consistency between subcategories

1.3.9. Option 5(a)

The option 5(a) gives the entire responsibility of the LULUCF inventory to an external organization (Agricultural university, State university…). It implies that:

- The LULUCF inventory is made by an external organization.
- The LULUCF inventory is made by 1 structure that have high scientific expertise.

FIGURE 13: DISTRIBUTION OF RESPONSIBILITIES IN OPTION A3

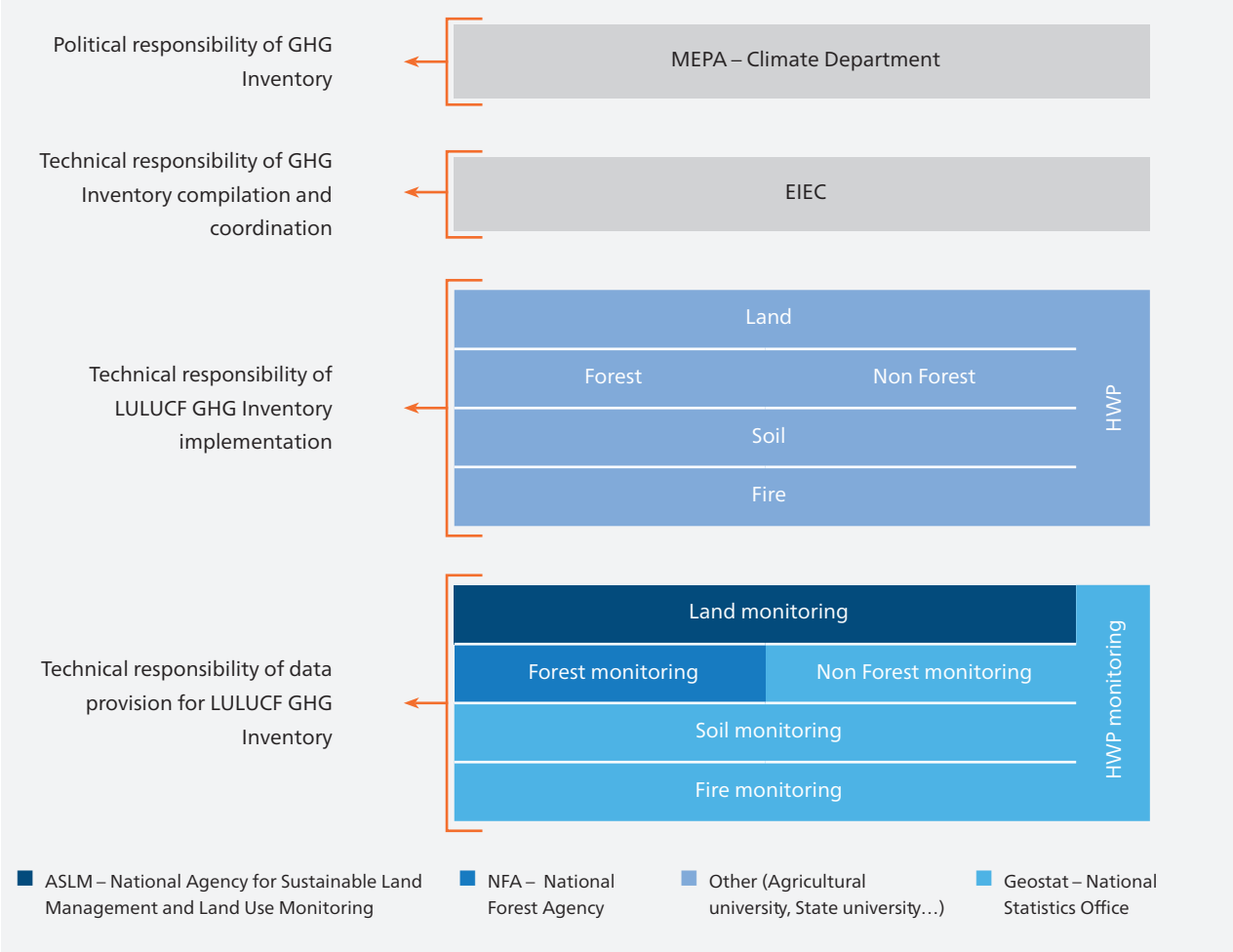


TABLE 15: STRENGTHS AND WEAKNESSES OF OPTION 5(A)

Strengths	Weaknesses
• High consistency among LULUCF sectors • High scientific background and expertise • Possible good knowledge on IPCC procedures • Possibly saving in terms of resources • Easy mobilization of human resources	• Possible low involvement (no clue on university involvement) • Possible low access to data • Possible low expertise in forest and agriculture economic sectors

1.4. CONCLUSION ON OPTIONS

The conclusion of this chapter concerns the choice of possible options.

The proposals of options were inspired from a benchmark led on European countries where various situations were observed. Indeed, among European countries a lot of systems can be seen, it shows the diversity of options and the fact that the proposed options are relevant.

TABLE 16: BENCHMARK OF LULUCF SYSTEM IN EUROPE

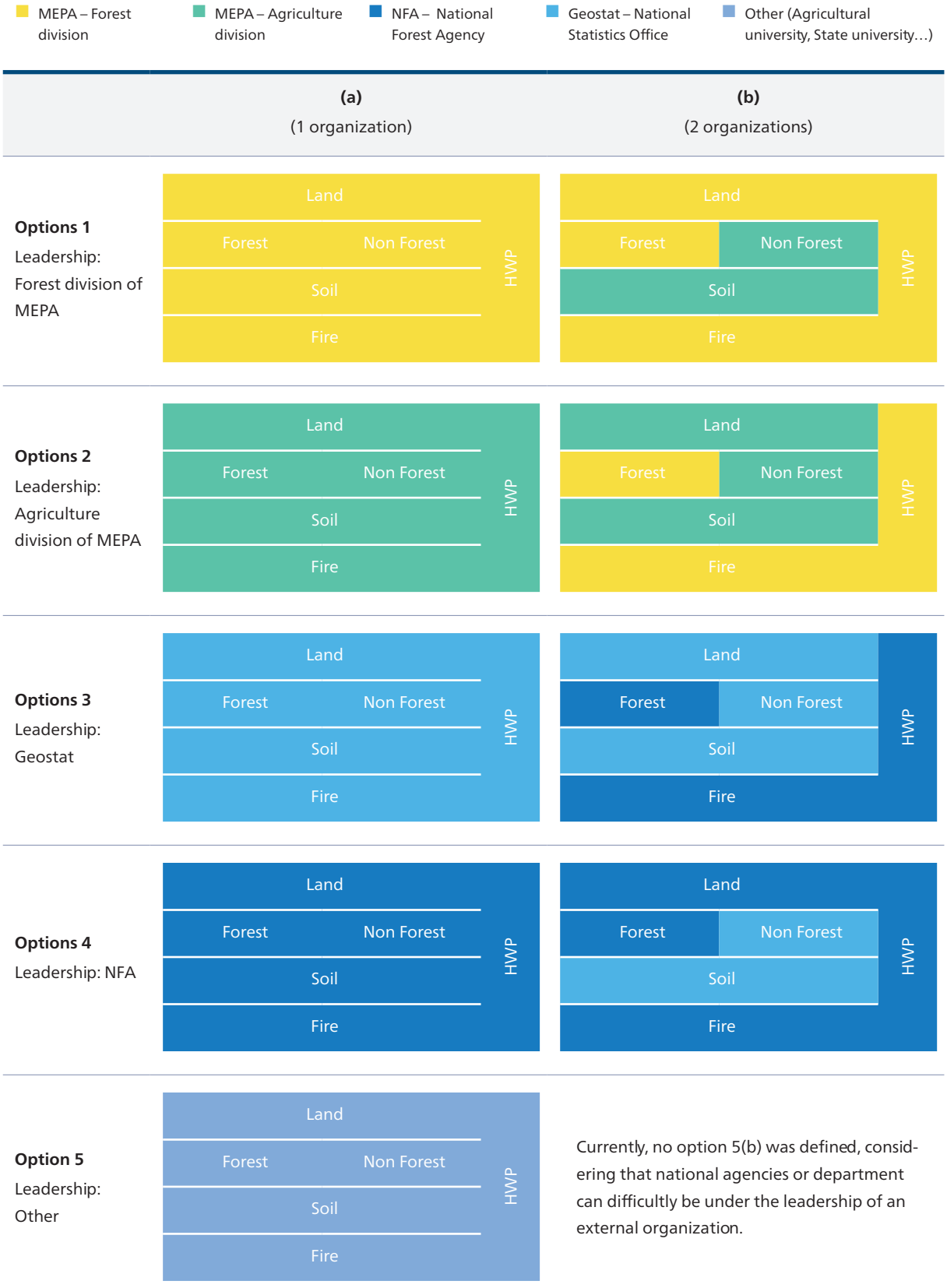
All by 1 generalist structure	All by 1 LULUCF structure (main scope)	By 2 LULUCF structures (main scopes)	By 3 LULUCF structures (main scopes)	By 4 LULUCF structures (main scopes)
Austria	Estonia (Forest)	Czechia (Forest/Agri)	Slovakia (Forest/Agri/soil)	Romania (Land/Forest/ Agri/soil)
Belgium	Finland (AFOLU)	Denmark (Forest/Agri)		
Bulgaria	Germany (AFOLU)	Hungary (Forest/Agri)		
Croatia	Iceland (Soil)	Iceland (Forest/Agri)		
Cyprus	Latvia (Forest)	Lithuania (Forest/Agri)		
France	Netherlands (Agri).	Slovenia (Forest/Agri)		
Greece	Norway (Forest)			
Italy	Sweden (Agri)			
Ireland	United Kingdom (Forest & soil)			
Luxembourg				
Poland				
Portugal				
Spain				

A few comments on this benchmark:

- LULUCF remains the sector where there is often at least a dedicated structure. It reflects the difficulty for a generalist entity to make the inventory for LULUCF.
- A lot of countries are based on 2 structures, one for forest one for agriculture. It seems a good option, but it does not explicit how land monitoring is used and produced.
- the younger systems tend to have more structures involved and the oldest ones have generalist.
- Romania (now with 4 LULUCF structures involved) has just changed its system and involved a lot of expert structures to strengthen its work on LULUCF. Currently it seems that it works but of course it is much more demanding in terms of resources than other systems.

9 options are presented for Georgia, all of them may be good, there is no irrelevant system among them. The options only concern the technical responsibility of the LULUCF inventory, it implies differently existing structures in Georgia.

FIGURE 14: SUMMARY OF OPTIONS FOR THE TECHNICAL RESPONSIBILITY OF THE LULUCF INVENTORY



It is important to indicate that no obvious system was found for Georgia:

- Options based on MEPA's divisions (forestry or agriculture) may not be easy to manage because they should deal with internal funds and will certainly face difficulties in terms of human resources.
- Options based on agencies are not obvious because the scope and the missions of agencies does not fit very well with LULUCF categorizations. No specific agency was identified to manage non-forest issues for LULUCF.
- LULUCF is firstly based on land monitoring but the land agency, which could be relevant, does not really have the capacity to lead a LULUCF inventory. They consider they can be involved as data providers only.
- Geostat could be indicated as it is closely linked to data provision, but no contact was taken during the project. Moreover, statistical offices are often not very motivated by this type of task quite different from their main mission.
- No external stakeholder was clearly identified as fully relevant to lead the LULUCF inventory. No contact was taken with universities.

Considering these limitations, among all options presented, we consider that options 1(b), 3(a), 4(b), and 5(a) are the most promising options.

- Option 1(b) gives the leadership to the forest division at MEPA with the contribution of the agriculture division at MEPA. This choice is linked with the importance of forest in Georgia and the involvement of forest department in MRV systems. The main challenge with this option is certainly to mobilize human resources internally at MEPA.
- Option 3(a) gives the entire responsibility of the LULUCF inventory to Geostat. It is considered that Geostat could be a generalist entity capable to manage a LULUCF inventory by using available data. Yet no feedback from Geostat on this possibility was received.
- Option 4(b) gives the leadership to the national forest agency with the contribution of Geostat for non-forest issues. This choice is linked with the importance of forest in Georgia and the interest to imply agencies in such a work.
- Option 5(a) gives the entire responsibility of the LULUCF inventory to an external organization. It may be the easiest way at it is rather like the current situation where national experts are contracted. The involvement of scientific universities is often a guarantee of quality for LULUCF inventories. Yet no contact was taken with universities to further check the relevancy of this option.

The LULUCF sector may be treated with specific consideration and separately from the rest of the GHG inventory. Yet, the system should also take in consideration the other sectors of the GHG inventory. The system should not be chosen without considering the sector agriculture which may be much linked with LULUCF.

2. PROPOSED PROCEDURES TO ENSURE THAT ORGANIZATIONS AND INDIVIDUALS WILL PARTICIPATE AND COLLABORATE

2.1. NATIONAL INVENTORY SYSTEM DOCUMENT

2.1.1. Official mandates

The option chosen to organize national arrangements to set up a sustainable and robust system for national GHG inventory compilation, and in particular the LU-LUCF sector, needs to be formally established.

To do so, one or several documents, such as decrees, orders, or other relevant legal texts, shall be edited – or existing documents shall be updated.

To operationalize the Decree, bilateral/multilateral agreements should normally be established between the institutions involved, describing the areas of collaboration between these stakeholders in the context of the inventory.

Such document shall define the national system to conduct, on a permanent basis, national GHG inventory, its frequency and the roles and responsibilities of each organization. This document shall then officially mandate each organization, agency or other group to participate to the system.

This or these documents shall:

1. define (or remind) the **political responsibility of GHG Inventory**, for which the Climate division of MEPA is responsible, with the consultative role of the Climate Change Council (CCC). The document would list the typical obligations associated with this level of responsibility, such as officially submitted reporting elements to the UNFCCC secretariat, tracking the evolution of international requirements, and ensuring a link between government policy action and GHG inventory.
2. define the **technical responsibility of GHG Inventory compilation and coordination**, for which the EIEC is supposed to be responsible. The document would then clarify EIEC role and budget allocation rules regarding this function. The specific missions, agenda and deliverables expected from this role are also to be explicitly listed. In particular, this level of responsibility shall include:

- the compilation of all sectoral results into consistent documents and tables.
- the preparation of Terms of Reference for the organisation(s) responsible for the technical work on LULUCF GHG Inventory implementation.
- the updating of an improvement plan of the inventory.
- the regular organization of meetings ensuring the follow-up of the inventory compilation of each sector and the respect of the terms of reference.

3. define the **technical responsibility of LULUCF GHG Inventory implementation**, for which different organizations could be responsible for, as presented in the different options within the present report. The specific missions, agenda and deliverables expected from this role are also to be explicitly listed.
4. define the **technical responsibility of data provision for LULUCF GHG Inventory**, for which different organizations could be responsible for, as presented in the different options within the present report. The types of data expected could be presented, without specifically name precise datasets, since they can evolve. Instead, it should be stated there that data providers are mandated to provide directly and with no cost datasets fitting the needs expressed by the organization(s) responsible for the technical responsibility of LULUCF GHG Inventory implementation.

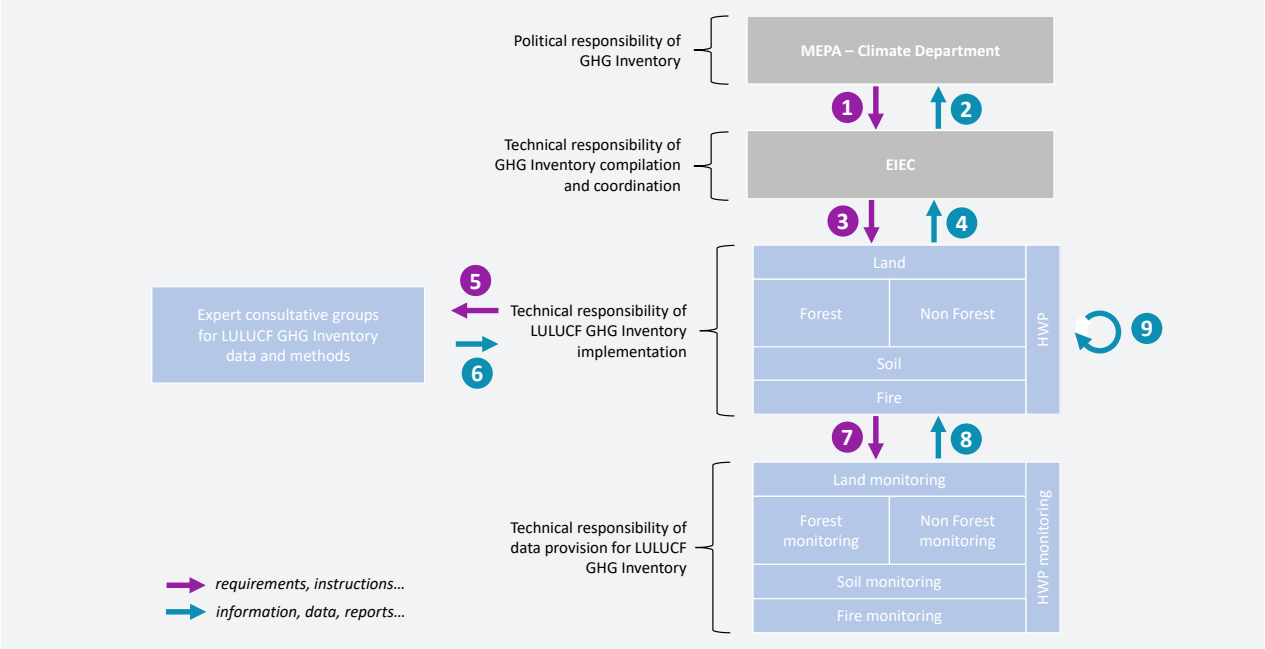
We identify two ways to establish such a document:

- Either a unique National Inventory System Document (NISD) is drafted by MEPA, with the participation of EIEC.
- Or two documents are drafted. One document is prepared to cover points 1. and 2. of the list presented above, and a second document is prepared to cover points 3 and 4. This allows updates of the second document to be easier and to be agreed upon more swiftly.

2.1.2. Collaborations to be formally agreed upon

In this or these documents, specific collaborations between organizations and experts shall be presented. These collaborations can be requirements (instructions, orders, terms of reference…) or information (data, reports, oral or written explanations…). These collaborations are summarized below:

FIGURE 15: COLLABORATION, MANDATES, RESULT PROVISION, DATA PROVISION



Legend

❶ Updates on international requirements evolution (Paris Agreement, CRT, etc.); National indicators requirements (for NDC updating and action follow up, national strategy for mitigation…); Policy priorities and associated needs for inventory improvement .. Recommendations of the Climate Change Council (CCC)…;

❷ Draft final reports (National Inventory Reports (NIR), Nationally-Determined Contributions (NDC), Biennial Transparency Reports (BTR), National Communications (NC)…), Indicators for national climate strategy…;

❸ Terms of Reference for the compilation of the inventory: sectors and subsectors to be estimated, priorities, deadlines, data reporting formats, improvement plan…;

❹ Intermediate and final results of emissions and removals for all sectors, methodological reports, other information required in the terms of reference;

❺ Identification and invitation of experts and setting up of meetings for thematic advisory working groups;

❻ Provision of information and expertise on LULUCF topics and technical work from the organization in charge of the technical work on LULUCF GHG inventory;

❼ Exchange of data and assumptions to ensure consistency between LULUCF subcategories. In particular, land-use categories definitions and areas are to be estimated by the experts assigned in the "Land" component, and used by other components if needed (e.g. for carbon stock change due to land use conversion, in the "soil", "forest" and "non-forest" components. The experts assigned in the "Land" component have an overview role to ensure such consistency. Other key parameters such as biomass carbon stocks, soil carbon stocks, climate zones, etc., are also to be shared and discussed between the different experts, and used consistently. Specific assumptions (e.g. default assumption of equilibrium of a specific pool) have also to be shared and discussed.

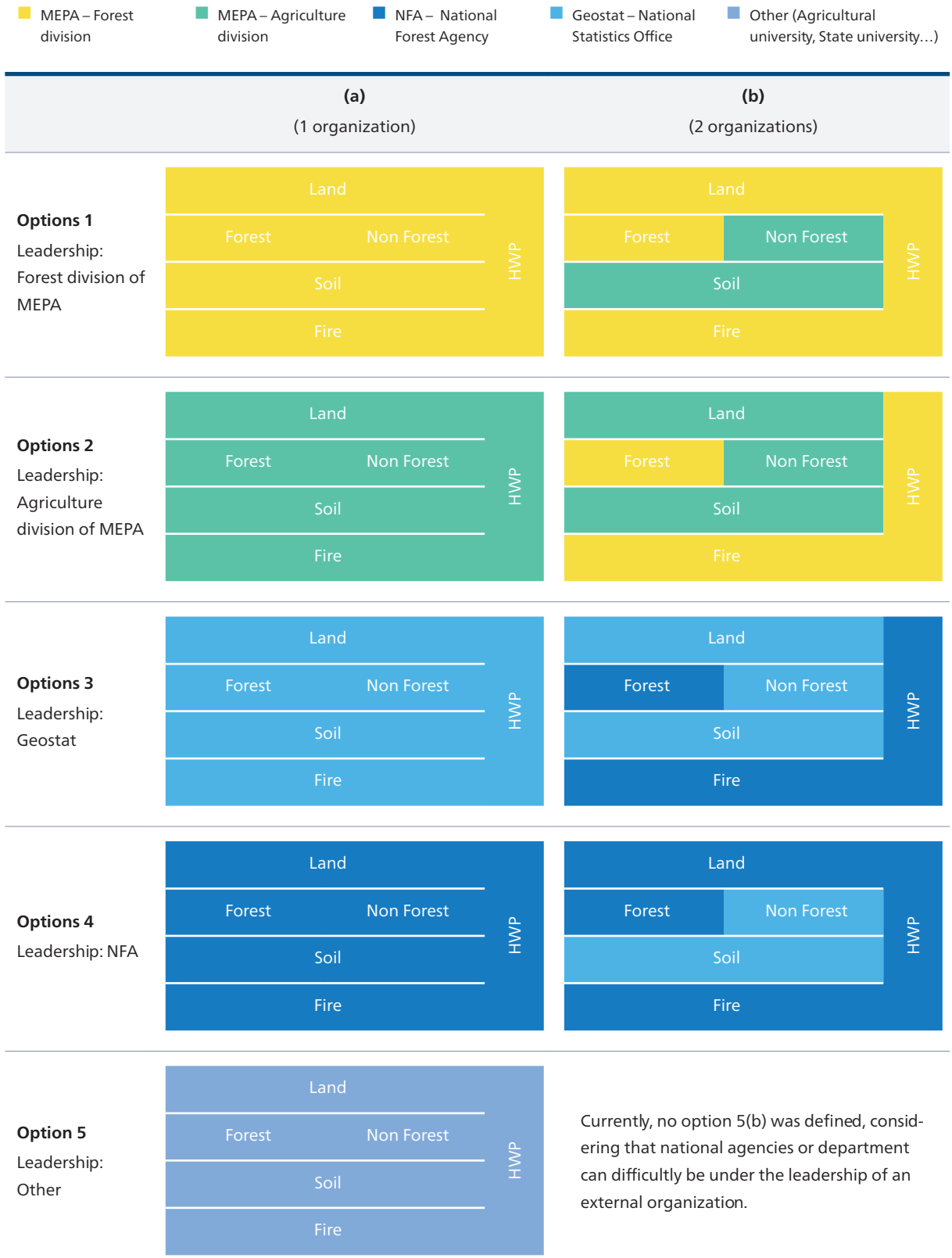
❽ Data needs, with specific requirements of the LULUCF inventory. For example, land-use areas must be compatible with IPCC definitions of the six main land use categories, compatible with the country's official forest definition, and compatible with the need to reconstruct annual land use change matrices from 1970.

❾ Direct communication of information and datasets, with additional explanations regarding definitions, units, data limits, possible uses, spatial and temporal consistency, and representativity for the whole country.

2.2. TECHNICAL RESPONSIBILITY FOR LULUCF INVENTORY

Different arrangements and procedures can be considered for each of the options proposed in section 2 of this report, which are summarized below.

FIGURE 16: SUMMARY OF OPTIONS FOR THE TECHNICAL RESPONSIBILITY OF THE LULUCF INVENTORY



Option 1(a) gives the entire responsibility of the LULUCF inventory to the Forest Division of MEPA. The Forest Division should organize and plan the elaboration of the LULUCF inventory and be the main actor for the LULUCF calculations. Option 1(b) let the main responsibility of the LULUCF inventory to the Forest Division of MEPA but officializes the responsibility of the agriculture division of MEPA on non-forest topics. This option implies a higher collaborative exercise between the Forest Division and the Agriculture Division of MEPA, eventually with the assistance of the Climate Change Division for methodological purposes. In order to arrange for the organization and planning of the LULUCF inventory, a Memorandum of Understanding could be agreed upon by their respective departments in order to specify who is doing what, when and how, including budgetary implications and human resources' allocation.

With options 2(a) and 2(b), the LULUCF inventory is still made internally by MEPA but the leadership is given to the Agriculture division of MEPA.

Options 1 and 2 do not exclude a collaborative work with other MEPA departments, divisions and agencies. A Task Force for LULUCF Inventory may for instance be proposed, bringing together representatives of the Forest Division, the Department of Agriculture, Food and Rural Development, the Department of Environment and Climate Change, the Department of Policy Coordination and Analysis, and the Department of Biodiversity and Forestry. NFA, APA and ASLM could be involved as observers. The Task Force would be chaired by the Director General of the Forest Division and supported by the Climate Change Division on the methodological aspects of the inventory for the proper application of the IPCC Guidelines.

Options 3 and 4 are different to the extent that the technical responsibility for implementing the LULUCF inventory is mainly allocated to agencies having relevant expertise and data connection. Among agencies, only Geostat and the National Forest Agency (NFA) seem capable to carry out a LULUCF inventory. Both are under MEPA's supervision.

Option 5(a) shows that it would be also possible to have other structures out of MEPA's supervision with for instance a university. Some arrangements should be put in place to ensure data provision.

2.3. TECHNICAL RESPONSIBILITY FOR DATA PROVISION

Having in mind that data collection is based on a large panel of actors and that LULUCF inventory is usually done with existing statistical data in most UNFCCC Parties, priority should be given to data accessibility. The assurance that data will be provided by those who will be tasked with the technical responsibility can be given through different arrangements that may be combined:

- Access to information: one proposal can be that all relevant information for the establishment of the LULUCF inventory should be made available for those institutions that will be tasked with the technical responsibility for LULUCF inventory implementation (see section 3.1 above). This means

that those institutions could specify what data is relevant for LULUCF inventory and request from the data collectors their provision when necessary for the elaboration of the LULUCF inventory (e.g. supposedly every two years, for the BTR).

- Partnership with the National Statistics Office (NSO): another proposal can be that those institutions tasked with the technical responsibility for LULUCF inventory implementation engage a partnership with NSO to get the relevant data for LULUCF inventory. Such partnership should specify all data that can be relevant for LULUCF inventory. It would be then the responsibility of the NSO to make sure existing statistics are sufficient and, if not, to obtain them from data providers in all sectors, including those who work under the supervision of MEPA. In any case, the partnership should be signed at the level of the two General Secretariats of NSO and MEPA, with the agreement of the Prime Minister Services.
- Put a regulatory obligation on data providers to collect relevant data: this is the most radical proposal to get the assurance that the most up to date data is provided in a timely manner, eventually in the prescribed format in advance. Given the multitude of sectors concerned by LULUCF, it would be logical to have this regulatory obligation set for all Governmental members and bodies through an administrative Decree signed by the Prime Minister. However, this would certainly have budgetary implications for all of them.

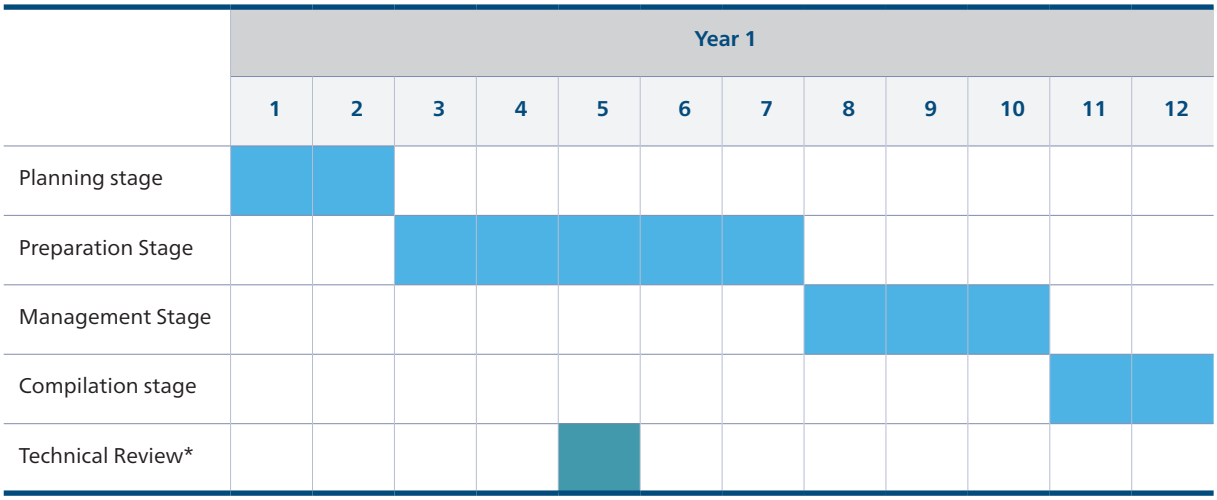
To facilitate the exchange of Data Supply Agreement (DSA) or Memorandum of Understanding (MoU) can be signed between data providers and data users. A template for MoU is provided in annex 1 of this report.

3. PROPOSED WORKPLAN FOR LULUCF INVENTORY

The schedule can be designed for an annual frequency or a biennial frequency. It seems that the annual frequency is more expensive that the biennial one, in practice it is not obvious because routines are much easier to implement on an annual basis than on 2 years. As far as possible annual schedule should be prioritized.

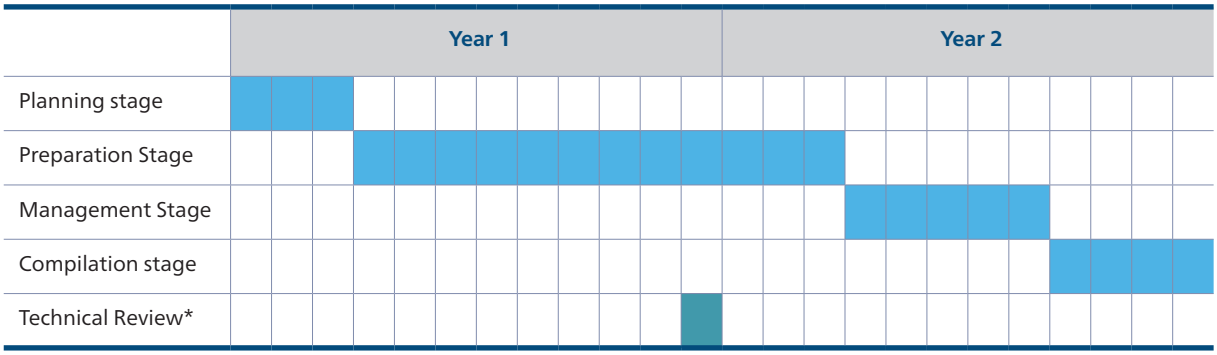
The following figures show possible workplan, ideally it would be more detailed by task and responsibility.

FIGURE 17: POSSIBLE WORKPLAN WITH ANNUAL FREQUENCY



* ■ of the previous edition of inventory

FIGURE 18: POSSIBLE WORKPLAN WITH BIENNIAL FREQUENCY



* ■ of the previous edition of inventory

One must also indicate that the 2019 IPCC refinement give a very good example of workplan in Table 1.6.

3.1. PLANNING STAGE

Possible tasks for this stage:

- Review of preview estimates, procedures, feedback, comments from official or informal technical review, and list of planned improvement.
- Establish or update Inventory protocols and guidelines containing instructions and procedures for preparing the inventory.
- Form or activate inventory-working groups for the inventory sectors and cross-cutting issues.
- Formulate and sign or confirm memorandum of Understanding (MoU) among inventory institutions. The MoUs define specific functions of inventory institutions relating to estimation etc.
- Organize meetings of the working groups
- Training for inventory teams to ensure readiness and distribute overall and sector inventory instructions, provide relevant training to teams.
- Organize kick-off meetings.

3.2. PREPARATION STAGE

Possible tasks for this stage:

- Identification and review of data sources including choices of data, methodologies, and software.
- Data request, data review, evaluation, and documentation
- Review performance of existing tools and where necessary making changes to work efficiently.
- Review performance of data storage and where possible making necessary corrections
- GHG estimation and text files for each source/removal (see simplified guidelines to have an overview on methodology and main calculations)
- Quality control
- All worksheets and documentations submitted
- Compile zero order draft of inventory and submit to inventory coordinator

3.3. MANAGEMENT STAGE

Possible tasks for this stage:

- Distribute zero-order drafts for internal review
- Distribute source files (tools, worksheets) and internal review to lead institutions
- Incorporate internal comments, observations, and corrections
- Collect uncertainty values from sectors and quantify uncertainty for the overall inventory.

- Compile second order draft of inventory and revise worksheets
- External review of second order inventory (Quality Assurance)
- Incorporate external comments and revise worksheets

3.4. COMPILATION STAGE

Possible tasks for this stage:

- Draft improvement strategy
- Collect all pertinent paper and electronic source materials for archiving place in archive due national archiving and documentation institution
- Compile final Inventory and preparation of key category analysis
- Compile inventory improvement strategy
- Compilation of National Inventory Report (NIR)
- NIR submitted to National Inventory Entity for incorporation into National Communication and Biennial Update Report
- Dissemination of NIR – Submission to UNFCCC, inventory is available for public release

3.5. TECHNICAL REVIEW

Possible tasks for this stage:

- Coordinate the technical review process
- Compile all comments, feedback, and planned improvement list

4. SIMPLIFIED GUIDELINES AND INFORMATION FOR NATIONAL EXPERTS TO PROCESS LULUCF INVENTORY

The LULUCF sector of the national GHG inventory is a complex product. To manage it, inventory compilers are guided by the IPCC guidelines. Currently, the 2006 IPCC guidelines are the basis. They are refined by the 2019 IPCC refinement but for LULUCF only few cases are significantly different. For wetlands the 2013 IPCC complement on wetlands is also recommended.

It is not easy nor relevant to produce alternative guidelines to the 2006 guidelines for LULUCF. In this project, a few elements considered as the major ones are presented as simplified elements of guidelines. It does not replace the official guidelines but introduce a selection of major equations that are used in LULUCF inventories.

- General methodology for land monitoring
- General methodology for estimating carbon fluxes
- Main calculations
  - Calculation of carbon fluxes in biomass of forest lands
  - Calculation of carbon fluxes in woody crops
  - Calculation of carbon fluxes for conversions of land use
  - Calculation of carbon fluxes in soil organic matter
  - Calculation of other emissions from soils
  - Calculation of emissions related to burning
  - Calculation of carbon fluxes due to harvested wood products (HWP)

By screening these elements on LULUCF, a national expert should understand the main objectives and possibilities to implement a LULUCF inventory.

Informal recommendations are also presented in these simplified guidelines, they are based on our experience of inventories and not directly mentioned in the official IPCC guidelines. These recommendations are subjective recommendations and may lead to discussions among LULUCF experts. It remains the responsibility of the national teams to select useful information.

4.1. GENERAL INFORMATION ON THE SECTOR

The Land Use, Land Use Change and Forestry (LULUCF) sector is a category that aggregates GHG emissions but also removals. It is focused on the variation of the carbon stocks from the different carbon pools (living biomass, soil organic matter…), and some related emissions (emissions from burning on non-agricultural sites...).

Emissions and removals are expected for the following land use categories:

- Forest land
- Cropland
- Grassland
- Wetlands
- Settlements
- Other land

This sector LULUCF also includes the category "harvested wood products" (HWP) which is independent of land use, but connected to land management and wood production.

4.2. GENERAL METHODOLOGY FOR LAND MONITORING

The first step in estimating emissions and removals is to monitor the evolution of land uses. The 2006 IPCC guidelines offer 3 approaches of increasing precision and difficulty to assess land use changes:

- Approach 1: representation of land without monitoring the evolution of each category of land,
- Approach 2: use of land use change matrices on a sample and extrapolation to the entire territory,
- Approach 3: Use of land use change matrices with comprehensive coverage and the ability to spatially represent a land use change map. Approach 3 is most often the result of work from satellite images but can also in theory be implemented from statistical sampling.

To carry out land monitoring for LULUCF inventories, several collection techniques are possible:

- Field surveys
- Photo-interpretation
- Mapping known as "wall to wall"

Regardless of the basic data used, the implementation of land monitoring for the national inventory is always one of the major challenges for inventory compilers. It most often results in the production of land use change matrices like the one presented below.

FIGURE 19 : POSSIBLE REPRESENTATION OF LAND USE CHANGES WITH A MATRIX

	Forest	Cropland	Grassland	Wetland	Settlement	Other land	Initial Area
Forest							
Cropland							
Grassland							
Wetland							
Settlement							
Other land							
Final Area							

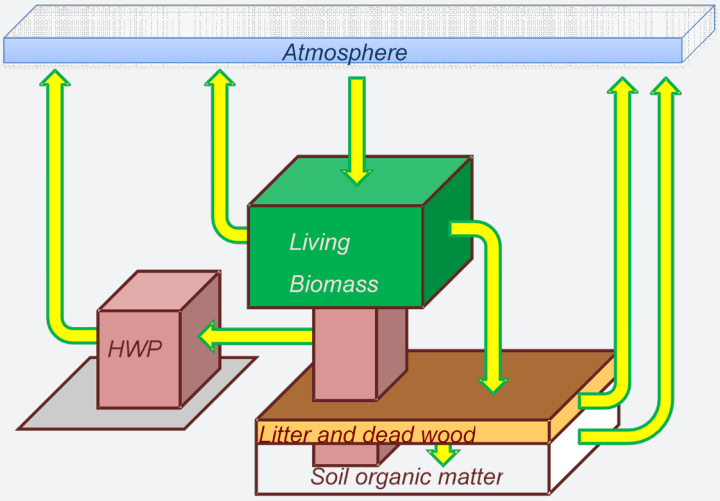
TABLE 17: INFORMAL RECOMMENDATIONS ON LAND MONITORING (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 1	*We recommend focusing first on land use changes for all land use changes between the 6 categories of land and to estimate annual land use changes before implementing any matrix. The lands without changes (i.e. Forestland remaining forestland) must be calculated by difference between the total area of a land use and the sum of lands converted to this land use.*
Reco 2	*We recommend using only one year as reference for land areas and to use land use change areas to calculate the entire time series.*
Reco 3	We recommend estimating land use changes since 1970 to avoid artificial changes in land use change rates for the period 1990-20xx, even if it is a basic extrapolation.
Reco 4	We recommend being very cautious by comparing maps that are made with different methods. A lot of irrelevant land use changes may appear.
Reco 5	We recommend dealing woody crops as a land use subcategory of Cropland (which is not the case in the IPCC).
Reco 6	We recommend being very cautious when using different climate zones. It may be more reasonable to keep only one zone and to simplify calculations. Indeed, the split of the territory into climate zone must be applied for all parameters once it is chosen and can therefore increase the working time
Reco 7	We recommend verifying the consistency of the global territory covered by the inventory over the entire time series. The category Other Land can be used as a "remaining category" to ensure this consistency.

4.3. GENERAL METHODOLOGY FOR ESTIMATING CARBON FLUXES

The LULUCF inventory requires the assessment of all carbon fluxes between terrestrial carbon pools and the atmosphere. The principle of these carbon fluxes between pools can be summarized as follows:

FIGURE 20: SCHEME OF CARBON POOLS AND CARBON FLUXES



The equation 2.3 of 2006 IPCC Guidelines presents all these carbon fluxes.

Equation 1: Annual carbon stock for a stratum of land-use category (Equation 2.3, 2006 IPCC guidelines)

EQUATION 2.3
ANNUAL CARBON STOCK CHANGES FOR A STRATUM OF A LAND-USE CATEGORY AS A SUM OF CHANGES IN ALL POOLS

$$\Delta C_{LU_i} = \Delta C_{AB} + \Delta C_{BB} + \Delta C_{DW} + \Delta C_{LI} + \Delta C_{SO} + \Delta C_{HWP}$$

Where:

ΔC_{LUi} = carbon stock changes for a stratum of a land-use category

Subscripts denote the following carbon pools:

AB = above-ground biomass

BB = below-ground biomass

DW = deadwood

LI = litter

SO = soils

HWP = harvested wood products

Two calculation methods are proposed by the IPCC to estimate carbon stock and fluxes: a flux method (Gains – losses) and a stock change method. Depending on the pool and the type of land, one method or the other is preferred.

Equation 2 : Gains-losses method (Equation 2.4 2006 IPCC guidelines)

ΔC_L = annual loss of carbon, tonnes C yr^{-1}

EQUATION 2.4
ANNUAL CARBON STOCK CHANGE IN A GIVEN POOL AS A FUNCTION OF GAINS AND LOSSES (GAIN-LOSS METHOD)

$$\Delta C = \Delta C_G - \Delta C_L$$

Where:

ΔC = annual carbon stock change in the pool, tonnes C yr^{-1}

ΔC_G = annual gain of carbon, tonnes C yr^{-1}

Equation 3: Stock change method (Equation 2.5, 2006 IPCC guidelines)

EQUATION 2.5
CARBON STOCK CHANGE IN A GIVEN POOL AS AN ANNUAL AVERAGE DIFFERENCE BETWEEN ESTIMATES AT TWO POINTS IN TIME (STOCK-DIFFERENCE METHOD)

$$\Delta C = \frac{(C_{t_2} - C_{t_1})}{(t_2 - t_1)}$$

Where:

ΔC = annual carbon stock change in the pool, tonnes C yr^{-1}

C_{t_1} = carbon stock in the pool at time t_1, tonnes C

C_{t_2} = carbon stock in the pool at time t_2, tonnes C

4.4. MAIN CALCULATIONS

4.4.1. Calculation of carbon fluxes in biomass of forest lands

CO2 emissions and removals from forest living biomass are estimated either by Gains-Losses method (by difference between tree increment and wood harvest and/or disturbances) or by stock change method.

Equation 4 : Biomass increment in forest (Equation 2.10, 2006 IPCC guidelines)

EQUATION 2.10
AVERAGE ANNUAL INCREMENT IN BIOMASS

Tier 1

$G_{TOTAL} = \sum \{G_W \bullet (1+R)\}$ Biomass increment data (dry matter) are used directly

Tiers 2 and 3

$G_{TOTAL} = \sum \{I_V \bullet BCEF_I \bullet (1+R)\}$ Net annual increment data are used to estimate G_W by applying a biomass conversion and expansion factor

Where:

G_{TOTAL} = average annual biomass growth above and below-ground, tonnes d. m. ha^{-1} yr^{-1}

G_W = average annual above-ground biomass growth for a specific woody vegetation type, tonnes d. m. ha^{-1} yr^{-1}

R = ratio of below-ground biomass to above-ground biomass for a specific vegetation type, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$. R must be set to zero if assuming no changes of below-ground biomass allocation patterns (Tier 1).

I_V = average net annual increment for specific vegetation type, m^3 ha^{-1} yr^{-1}

$BCEF_I$ = biomass conversion and expansion factor for conversion of net annual increment in volume (including bark) to above-ground biomass growth for specific vegetation type, tonnes above-ground biomass growth (m^3 net annual increment)$^{-1}$, (see Table 4.5 for Forest Land). If $BCEF_I$ values are not available and if the biomass expansion factor (BEF) and basic wood density (D) values are separately estimated, then the following conversion can be used:

$$BCEF_I = BEF_I \bullet D$$

Equation 5 : Biomass losses due to wood removals in forest (Equation 2.12, 2006 IPCC guidelines)

EQUATION 2.12
ANNUAL CARBON LOSS IN BIOMASS OF WOOD REMOVALS

$$L_{wood-removals} = \{H \bullet BCEF_R \bullet (1+R) \bullet CF\}$$

Where:

$L_{wood-removals}$ = annual carbon loss due to biomass removals, tonnes C yr^{-1}

H = annual wood removals, roundwood, m^3 yr^{-1}

Where:

$L_{wood\text{-}removals}$ = annual carbon loss due to biomass removals, tonnes C yr^{-1}

H = annual wood removals, roundwood, m^3 yr^{-1}

R = ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$. R must be set to zero if assuming no changes of below-ground biomass allocation patterns (Tier 1).

CF = carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$

$BCEF_R$ = biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark), tonnes biomass removal (m^3 of removals)$^{-1}$, (see Table 4.5 for Forest Land). However, if $BCEF_R$ values are not available and if the biomass expansion factor for wood removals (BEF_R) and basic wood density (D) values are separately estimated, then the following conversion can be used:

$$BCEF_R = BEF_R \bullet D$$

Equation 6: Biomass losses due to fuelwood removals in forest (Equation 2.13, 2006 IPCC guidelines)

EQUATION 2.13
ANNUAL CARBON LOSS IN BIOMASS OF FUELWOOD REMOVAL

$$L_{fuelwood} = [\{FG_{trees} \bullet BCEF_R \bullet (1+R)\} + FG_{part} \bullet D] \bullet CF$$

Where:

$L_{fuelwood}$ = annual carbon loss due to fuelwood removals, tonnes C yr^{-1}

FG_{trees} = annual volume of fuelwood removal of whole trees, m^3 yr^{-1}

FG_{part} = annual volume of fuelwood removal as tree parts, m^3 yr^{-1}

R = ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$; R must be set to zero if assuming no changes of below-ground biomass allocation patterns. (Tier 1)

CF = carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$

D = basic wood density, tonnes d.m. m^{-3}

$BCEF_R$ = biomass conversion and expansion factor for conversion of removals in merchantable volume to biomass removals (including bark), tonnes biomass removal (m^3 of removals)$^{-1}$, (see Table 4.5 for Forest Land). If $BCEF_R$ values are not available and if the biomass expansion factor for wood removals (BEF_R) and basic wood density (D) values are separately estimated, then the following conversion can be used:

$$BCEF_R = BEF_R \bullet D$$

TABLE 18 : INFORMAL RECOMMENDATIONS ON BIOMASS OF FOREST (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 8	*We recommend being very cautious by using expansion and conversion factors. They are rather difficult to choose correctly. In case of doubt don't hesitate to use basic increment in dry matter.*
Reco 9	*We recommend crosschecking data on wood harvest and wood consumption to estimate a robust Figure for total harvest.*

Reco 10	*We recommend considering trees out of forest in the estimate of wood harvest to avoid overestimates of harvest in forestlands.*
Reco 11	*We recommend double checking of the scope of units (volumes, tonnages) for increment and wood removals.*
Reco 12	*We recommend crosschecking data on stocks and data on fluxes by making a carbon assessment of biomass in forest.*
Reco 13	*We recommend not forgetting mortality of trees as a disturbance in carbon balance of lands.*
Reco 14	*We recommend specifying wood removals on deforested areas and prevent any double counting of these losses.*

4.4.2. Calculation of carbon fluxes in biomass of woody crops

Carbon fluxes can be estimated thanks to a Gains-losses method with default value provided in Table 5.1 of the 2016 IPCC guidelines.

TABLE 7: PARAMETERS TO ESTIMATE BIOMASS GAINS AND LOSSES FOR WOODY CROPS (TABLE 5.1, 2006 GUIDELINES)

Table 5.1
Default Coefficients For Above-Ground Woody Biomass And Harvest Cycles In Cropping Systems Containing Perennial Species

Climate Region	Above-Ground Biomass Carbon Stock At Harvest (Tonnes Cha^{1})	Harvest Maturity cycle (yr)	Biomass accumulation rate (G) (tonnes Cha^{1} yr^{1})	Biomass carbon loss (L) (tonnes Cha^{1} yr^{1})	Error range[1]
Temperate (all moisture regimes)	63	30	2.1	63	+75%
Tropical, dry	9	5	1.8	9	+75%
Tropical, moist	21	8	2.6	21	+75%
Tropical, wet	50	5	10.0	50	+75%

Note: Values are derived from the literature survey and synthesis published by Schroeder (1994).

[1] Represents a nominal estimate of error, equivalent to two times standard deviation, as a percentage of the mean.

TABLE 19: INFORMAL RECOMMENDATIONS ON BIOMASS OF WOODY CROPS (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 15	We recommend using references provided in 2019 IPCC refinement which are clearer and more detailed than 2006 IPCC guidelines.
Reco 16	We recommend dealing woody crops as a land use instead of a subcategory of cropland (if possible), it makes the calculations much easier.
Reco 17	We recommend being cautious by applying this method and not to forget losses when gains are applied on woody crops. With a constant area of woody crops gains should equal losses. Any large sink or source on these woody crops should be cautiously analyzed.

4.4.3. Calculation of carbon fluxes for conversions of land use

In the case of a land use conversion, equations 2.15 and 2.16 of the 2006 IPCC guidelines should be used. These equations merges two methods (carbon stock changes and Gains-losses).

This equation is presented for biomass but also possible for all pools.

Equation 8: Carbon fluxes on land with conversions (Equation 2.15, 2006 IPCC guidelines)

EQUATION 2.15
ANNUAL CHANGE IN BIOMASS CARBON STOCKS ON LAND CONVERTED TO OTHER LAND-USE CATEGORY (TIER 2)

$$\Delta C_B = \Delta C_G + \Delta C_{CONVERSION} - \Delta C_L$$

Where:

ΔC_B = annual change in carbon stocks in biomass on land converted to other land-use category, in tonnes C yr^{-1}

ΔC_G = annual increase in carbon stocks in biomass due to growth on land converted to another land-use category, in tonnes C yr^{-1}

$\Delta C_{CONVERSION}$ = initial change in carbon stocks in biomass on land converted to other land-use category, in tonnes C yr^{-1}

ΔC_L = annual decrease in biomass carbon stocks due to losses from harvesting, fuel wood gathering and disturbances on land converted to other land-use category, in tonnes C yr^{-1}

Conversion to another land category may be associated with a change in biomass stocks, e.g., part of the biomass may be withdrawn through land clearing, restocking or other human-induced activities. These initial changes in carbon stocks in biomass ($\Delta C_{CONVERSION}$) are calculated with the use of Equation 2.16 as follows:

Equation 9: Carbon stock change between before and immediately after conversion (Equation 2.16, 2006 IPCC guidelines)

EQUATION 2.16
INITIAL CHANGE IN BIOMASS CARBON STOCKS ON LAND CONVERTED TO ANOTHER LAND CATEGORY

$$\Delta C_{CONVERSION} = \sum_i \{(B_{AFTER_i} - B_{BEFORE_i}) \bullet \Delta A_{TO\_OTHERS_i}\} \bullet CF$$

Where:

$\Delta C_{CONVERSION}$ = initial change in biomass carbon stocks on land converted to another land category, tonnes C yr^{-1}

B_{AFTER_i} = biomass stocks on land type *i* immediately after the conversion, tonnes d.m. ha^{-1}

B_{BEFORE_i} = biomass stocks on land type *i* before the conversion, tonnes d.m. ha^{-1}

$\Delta A_{TO\_OTHERS_i}$ = area of land use *i* converted to another land-use category in a certain year, ha yr^{-1}

CF = carbon fraction of dry matter, tonne C (tonnes d.m.)$^{-1}$

i = type of land use converted to another land-use category

TABLE 20 : INFORMAL RECOMMENDATIONS ON CONVERSIONS (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 18	We recommend specifying explicitly the stocks of ligneous and non-ligneous biomass for land use conversions.
Reco 19	We don't 'recommend using the default values of 5tC/ha/yr from IPCC 2006 and 2019 for the gains after conversion to cropland (issue discussed among reviewers) even if it is what IPCC presents.
Reco 20	We recommend considering a gain of carbon for litter and deadwood for the conversion to forest and a loss of carbon for litter and deadwood for the conversion from forest based on default and country specific data of average stocks in forest.

4.4.4. Calculation of carbon fluxes in soil organic matter

For soils, the equation 2.25 of the 2006 IPCC guidelines allows to estimate carbon stock changes on the basis of changes in management (tillage intensity, fertilisation rate…).

It requires an efficient monitoring of practices to be considered as relevant enough. It should be applicable on cropland and grasslands. In practice it is very rare to collect relevant data in grassland management to implement such calculations.

For cropland, data on several management can be compiled and used to estimate the dynamics of carbon in soils.

Equation 10 : Carbon stock change in mineral soils (Equation 2.25, 2006 IPCC guidelines)

EQUATION 2.25
ANNUAL CHANGE IN ORGANIC CARBON STOCKS IN MINERAL SOILS

$$\Delta C_{Mineral} = \frac{(SOC_0 - SOC_{(0-T)})}{D}$$

$$SOC = \sum_{c,s,i} \left(SOC_{REF_{c,s,i}} \bullet F_{LU_{c,s,i}} \bullet F_{MG_{c,s,i}} \bullet F_{I_{c,s,i}} \bullet A_{c,s,i} \right)$$

(Note: T is used in place of D in this equation if T is ≥ 20 years, see note below)

Where:

$\Delta C_{Mineral}$ = annual change in carbon stocks in mineral soils, tonnes C yr^{-1}

SOC_0 = soil organic carbon stock in the last year of an inventory time period, tonnes C

$SOC_{(0-T)}$ = soil organic carbon stock at the beginning of the inventory time period, tonnes C

SOC_0 and $SOC_{(0-T)}$ are calculated using the SOC equation in the box where the reference carbon stocks and stock change factors are assigned according to the land-use and management activities and corresponding areas at each of the points in time (time = 0 and time = 0-T)

T = number of years over a single inventory time period, yr

D = Time dependence of stock change factors which is the default time period for transition between equilibrium SOC values, yr. Commonly 20 years, but depends on assumptions made in computing the factors F_{LU}, F_{MG} and F_I. If T exceeds D, use the value for T to obtain an annual rate of change over the inventory time period (0-T years).

c = represents the climate zones, *s* the soil types, and *i* the set of management systems that are present in a country.

SOC_{REF} = the reference carbon stock, tonnes C ha^{-1} (Table 2.3)

F_{LU} = stock change factor for land-use systems or sub-system for a particular land-use, dimensionless

[Note: F_{ND} is substituted for F_{LU} in forest soil C calculation to estimate the influence of natural disturbance regimes.

F_{MG} = stock change factor for management regime, dimensionless

F_I = stock change factor for input of organic matter, dimensionless

A = land area of the stratum being estimated, ha. All land in the stratum should have common biophysical conditions (i.e., climate and soil type) and management history over the inventory time period to be treated together for analytical purposes.

TABLE 21 : INFORMAL RECOMMENDATIONS ON SOILS (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 21	*We recommend being cautious when splitting the territory according to soils zones. All parameters should be estimated by zone. It may be better to simplify the work by using only one soil zone.*
Reco 22	*We recommend being aware of what is tracked by this methodology on soils. Only dynamics are captured by this method. It is worthless spending a lot of resources on soils if no data on dynamics are available.*
Reco 23	*We recommend focusing on intermediate crops, the use of residues, organic fertilization and tillage which are supposed to be the main drivers.*
Reco 24	*We recommend being careful on the effect of tillage which may be different according to the climate. We recommend using the references proposed in the 2019 refinement for soils.*
Reco 25	*We recommend being humble on our capacity to really track carbon changes in soils with IPCC methods, the uncertainty in the result is very high.*

4.4.5. Calculation of other emissions from soils

LULUCF is a sector that aims to track land carbon fluxes. Nevertheless, some land emissions have been associated with this sector, either because they were closely related to changes in carbon stocks or because they are associated with land use and not included in agriculture.

- N2O emissions related to land fertilization (excluding agriculture)
- N2O emissions related to soil carbon mineralization
- CO2, CH4, N2O emissions related to management of organic soils
- Indirect N2O emissions from soils at volatilization or leaching (excluding agriculture)

Different methods are presented to calculate these emissions, they are based on the amount of fertilizer, the area of cultivated organic soils, or the carbon losses from soils.

All these sources are usually minor sources compared to the rest of the inventory.

TABLE 22 : INFORMAL RECOMMENDATIONS ON OTHER EMISSIONS FROM SOILS (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 26	We recommend keeping these estimates simple (tier 1) considering the high uncertainty on these emissions.
Reco 27	We recommend focusing on organic soils if organic soils are significant and to use 2013 IPCC on wetlands for these sources.
Reco 28	We recommend being aware of what CO2 emission from cultivation of organic soils mean: cultivation of organic soils leads to lower the watershed level. All carbon above the watershed level is exposed to oxidation and is emitted till another equilibrium is found. Under the watershed level, organic matter is protected from oxidation.

4.4.6. Calculation of emissions related to burning

Part of the emissions related to burning biomass is accounted for in the Agriculture sector (crop residue burning and savannah burning). There could still be biomass burning in the other land use categories, in particular under forestlands and grassland. These emissions are estimated with equation 2.27 of 2006 IPCC Guidelines.

Equation 11 : Emissions from biomass burning (Equation 2.27, 2006 IPCC guidelines)

EQUATION 2.27
ESTIMATION OF GREENHOUSE GAS EMISSIONS FROM FIRE

$$L_{fire} = A \bullet M_B \bullet C_f \bullet G_{ef} \bullet 10^{-3}$$

Where:

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH_4, N_2O, etc.

A = area burnt, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}. This includes biomass, ground litter and dead wood. When Tier 1 methods are used then litter and dead wood pools are assumed zero, except where there is a land-use change (see Section 2.3.2.2).

C_f = combustion factor, dimensionless (default values in Table 2.6)

G_{ef} = emission factor, g kg^{-1} dry matter burnt (default values in Table 2.5)

Note: Where data for M_B and C_f are not available, a default value for the amount of fuel actually burnt (the product of M_B and C_f) can be used (Table 2.4) under Tier 1 methodology.

TABLE 23 : INFORMAL RECOMMENDATIONS ON BIOMASS BURNING (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 29	*We recommend being aware of what include the values of biomass provided by default in the guidelines. It may include both ligneous and non-ligneous biomass. And it may exclude trees in savannahs for instance. It does not include litter or soil organic matter in organic soils that may bum.*
Reco 30	*We recommend keeping default combustion factor and emission factor considering the high uncertainty of these parameters.*
Reco 31	*We recommend specifying the areas in land use change matrixes where areas are burnt to maintain the possibility to report emissions by land use category.*
Reco 32	*We recommend ensuring that there is no double counting of CO2 emissions with other carbon losses from biomass.*

4.4.7. Calculation of carbon fluxes due to harvested wood products (HWP)

A large share of the wood harvested remains in products for more than 1 year. Depending on the product, the lifetime can be short (paper…) or very long (50 or 100 years in buildings). The calculations can be made thanks to the equation 12.1 of the 2006 IPCC Guidelines.

Equation 12 : carbon stock changes in HWP (Equation 12.1, 2006 IPCC guidelines)

EQUATION 12.1
ESTIMATION OF CARBON STOCK AND ITS ANNUAL CHANGE IN HWP POOLS OF THE REPORTING COUNTRY

Starting with $i = 1900$ and continuing to present year, compute

$$(A) \qquad C(i+1) = e^{-k} \bullet C(i) + \left[\frac{\left(1-e^{-k}\right)}{k}\right] \bullet Inflow(i) \qquad with \;\; C(1900) = 0.0$$

$$(B) \qquad \Delta C(i) = C(i+1) - C(i)$$

Note: For an explanation of technique used in Equations 12.1A to estimate first-order decay see Pingoud and Wagner (2006).

Where:

i = year

$C(i)$ = the carbon stock of the HWP pool in the beginning of year i, Gg C

k = decay constant of first-order decay given in units, yr^{-1} ($k = \ln(2) / HL$, where HL is half-life of the HWP pool in years. A half-life is the number of years it takes to lose one-half of the material currently in the pool.)

Inflow(i) = the inflow to the HWP pool during year i, Gg C yr^{-1}

$\Delta C(i)$ = carbon stock change of the HWP pool during year i, Gg C yr^{-1}

TABLE 24 : INFORMAL RECOMMENDATIONS ON HWP (NOT INCLUDED IN THE IPCC GUIDELINES)

Reco 33	*We recommend being cautious by applying this methodology and to ensure a complete timeseries since 1900 as expected by the guidelines to avoid any artificial discrepancy in reporting.*
Reco 34	*We recommend being fully aware of what this category recovers: stock variations of carbon in harvested products out of lands. Increasing stocks of harvested wood products should lead to sinks whereas decreasing stocks should lead to emissions. A constant use of wood should lead to an equilibrium between gains and losses.*
Reco 35	*We recommend making the calculations from IPCC equations to fully understand the method and possibly crosscheck with existing tools.*
Reco 36	*We recommend crosschecking statistics on harvest and statistics on sawn wood.*

ANNEX 1: TEMPLATE AND GUIDELINES FOR A MEMORANDUM OF UNDERSTANDING (MOU)

These guidelines and template are provided on the following link, it is based on USA examples:

https://www.doj.state.or.us/wp-content/uploads/2017/08/mou_sample_guidelines.pdf

It is recommended by 2019 IPCC refinement.

GUIDELINES FOR A MEMORANDUM OF UNDERSTANDING

A Memorandum of Understanding (MOU) is required of an agency when an application for funds includes an explicit non-financial collaboration with partnering organizations. The MOU provides documentation that demonstrates the organizations have consulted and coordinated the responsibilities of their grant activities. The following elements should be considered when constructing an MOU:

- Describe each partner agency;
- State the purpose of the MOU;
- Clearly describe the agreed upon roles and responsibilities each organization or agency will be providing to ensure project success. The roles and responsibilities should align with project goals, objectives and target outputs;
- Identify the staff responsible for completing the specific responsibilities, this should include meeting CVSD reporting requirements;
- Describe how the collaboration/partnership benefits the project;
- Describe the resources each partner would contribute to the project. This can be contributing staff time, making in-kind contributions, delivering services, offering training or expertise, etc.;
- Provide a statement that the lead agency accepts full responsibility for the performance of the collaborative organizations/agencies; and
- The MOU must be signed by all partners. Signatories must be officially authorized to sign on behalf of the agency and include title and agency name.

SAMPLE FORMAT AND CONTENT MEMORANDUM OF UNDERSTANDING

All italicized sentences are considered instructions and should be deleted prior to the submission of the final MOU.

This Memorandum of Understanding (MOU) is entered into by and between: *Provide the agency name and a brief description of each agency*.

_____

_____

_____

_____

_____

A. Purpose. *State the purpose of the MOU. Include statements that explain how the collaborative relationship enhances or benefits the Applicant's program;*

B. Roles and Responsibilities. *Clearly describe and delineate the agreed upon roles and responsibilities each organization or agency will be providing to ensure project success. The roles and responsibilities should align with project goals, objectives and target outputs. This may be contribution of staff time, in-kind contributions of space or materials, delivery of program services, provision of training or staff expertise, etc.*

Agency A agrees to:

Responsibility/Activity

Agency B agrees to:

Responsibility/Activity

C. Reporting Requirements. *Describe who will be responsible for collecting, collating and submitting data as per the project target outputs and outcomes.*

D. Timeframe. *Clearly state the time period that this MOU will be in effect.*

This MOU will commence on _____ and will dissolve at the end of the grant funding period on _____ .

F. Confidentiality. *In order to ensure the safety of clients, all parties to the Memorandum of Understanding agree to adhere to the confidentiality expectations as outlined in the Grant Agreement.*

The designated lead agency accepts full responsibility for the performance of the collaborative organizations/agencies.

This Memorandum of Understanding is the complete agreement between _____ and _____ and may be amended only by written agreement signed by each of the parties involved.

The MOU must be signed by all partners. Signatories must be officially authorized to sign on behalf of the agency and include title and agency name.

AGENCY A

Authorized Official: _____ _____

Signature *Printed Name and Title*

Address: _____

Telephone(s): _____

E-Mail Address: _____

AGENCY B

Authorized Official: _____ _____

Signature *Printed Name and Title*

Address: _____

Telephone(s): _____

E-Mail Address: _____

ANNEX 2: ADDITIONAL DETAIL FROM BENCHMARK ON LULUCF SYSTEMS IN EUROPEAN COUNTRIES

Note: information was collected for the NIR 2022, errors can occur for countries, especially for the estimate of people involved which are never explicitly mentioned.

Country	Political responsibility	Technical responsibility for GHG inventoriy	Technical responsibility for LULUCF	Estimate of number of people involved in LULUCF team
Austria	Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	Federal Environment Agency (UBA)	Federal Environment Agency (UBA)	6
Belgium	Inter-ministerial conference for the environment (ICE)	Regional agencies	?	?
Bulgaria	Ministry of environment and water (MoEw)	Executive Environment Agency (ExEA)	Executive Environment Agency (ExEA)	?
Croatia	?	EKONERG – Energy and Environmental Protection Institute	EKONERG – Energy and Environmental Protection Institute	2
Cyprus	Department of Environment of the Ministry of Agriculture, Rural Development and Environment (DoE)	Department of Environment of the Ministry of Agriculture, Rural Development and Environment (DoE)	Department of Environment of the Ministry of Agriculture, Rural Development and Environment (DoE)	1
Czechia	Ministry of the Environment (MoE)	Czech Hydrometeorological Institute (CHMI)	: Institute of forest ecosystem research (IFER), Global change research institute (GCRI)	5
Denmark	Ministry of Environment and Food and the Ministry of Climate, Energy and Utilities	Danish Centre for Environment and Energy (DCE)	Department of Geosciences and Natural Resource Management, University of Copenhagen, Danish Centre for Food and Agriculture (DCA), Aarhus University	2
Estonia	Ministry of the Environment (MoE)	Estonian Environmental Research Centre (EERC)	Forest Department of the Estonian Environment Agency (EstEA)	4
Finland	?	Statistics Finland	Natural Resources Institute Finland (Luke)	5-6
France	Ministry of the Environment (MoE)	Citepa	Citepa	3

Country	Political responsibility	Technical responsibility for GHG inventoriy	Technical responsibility for LULUCF	Estimate of number of people involved in LULUCF team
Hungary	Ministry of agriculture	HMS (unit of national emission inventories)	Hungarian National Land Centre (NLC), Forestry Department of the NLC, Forest Research Institute of the University of Sopron, National Food Chain Safety Office (NFCSO)	3
Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (leadership)	federal environment Agency (UBA)	Thünen Institute (TI)	>10
Greece	Division of Climate Change and Air Quality of Ministry of environment and energy (MEEN)	National Technical University of Athens (NTUA) / School of Chemical Engineering	National Technical University of Athens (NTUA)	?
Italy	Ministry for the Environment, Land and Sea	Institute for Environmental Protection and Research (ISPRA)	Institute for Environmental Protection and Research (ISPRA)	2
Iceland	Ministry of the Environment Energy and Climate	Environment Agency	Soil Conservation Service of Iceland, Icelandic Forest Service	4
Ireland	?	?	?	1
Latvia	Ministry of Environmental protection and regional development	Latvian Environment, Geology and meteorology Center	Latvian State Forest Research Institute (LSFRI) «Silava»	4
Lithuania	Ministry of Environment	Environment protection agency	Lithuanian Research Center for Agriculture and Forestry, State Forest Service	3
Luxembourg	Ministry for the Environment, Climate and Sustainable Development (MECDD)	Environment Agency	Environment Agency	1
Netherlands	?	?	Wageningen university and research	1
Norway	?	Norwegian Environment Agency	Norwegian Institute of Bio-economy Research	7
Poland	Minister of Climate and Environment	National Centre for Emissions Management (KOBiZE) in the Institute of Environmental Protection	National Centre for Emissions Management (KOBiZE) in the Institute of Environmental Protection	?
Portugal	Agency of environment protection (APA)	APA´s Climate Change Department (DCLIMA)	APA´s Climate Change Department (DCLIMA)	1
Romania	Ministry of Environment (MEWF)	Environmental Protection Agency (NEPA)	ICSI, INCDS, ICPA, INCAS	>10
Slovakia	Ministry of Environment (MŽP SR)	Slovak Hydrometeorological Institute (SHMÚ)	National Forest center Zvolen, research institute on soil protection, National agriculture and food institute	6

Country	Political responsibility	Technical responsibility for GHG inventoriy	Technical responsibility for LULUCF	Estimate of number of people involved in LULUCF team
Slovenia	Ministry of the Environment and spatial planning	Slovenian Environment Agency (SEA)	Slovenian Forestry Institute, Agricultural Institute of Slovenia	2
Spain	Dirección General de Calidad y Evaluación Ambiental del MITECO	Unidad de Inventario de Emisiones de la Subdirección General de Aire Limpio y Sostenibilidad Industrial de la DGCEA(UI) & assisted by: sociedad TRAGSATEC (Ttsec)	Unidad de Inventario de Emisiones de la Subdirección General de Aire Limpio y Sostenibilidad Industrial de la DGCEA(UI) & assisted by: sociedad TRAGSATEC (Ttsec)	3
Sweden	Ministry of the Environment	Swedish Environmental Protection Agency (Swedish EPA)	Swedish University of Agricultural Sciences (as consultants)	7

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TOWARDS DEVELOPMENT/ STRENGTHENING OF THE NATIONAL GHG INVENTORY SYSTEM —

CONCEPTUAL FRAMEWORK FOR MONITORING, REPORTING AND VERIFICATION OF LAND USE, LAND-USE CHANGE AND FORESTRY (LULUCF) SECTOR IN GEORGIA

MRV LULUCF GEORGIA

ROADMAP

EU4Climate
Better Climate Policies for Eastern Partner Countries

November 2022

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Conceptual Framework for Monitoring, Reporting and Verification of Land Use, Land-Use Change and Forestry (LULUCF) Sector in Georgia

MRV LULUCF GEORGIA

ROADMAP

RECOMMENDATIONS FOR THE NEXT STEPS NECESSARY TO BUILD A ROBUST MRV SYSTEM RELATED TO THE LULUCF SECTOR (ROADMAP)

November 2022

WRITING

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EU4Climate
Better Climate Policies for Eastern Partner Countries

Outline

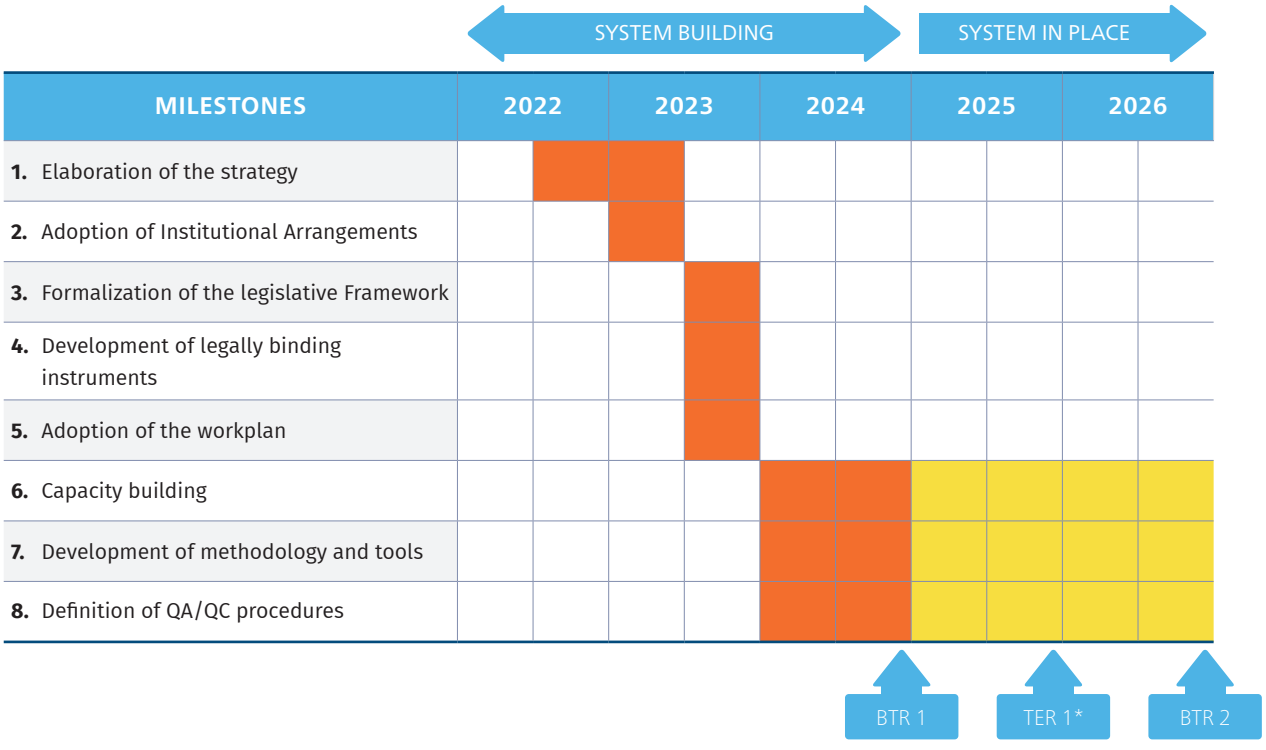
This report presents the roadmap for implementing a new MRV organizational scheme for LULUCF in Georgia. The roadmap describes the steps to achieve an efficient inventory system for LULUCF.

It includes recommendations for the next steps necessary to build a robust MRV system related to the LULUCF sector, as described in the previous detailed report.

Ideally it would have been strongly recommended to complete this roadmap by the end of 2024 to meet the desired reporting requirements under the Paris Agreement and effectively contribute to the implementation of Georgia's first biennial transparency report (BTR). In practice the process of producing the BTR 1 is already ongoing, and it is rather unlikely that the system becomes already operational for this next exercise.

This report summarizes key actions that need to be put in place to have a robust, efficient, impactful, and sustainable MRV system for LULUCF in Georgia.

FIGURE 1: POSSIBLE ROADMAP FOR SYSTEM BUILDING



* TER: Technical expert review

1. ELABORATION OF THE STRATEGY

The EU4Climate project that the present reports is part of already participates to the strategy for implementing a new MRV organizational scheme for LULUCF, by presenting several options of organizations. As mentioned in the detailed report there is no obvious or "natural organization" for LULUCF in Georgia, so there are still needs for national brainstorming on the best system to conduct the LULUCF GHG inventory.

The strategy requires to cross the possible organizations, the expected results and the possible resources. It may be difficult to reach a national consensus and it is important to remind that all choices must be associated with appropriate communication on objectives and constraints.

TABLE 1: INFORMAL RECOMMENDATIONS ON THE STRATEGY

Reco 1	*We recommend involving stakeholders broadly in decision process.*
Reco 2	*We recommend reminding the national interest, and the importance of international engagements when making the choice of options.*
Reco 3	*We recommend basing the strategy on technical skills and capacities of involvement from teams more than current data availability.*

2. ADOPTION OF INSTITUTIONAL ARRANGEMENTS

The institutional arrangements are the results of a national consultation. They may be adopted by a large panel of actors and thus approved with a workshop where all stakeholders are invited.

The validation of the institutional, organizational and regulatory aspects should be done by the relevant stakeholders as soon as possible in order to adopt and initiate the operations of setting up the system and those determining the preparation and establishment of the Decree, as well as internal Orders / Circulars within the bodies involved in the system.

TABLE 2: INFORMAL RECOMMENDATIONS FOR ADOPTION OF INSTITUTIONAL ARRANGEMENTS

Reco 4	*We recommend ensuring the consistency of treatment of LULUCF with other sectors but reminding the high specificities of the sector (no obvious responsibility, technical issues, political importance, data gaps, uncertainties)*
Reco 5	*We recommend organizing a workshop/event for the adoption of the system.*
Reco 6	*We recommend using schemes to explain and communicate on the institutional arrangements (the scheme presented in detailed report on options is recommended).*

3. FORMALIZATION OF THE LEGISLATIVE FRAMEWORK

The establishment of the system should be based on a legal text giving legal force to the inventory operation, ideally in the form of a Decree, followed by an Order. This document may be common with other sectors. Precisions on the content of this document are provided in section 3.1 of the detailed report.

TABLE 3: INFORMAL RECOMMENDATIONS FOR FORMALIZATION OF THE LEGISLATIVE FRAMEWORK

Reco 7	*We recommend naming organizations in the official documents but without being to precise in terms of data because methods are changing often.*

4. DEVELOPMENT OF LEGALLY BINDING INSTRUMENTS

MEPA in collaboration with EIEC and organization in charge of technical work for LULUCF need to develop data sharing Memorandum of Understanding (MoUs) and Agreements.

One must remind that data supply agreements are presented in 2019 IPCC refinement paragraph 1.4.2.2 as good practices.

TABLE 4: INFORMAL RECOMMENDATIONS ON THE DEVELOPMENT OF LEGALLY BINDING INSTRUMENTS

Reco 8	*We recommend using the public data and encouraging the organization to communicate on the data they use.*
Reco 9	*We recommend reminding to data providers that it is useful to officialize the data needs to keep sustainable data production.*
Reco 10	*We recommend officializing data provision by Data Supply Agreement (DSA) or Memorandum of understanding (MoU) for which a template is provided in Annex 1 of the detailed report.*

5. ADOPTION OF THE WORKPLAN

The workplan must be drawn up both by the organizations politically responsible for the inventory and by the organizations in charge of its technical implementation.

The adoption of the workplan does not require the holding of a specific event such as the adoption of the institutional framework but it is important to have an official document that can be updated regularly.

FIGURE 2: EXAMPLE OF WORKPLAN FOR THE ENTIRE INVENTORY PROPOSED BY SWEDEN IN ITS NIR 2022

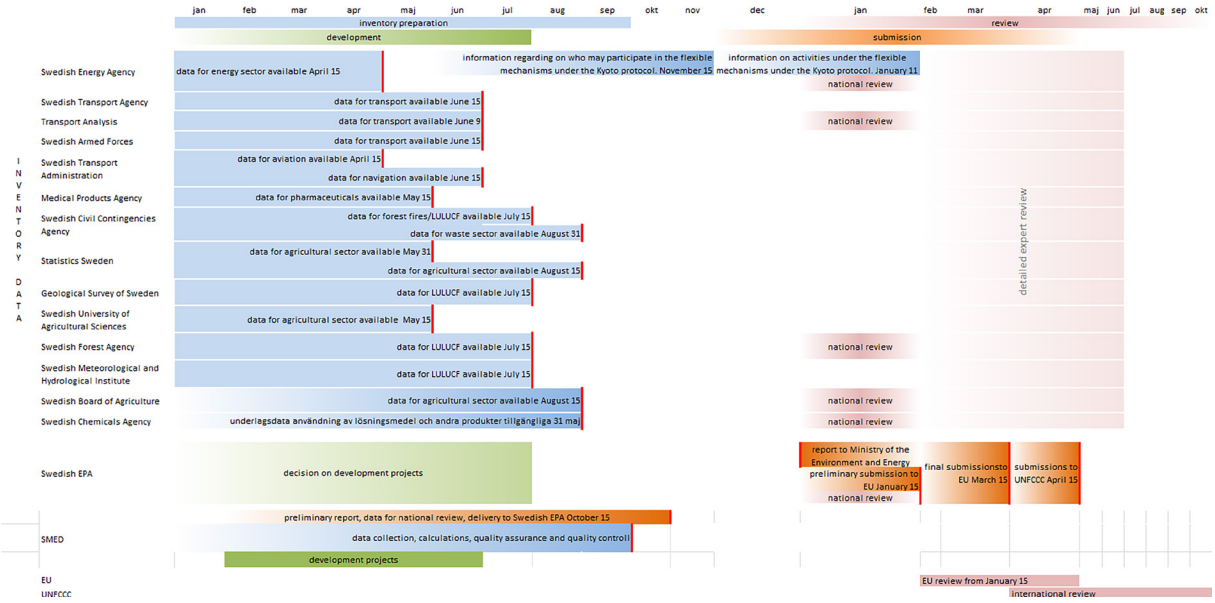


TABLE 5: INFORMAL RECOMMENDATIONS ON ADOPTION OF THE WORKPLAN

Reco 11	*We recommend using the workplan presented by the 2019 IPCC refinement.*
Reco 12	*We recommendto include the presentation of accurate deadlines, working periods, stakeholders and expected results in the workplan (like the exemple from Sweden presented above)*

6. CAPACITY BUILDING

The capacity-building plan should be continuous and support experts for long periods. It may cover:

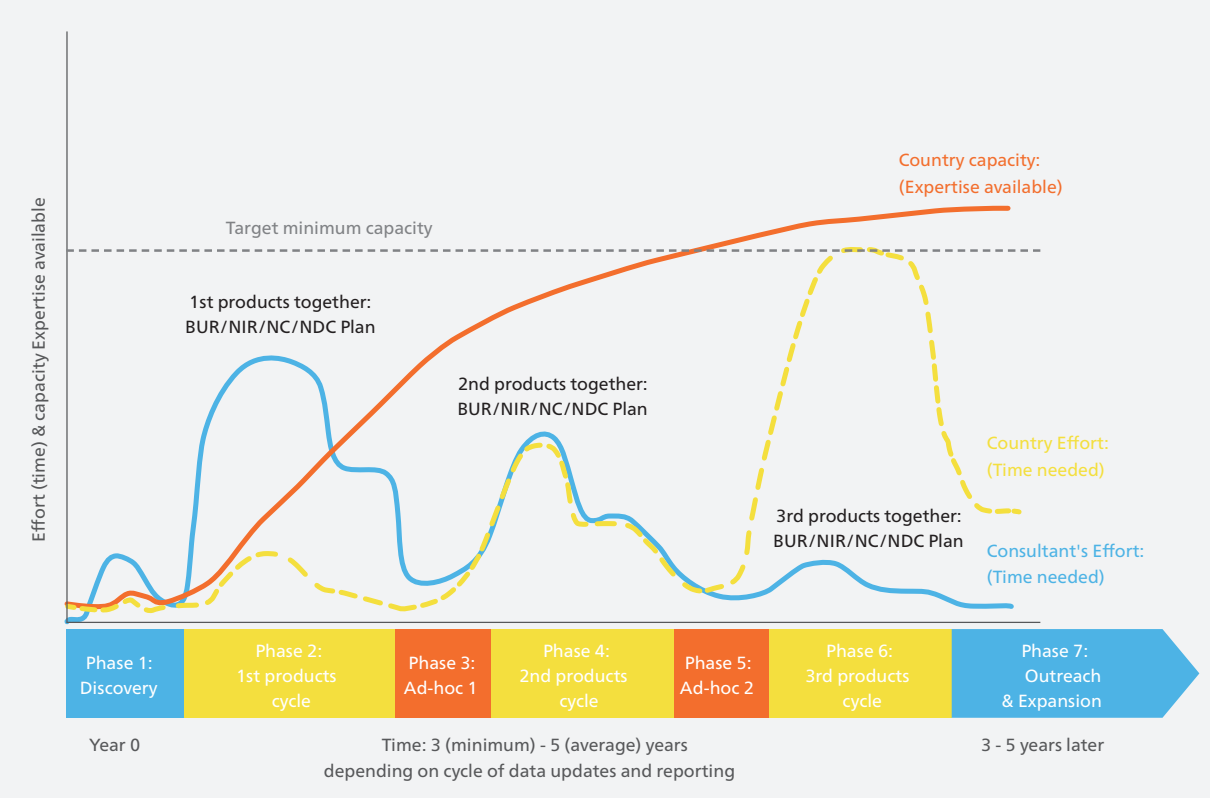
- Sectoral aspects and the definition of actions to improve methods;
- Cross-cutting aspects (analyses, key sources, uncertainties, report content, inventory cycles, QA/QC);
- Coordination and management of tools;
- Reporting to the UNFCCC and other international reporting requirements: the participation of national experts in the reviews would be an essential element of motivation for the teams, but also of positioning the country in the global expertise on the GHG inventory and in the improvement of methods.

Training may cover both the political dimensions of the process and the technical aspects:

- The enhanced transparency framework (ETF) of the Paris Agreement and the application of the Paris Rulebook;
- The collection process to be implemented to calculate GHGs according to the 2006 and 2019 IPCC methodologies;
- Synergies between GHG emissions, energy accounting and cross-cutting aspects on the scope to be covered (in terms of GHGs, sectors, etc.);
- GHG accounting principles highlighting the differences between the 2006 and 2019 guidelines;

The expertise at the national level must be consolidated over a period of 3 to 5 years, which corresponds to the publication cycle of the second BTR at the end of 2026.

FIGURE 2: TYPICAL CYCLE OF CAPITALIZATION OF GHG INVENTORY SKILLS AND EXPERTISE



Source: CGE 2020, Handbook on institutional arrangements to support MRV/transparency of climate action and support

TABLE 6: INFORMAL RECOMMENDATIONS ON CAPACITY BUILDING

Reco 13	*We recommend considering capacity building on technical issues when teams are already built and in charge of the products. The non-targeted capacity building on technical topics have limited benefits.*
Reco 14	*We recommend the shift of responsibilities from national consultants to expert teams (private or public but sustainable) within the 4 coming years.*

7. DEVELOPMENT OF METHODOLOGY AND TOOLS

Calculations for LULUCF inventory must be done in accordance with expected reporting format. The format for the coming BTR (biennial transparency report) was recently fixed by the UNFCCC with the final version of CRT (common reporting tables) including tables for LULUCF. These reporting tables are closed to the ones use in Annex I countries until now.

Approved version of CRT[1] tables is version 2.80. These tables give an overview of reporting expectations for LULUCF.

Results provided by the entities in charge of the technical responsibility of LULUCF should be sufficient to fulfil this document.

Methodologies for estimating emissions and removals may be developed as well as develop a nationally appropriate book as a guide to clarify and simplify the process. Both methodologies and tools may be very frequently updated to respond to the increasing demand of accuracy on inventories.

This must be developed by the organization in charge of the technical work on LULUCF in accordance with other actors involved in the inventory process.

TABLE 7: INFORMAL RECOMMENDATIONS ON METHODOLOGIES AND TOOLS

Reco 15	*We recommend authorizing the diversity of tools for LULUCF as far as they are developed/ accepted by the technical teams*
Reco 16	*We recommend using Microsoft Excel for its flexibility and facility when calculations are not too huge and other software like R, PostGreSQL when data are becoming important.*
Reco 17	*We recommend preparing data out of IPCC tool (if IPCC tool is used at national level) and calculate emissions out of IPCC tool at the same time to ensure that calculations are well managed.*

8. DEFINITION OF QA/QC PROCEDURES

There are two types of controls to be implemented within the framework of an inventory: quality control and quality assurance.

- Quality Control is a control performed by personnel involved in inventory compilation, it is a system of routine technical activities intended to assess and maintain the quality of the inventory as compiled.
- Quality assurance is a control performed by personnel not directly involved in the compilation process, these are external checks. In the MRV system it is relevant to specify some responsibilities in terms of quality assurance. It could be expected from experts in ministries but also from fully independent reviewers that can be recorded in the MRV system.

A nationally appropriate process for quality control (QC) and quality assurance (QA) of all data collected in the sector should be built.

It must be developed by the organization in charge of the technical work on LULUCF in accordance with other actors involved in the inventory process.

TABLE 8: INFORMAL RECOMMENDATIONS ON QA/QC

Reco 18	*We recommend tracking very accurately the methodology changes with a panel of rules (color codes, dates of modification, common rules of work)*
Reco 19	*We recommend the nomination of support people for each category of the inventory (at least 2 people by topic)*
Reco 20	*We recommend the implementation of lots of consistency checks in the calculation files.*
Reco 21	*We recommend recording the mistakes and comments from internal and external reviews and quality assurance*
Reco 22	*We recommend the assistance of experienced inventory teams for developing good QA/QC systems*

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