



This project is co-financed by  
the European Union and the Republic of Turkey

National Programme for Turkey 2013 –  
Instrument for Pre-Accession Assistance

# Technical Assistance for Developed Analytical Basis for Land Use, Land Use Change and Forestry (LULUCF) Sector

Project Identification No: EuropeAid/136031/IH/SER/TR

Contract No: TR2013/0327.05.01-03/001

## Activity 2.1: Training and Assistance Needs Analysis (TANA) Report



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## ABBREVIATIONS

AD	Activity Data
ARD	Afforestation/Reforestation/Deforestation
ARR	Annual Inventory Review Reports
BR	Biennial Report
NC	National Communication
CO2-eq	Carbon Dioxide Equivalent
COP	Conference of the Parties
CORINE	A remote sensing-based land cover assessment for Europe
CRF	Common Reporting Format
DBM	Diameter at Breast Height
DCC	Department of Climate Change
DGEM	Directorate General of Environmental Management
EF	Emission Factor
ENVANIS	Key dataset for estimation of forest removals and carbon change
ERT	Expert Review Team - UNFCCC
ETS	European Trading System
EU	European Union
FM	Forest Management
FMP	Forest Management Plan
GDAR	General Directorate of Agriculture Reform
GDDEC	General Directorate of Desertification and Erosion Control
GDF	General Directorate of Forestry
GDSP	General Directorate of Spatial Planning
GDSHW	General Directorate of Hydraulic Works
GHG	Greenhouse Gas
GPG-LULUCF	Good Practice Guide for Land Use, Land Use Change and Forestry
GIS	Geographic Information Systems
HWP	Harvested Wood Products
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LPIS	Land Parcel Identification System
LULUCF	Land Use, Land-Use Change and Forestry
MoFWA	Ministry of Forest and Water Affairs
MoEU	Ministry of Environment and Urbanization
MFAL	Ministry of Food, Agriculture and Livestock
MRV	Measurable, Reportable, Verifiable
NC	National Communication
NFI	National Forest Inventory
NIR	National Inventory Report
TACCC	Transparency, Accuracy, Completeness, Comparability, Consistency
TANA	Training and Assistance Need Analysis
TurkStat	Turkish Statistical Institute
UNFCCC	United Nations Framework Convention on Climate Change

## EXECUTIVE SUMMARY

Training and Assistance Needs Analysis (TANA) falls under activity 2.1 of *Component 2: Development of analytical tools and guidelines* of the project Technical Assistance for Developed Analytical Basis for Land Use, Land Use Change and Forestry (LULUCF) Sector.

This report covers the analysis of training needs of the institutions taking part in GHG Inventory of Turkey. Focus is on identification and assessment of the needs and gaps concerning the establishment of a training program that aims to improve the national and local capacity to estimate carbon stocks and report GHG emissions and removals from the LULUCF sector in accordance with decisions taken under the UNFCCC as well as EU decisions regarding LULUCF. In particular the capacity building and additional training needs for the Directorate General of Forestry and the Directorate General of Agricultural Reform under the two responsible line ministries for LULUCF GHG reporting (Ministry of Forestry and Water Affairs and Ministry of Food, Agriculture and Livestock, respectively) have been covered.

Reporting of greenhouse gas (GHG) emissions and removals in the LULUCF sector are particularly difficult because of the many uncertainties in estimation of land cover categories and of carbon stock, emissions and removals calculations. An analysis of potential and occurring gaps in knowledge and capacity is required to improve overall standards in GHG inventory and meeting international standards. Especially harmonization with European developments in LULUCF are of relevance in the light of the requirements for accession of Turkey to the European Union and to align with the EU Climate policy and legislation.

While the institutional arrangements for Turkish Greenhouse Gases reporting work to the satisfaction of all involved and National Inventory reporting has been done for over a decade, flaws and deficiencies have been noticed Regarding the underlying data and information for the NIR. Overall improvements in *activity data* (AD), enhanced capacity regarding the *use and integration of spatial datasets*, and stronger capacity in *modelling and calculations of carbon stock and carbon change* for all land use categories and sub-categories have been found a priority.

## INTRODUCTION

Reporting of greenhouse gas (GHG) emissions and removals in the LULUCF sector has been especially difficult because of the many uncertainties in estimation of land cover categories and of carbon stock, emissions and removals calculations. The current project aims to help Turkish Government improve the standard of annual GHG Inventory reporting in the LULUCF sector. An analysis of potential and occurring gaps in knowledge and capacity is required to improve overall standards in GHG inventory and meeting international standards of such reporting. In particular, harmonization with developments in the EU are of relevance in the light of the requirements for accession of Turkey to the European Union and to align with the EU Climate policy and legislation.

The report builds upon the results achieved under Activity 1.1 and 1.2 under *Component 1 (Stock taking Analysis and Research needs on LULUCF)*, in particular what (type of) capacity is required to support the use of available data and methodologies for the improvement of the Turkish greenhouse gas (GHG) inventory for the LULUCF sector, and will provide input for the actual capacity building activities under Activity 2.2 - *Development and implementation of a training program including on-the-job training based on the findings from the TANA*.

## Objective and Scope

### Overall objective - project

The overall objective of the project is to reduce anthropogenic GHG emissions to contribute to the global efforts to mitigate climate change in line with the scientific evidence. More specifically, the project will contribute to a developed analytical basis for the LULUCF sector based on the Good Practice Guidelines of the Intergovernmental Panel on Climate Change (IPCC). In this respect, support will be given to determine the appropriate baseline information for land areas to estimate carbon stocks and emissions and removals of greenhouse gases associated with LULUCF activities and establishment of a Kyoto Protocol level reporting system.

Overall aim therefore is to further increase national and local capacity to prepare medium and long term climate action towards climate resilient low carbon development, which will gradually align with the EU Climate policy and legislation.

### Specific Objective - Activity

The objective of the Training and Assistance Needs Analysis (TANA) is to identify and assess the needs and gaps concerning the establishment of a training program that aims to improve the national and local capacity to estimate carbon stocks and report GHG emissions and removals from the LULUCF sector in accordance with decisions taken under the UNFCCC as well as EU decisions regarding LULUCF.

### Scope

The scope of the TANA activity is to increase the knowledge of the LULUCF Core Group on all relevant subjects of the inventory process and to raise the reporting level in LULUCF sector. Subjects to give particular attention to include, but are not limited to, (i) elements on LULUCF inventory assessment; (ii) methodologies for accounting and calculations for carbon (stock), and emissions and removals of GHG for land use categories; (iii) representation of land areas and methodologies for spatially explicit land identification including existing available systems used in Turkey; (iv) modelling and development of scenarios for LULUCF and harvested wood product calculations; (v) quality assessments and quality control procedures; and (vi) uncertainty assessments of key category analysis.

## Background

### Current situation in the LULUCF sector

Turkey became Party to the United Nations Framework Convention on Climate Change (UNFCCC) in 2004 and ratified the Kyoto Protocol in 2009. As a candidate member to the European Union, Turkey

aims to complete the full harmonisation to the EU acquis. Whereas Turkey is listed under Annex 1 of the UNFCCC, and has the obligation to annually submit its National Inventory Report (NIR) an a National Greenhouse Gas Inventory to the UNFCCC, the country is not listed under Annex B of the Kyoto Protocol and therefore does not have a quantified emissions limitation or reduction commitment.

### **International requirements for annual GHG Inventory reporting**

The UNFCCC reporting guidelines on annual inventories provide, among others, guidance on the estimation and reporting of anthropogenic emissions by sources and removals by sinks of greenhouse gases caused by activities on land units related to land use, land use change and forestry (land based approach). In principle, this approach applies a “wall-to-wall” comprehensive inventory of activities over the land units related to anthropogenic sources and sinks of greenhouse gases. As a rule GHG inventories should be transparent, consistent, complete, comparable and accurate, and consistent with methodologies from the IPCC guidance and guidelines documents. Under UNFCCC reporting on annual inventories should apply the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, while use of the 2013 supplement to the 2006 IPCC on Wetlands is encouraged. Furthermore, UNFCCC encourages countries to improve methodologies for estimating emissions and removals. Reporting is done over a historic time period, usually 1990 to the present, of which such time series form a central part of the inventory.

Using UNFCCC’s guidelines for emission reduction, the EU committed itself under the Paris Agreement on climate change to a reduction of greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels. Following the agreement with EU leaders in October 2014 that all sectors should contribute to the EU's 2030 emission reduction target, including the land use sector, in July 2016 the European Commission presented a legislative proposal to integrate greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework. The proposal sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of carbon-dioxide (CO<sub>2</sub>) from the atmosphere through action in the sector, what is known as the "no debit rule." Although Member States undertook this commitment under the Kyoto Protocol up to 2020, the proposal enshrines the commitment in EU law for the period 2021-2030. See Annex 2 for more on the EU regulations and the impact on the LULUCF sector.

### **Annual inventory in Turkey**

In line with the UNFCCC recommendation, Turkey also has selected 1990 as its baseline year for the GHG inventory. Following the 2006 IPCC Guidelines for National GHG inventories, but lacking explicit spatial related high-resolution land data, Turkey generally uses Tier 1 and Tier 2 methods<sup>1</sup> for calculations of land-based emissions. With successive years the change in C stocks, and GHG emissions and removals have been assessed, as well as improvements incorporated into the reporting process.

Turkey has been submitting LULUCF sector emissions and removals as part of its NIR report on an annual basis since 2007. The last reviewed inventory submission was April 2016, with the latest -yet to date un-reviewed - submission of its report was in April 2017. Review by UNFCCC indicated there were flaws and inaccuracies in the 2016 inventory report, in particular related to *completeness, transparency, consistency, comparability* and *accuracy* (see also previous project reports and presentations).

As mentioned in the report on Activity 1.2<sup>2</sup>, emissions factors (EF) and activity data (AD) are used to calculate GHG emissions and removals and annual change within each category and sub-category, and are critical to the level of accuracy. Availability and quality of (activity) data is prominently

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<sup>1</sup> *Estimating greenhouse gas levels follows reporting on selected methodological tier levels, corresponding to the progression of use of simple and more generic equations to those using country-specific data. Tier 1 is the default method, using IPCC guidelines default values for calculation coefficients, based on national activity data. Tier 2 uses coefficient data specific to national circumstances within each country. Tier 3 methods are generally more complex, involving modelling and higher resolution land use and land-use change data.*

<sup>2</sup> *Activity 1.2 Report on how research can support the improvement of the Turkish GHG Inventory for the LULUCF sector*

important. It is here that Turkey experiences lack in adequate knowledge and experience, and this would be the heart of the training and capacity development. Availability of data would be improved through sharing information between the respective departments and harmonizing relevant data sets, thus improving overall data quality. Targeted training shall enhance capacity with respect to data analysis, calculations of carbon stocks, carbon stock change and resulting emissions and removals of carbon and non-carbon greenhouse gases. Both availability and improved technical capacity may allow Turkey to report on a higher Tier level and will improve overall reporting on GHG emissions in Turkey.

## Organisation and Key Stakeholders

Greenhouse gas inventory and subsequent reporting in Turkey is following a well-organised and transparent line of participation of a set of ministries with its representative departments, each with its individual roles and responsibilities.

The Turkish Statistical Institute (TurkStat) is the national authority responsible for compiling the annual inventory and submitting it directly to the online UNFCCC GHG Inventory platform through the online system *CRF Reporter*. Besides the annual reporting, Turkstat together with key experts from MoFWA and MoFAL is also responsible for maintaining online sectoral reports on LULUCF, which includes regular updating and uploading relevant LULUCF data to these CRF tables.

Core responsible for the preparation and timely submission of the LULUCF sector calculations as input to the annual National Inventory Report (NIR), are two agencies under the Ministry of Forestry and Water Affairs (MoFWA) and the Ministry of Agriculture, Food and Livestock (MoFAL), respectively. These two agencies are:

- i. The *General Directorate of Forestry (GDF)* under MoFWA is the key data supplier for Forest land (category 5A) related data (including peatland management activities) and respective analysis and calculations on carbon stocks, removals and emissions. Two other directorates operating within the same ministry, the General Directorate for Nature Conservation and National Parks (GDNCNP) and the General Directorate of State Hydraulic Works (SHW) also contribute to forest related data.
- ii. The *General Directorate of Agriculture Reform (GDAR)* under MoFAL provides relevant data, analysis and calculations for the remaining key land categories, i.e. Grassland (5B), Cropland (5C), Wetland (5D), Settlements (5E), and Other land (5F). GDAR is generally supported for specific data on these categories by General Directorate of Agricultural Research and Policy (TAGEM), General Directorate of Plant Production (BUGEM), and the Soil, Fertiliser and Water Resources Central Research Institute.

According to the Department of Climate Change (DCC), residing under the Ministry of Environment and Urbanisation (MoEU) and beneficiary for this project, the current organisational set-up for reporting on GHG emissions and removals in Turkey works efficiently and allows for an effective and timely reporting mechanism. As representative of MoEU, which has responsibility for overall coordination of the project, DCC has a managerial role in the project, and again is not a data supplier for LULUCF.

As mentioned above, GHG reporting for the LULUCF sector in Turkey is carried out by various ministries and directorates, and for this project jointly working together in a *LULUCF Core Group*. This core group guides the improvement of the LULUCF reporting and includes staff of the directorates and ministries listed above, together with representatives from General Directorate of Spatial Planning (GDSP) under the Ministry of Environment and Urbanisation, and the General Directorate of State Hydraulic Works (DGSHW) and the General Directorate of Desertification and Erosion Control (DGDEC), both under the Ministry of Forest and Water Affairs. The LULUCF Core Group is the target group for enhanced capacity building in GHG reporting under this project.

## METHODOLOGY

The Training and Assistance Needs Analysis (TANA) reflects on the actual need for capacity building within the respective departments, directorates and ministries for enhanced quality of the Turkish National GHG Inventory and associated reporting. In this respect, besides analysing individual needs

of these stakeholders, this activity also builds upon the results and outcomes of *Component 1 - Stock taking Analysis and Research needs on LULUCF* (i.e. Activity 1.2).

The TANA addresses potential need for capacity enhancement regarding the methodologies and data sources used, QA/QC procedures used, the uncertainty assessments and key category analysis addressed, the ability to address the requirements for other reporting responsibilities (e.g. NCs and BRs to produce projections), and the data gaps identified under Result 1.

To properly assess the actual need for capacity building and assistance, an analysis was made of the organisational set-up for GHG Inventory and reporting in Turkey, including current responsibilities and tasks. Current available capacity and knowledge within the respective ministries and directorates in relation to international common standards was reviewed through desk study of the various reports available (i.e. UNFCCC official documents, project documents and presentations (e.g. project Terms of Reference, inception report, activity reports and reports of workshops)), personal analysis and interviews with relevant staff to identify gaps and training needs (meetings with respective key stakeholders were held from 24 to 27 April 2018; see Annex 1 for the list of people met).

During the meetings with key staff of the respective ministries and departments, use was made of the information provided by the outcome of Activity 1.2 of the project. To assess the role of research in supporting adequate GHG inventory, Activity 1.2 analysed the research subjects based on data requirements for adequate GHG Inventory in the LULUCF sector. This resulted in a comprehensive list of research subjects and associated gaps.

The list from Activity 1.2 was adopted to assess potential gaps in knowledge for the respective research areas, if any. Each of the research areas identified was discussed with the key staff met and properly assessed on potential capacity needs. Additionally, a prepared overview with a number of potential learning areas was presented during the meetings and briefly discussed. This table was prepared for discussion only and presented preliminary areas for training (T) or assistance (A) with a more detailed description divided over various categories (defining a more generic or more technical training or assistance). For each of the subjects an indicative priority ranking was included, for the stakeholders to assess and change if needed.

Staff representing the key stakeholders identified in Section 2, above, were asked to comment on the table and provide changes, edits or other modifications to it, and add comments to the various trainings subjects if needed. The modified and consolidated table now serves as the basis for recommendations on training and assistance needs for GHG reporting on LULUCF in Turkey (see Annex 3).

The Training and Needs Analysis and the recommendations are presented in Section 4 and serve as input to prepare an appropriate training programme including on-the-job mentoring and study tour (under Activity 2.2).

## TRAINING AND ASSISTANCE NEEDS ASSESSMENT

### Overview

Relevant in the assessment of required training and assistance needs of the LULUCF Core Group is to recognise the shortcomings identified by the review commission on the most recent NIR.

According to 2006 IPCC Guidelines reporting should be in line with the *GPG-LULUCF* and be consistent with the existing *good practice guidance* for the other sector. In this respect, adequate GHG reporting addresses<sup>3</sup>:

- Choice of estimation method within the context of the IPCC Guidelines;
- Quality assurance and quality control procedures to provide cross-checks during the inventory compilation;
- Data and information to be documented, archived and reported to facilitate review and assessment of inventory estimates;

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<sup>3</sup> Good Practice Guide for Land Use, Land Use Change and Forestry – The Intergovernmental Panel on Climate Change (IPCC), 2003 ([http://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf\\_contents.html](http://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf_contents.html))

- Quantification of uncertainties at the source or sink category level and for the inventory as a whole, so that resources available can be directed toward reducing uncertainties over time, and the improvement can be tracked.

In addition, GPG-LULUCF provides guidance related to the specific features of the LULUCF sector on consistent representation of land areas, sampling for area estimates and for estimating emissions and removals, verification, and guidance on how to complement the Convention reporting for the LULUCF sector to meet the supplementary requirements under the Kyoto Protocol.

As understood from the most recent annual inventory review from UNFCCC<sup>4</sup>, Turkey's National Inventory Report experienced several flaws and deficiencies related to most of the reporting elements. For each of these reference can be made to *the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (in short: 2006 IPCC Guidelines) with feedback provided by the ARR on its findings of the 2016 NIR of Turkey (see Annex 4). Overall, the issues identified in the review, and which have been the issue of previous inventory reports, boil down to *completeness, transparency, consistency, comparability & reporting, and accuracy*.

The findings of the expert review team (ERT) are consistent with the observations reported in project documents (project Terms of Reference, project Inception Report, activity reports and presentations) and which direct towards an anticipated field of technical support and training. Personal analysis of documents and feedback obtained during the meetings with the key stakeholders from MoEU, MoFWA and MoFAL show the same need for support. In particular, greater capacity building was specifically requested by the Core Group members and which has been one of the outcomes of the workshop under Activity 1.2<sup>5</sup>.

Therefore, assessment of required training needs and elements for assistance to the respective departments and directorates generally is in line of anticipated support as mentioned in the Terms of Reference for this project, while some additional fields for technical support and/or some adjustments ("fine-tuning") of identified fields have been identified. The findings are reported in the next paragraph.

## General findings

### LULUCF sector

Turkey has been reporting LULUCF sector emissions and removals to UNFCCC since 2006, annually submitting the National Inventory Report (NIR) since 2007. The current organisational set-up of the two line ministries (MoFWA and MoFAL) preparing the baseline calculations for the 6 land categories while Turkstat compiles the data and prepares the NIR is working to satisfaction.

Despite the smooth structure in reporting, the country needs to improve overall quality of the report on the items listed above. In particular, it should improve *consistency, completeness* and *accuracy* of the report. Consistency ensures that all calculations and use of baseline data is done in a consistent manner throughout the report and is in line with previous GHG reports. Otherwise, if other datasets methods or levels in calculations are used, these should be properly be accounted for and reported on. Accuracy refers to the estimates for carbon stock changes, emissions and removals of GHG emerging from LULUCF activities in all of the six land use categories and associated sub-categories. Completeness refers to the coverage of the reporting for all land categories and sub-categories. Only if no data is available, emissions or removals are not occurring, or if proper estimates are not possible,

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<sup>4</sup> Expert Review Team's (ERT's) assessment of the 2016 inventory submission against the UNFCCC review guidelines

<sup>5</sup> "... there was a feeling amongst many stakeholders of a need for more capacity building, to improve and widen staff knowledge of the very specific requirements of the GHG Inventory, share and build upon best practice for data collection and analysis, and speed the development of new technologies that could help improve the quality and coverage of the relevant datasets required" (Activity 1.2: *Report on how research can support the improvement of the Turkish GHG Inventory for the LULUCF sector* – page 13)

such blanks may appear in the report. These blanks (listed as “NA”, “NO”, or “NE”) should also properly be justified and accounted for. Currently, Turkey’s inventory reports contains too many blanks. Consistency, completeness and accuracy are deemed critical elements in effective and reliable reporting on GHG from the LULUCF sector.

Particular emphasis should be on analysis and understanding of GHG sources and sinks, and of their anthropogenic and natural components, which must be based on improved, robust, process orientated modelling approaches and assessment methods using atmospheric GHG measurements and land observations, in-situ and from space.

Within the ministries (personal communication from MoEU) there is an overall concern that wrong or bad quality data sets may undermine the image of Turkey and produce a bad international image. Overall upgrading of capacity and quality of data (through improved research) will get Turkey adhering to UNFCCC international standards for GHG reporting.

Besides the need to advance overall competence in the sector, there is an equal need to increase the number of people with relevant capacity and knowledge. The current limited number of capable staff in the LULUCF sector is considered a weakness, and as such poses a *risk*. Overall increase in (numbers of) capacity across the directorates and responsible departments, including Turkstat, will counter the universal problem of staff leaving due to better opportunities outside of the Public Sector (i.e. to the private sector) and putting unwanted stress on annual reporting on LULUCF.

Analysis of relevant country documentation and personal analysis based on feedback obtained from the meetings, lead to the following general observations with respect to TANA:

- In principal the departments and directorates have the overall required capacity and technical knowledge to carry out the calculations for LULUCF in line with 2006 IPCC Guidelines, but lack specific knowledge in certain fields (see further under section 3.3).
- In order to move to a higher tier in reporting, Turkey needs overall beefing-up of its capacity, with emphasis on technical training in particular subjects (section 3.2.3) and number of trained staff.
- Lack of appropriate integration of spatial data sets with land-based information seems to be a crucial barrier to LULUCF reporting, as it obstructs reliable identification of land use categories and sub-categories, prevents producing the required historical time-series, and causes the current gap in assessed land and land area LULUCF is reporting on.
- Skewed integration of available data sets, often merging poorly aligned data (e.g. different scales of data collection, different and non-matching classification standards, etc.) cause a further loss of valuable data to LULUCF reporting.
- Current inventory reports have too many categories and sub-categories for which no calculations on emissions or removals are made. In many cases greenhouse gases are “not occurring” or “not estimated”. It appears that the underlying data is not available and/or adequate capacity to use the algorithms is lacking. Particularly the lack of (knowledge of) national *activity data* and updated *emission factors* and *emission coefficients* are the underlying cause. Fitting scientific studies to update these will adequately ease this shortcoming.
- Ministries report a lack of proper use of (technical) English. This language problem is obstructing proper understanding of official documents prepared in English, such as the original IPCC Guidelines. However, despite the need for a technical language course, this is considered an in-house institutional problem within the directorates and ministries and should be solved by adequate selecting/recruiting of staff and providing in-house courses.

**TANA related to identified research subjects**

Activity 1.2 identified different research subjects to improve LULUCF sector inventory. Under the TANA activity it was assessed to what extent training was needed to use this data, or to produce this data (i.e. training in research areas). The feedback obtained from meetings with the relevant agencies is presented in Table 1, under. Training needs identified using this table largely coincide with training individually indicated by the agencies, using the consolidated preliminary table presented to them (table in Annex 3) and further discussed in Section 3.3.

**Table 1 – Training needs related to research subjects identified under Activity 1.2**

Research subjects identified to improve LULUCF sector inventory	Training needs and Assistance	Requesting Agency
Improved spatial data for key categories of land cover		

Consistent Land Use Matrix since 1990, bringing together Corine, Envanis and LPIS	Common understanding	GDAR / GDF
Completion of National Forest Inventory for Turkey	How to use NFI in relationship to Forest Management plans	GDF
<b>Improved estimations of C stocks and GHG calculations</b>		
Average above-ground and below-ground C stocks for grasslands for climate and soil types	Training on modelling and calculations	GDAR / GDF
Soil C stock values for climate (ecozone) and soil types		GDAR / GDF
Volume/DBH to biomass equations		GDF
Soil and C modelling		GDAR / GDF
Biomass, increment and CF for perennial croplands		GDAR
Flux measurements (through pilot projects)		GDAR / GDF
CF and EF for the peats extracted in the country		GDF
<b>Improved understanding of the impact of disturbances on C stocks and GHG emissions</b>		
Logging, both legal and illegal, wildfires, insects, drought, wind	Understanding and managing uncontrolled deforestation and forest degradation by natural and manmade causes	GDF
<b>Additional research projects of relevance to the Inventory suggested by the Workshop Groups</b>		
Research for EF and AD across all climate types and covering all tree species and age classes	Training on AD and EF required to determine (key) land categories	GDAR / GDF
Estimation of GHG emissions/removals which take place from changes in land use, and the amount of carbon sequestered in soil, dead wood, wetlands and grasslands.	Training on modelling and calculations	GDAR / GDF

## LULUCF Training and Assistance needs

### Overall issues

Regarding the entire LULUCF sector, some cross-cutting issues in deficiency of appropriate GHG reporting can be recognized.

As mentioned by the ERT, the legal forest definition and the land-cover data have not been adapted to provide a coherent land framework, due to non-harmonization of the two major sources of land-use category data, notably the legal forest land definition and the time series of CORINE land-cover information. In particular, activity data for the Inventory (e.g. different scales of data collection and different definitions of forest land) does not match. Moreover, LPIS land cover definitions, again based on remote sensing assessments, differ once more. This enhances the risk of potential omissions or double counting of land areas.

Furthermore, some confusion exists between several land-use categories, notably between forest land and grassland, as well as between grassland and annual crops in cropland. Most probably due to aforementioned non-harmonization, this confusion causes the large and unexplained discontinuities in land-use areas and consequently in the estimates (also recognized in the project TOR<sup>6</sup>). The extrapolation of land area data beyond 2006 is not explained in the NIR and Turkey was not able to demonstrate that the spatial integrity is maintained in the data set. Overall, the ERT's assessment of inventory submission found that the treatment of land information is not transparent and the reported information appears to be inconsistent, resulting in unreliable estimates in all land categories, especially in cropland and grassland.

There is a need for Turkey to clarify the description of land categories and check the integrity of the total land area over the entire time series. Critical input for this is the availability of aforementioned coherent and consistent land framework in order to produce a spatially consistent breakdown of land-use categories for the whole country, over time.

Cross-cutting for all land categories and residing under the responsibilities of the relevant agencies for adequate estimating emissions and removals, a thorough scientific assessment of estimation methods

<sup>6</sup> Turkey reported 22,682 million hectares in 2015, but the total land area is more than 78 million hectares. This means significant areas are missing including associated emissions and removals (source: LULUCF Project TOR).

needs to be made, and subsequently implementation thereof, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs in each pool.

Finally, as has been noted by the ERT and communicated to the LULUCF Core Group, in the NIR (2016) several mandatory categories are not estimated, i.e. reported as “NE”, “NA” or “NO”. This either indicates that no data is available, estimates are not relevant or possibly that capacity for estimating carbon stock changes for the respective land categories and sub-categories for the various pools is not present. The latter is the more appreciated as the responsible directorates indeed indicated gaps of knowledge in crucial areas to produce correct estimations and explain the trends in activity data (AD).

For each of the ministries involved in reporting on LULUCF sector emissions and removals an overview of requested training and assistance is made.

### **Training Needs DGEM**

As the beneficiary to the project, the General Directorate for Environmental Management, through the Department of Climate Change, has a coordinating role. It has no direct responsibility for the GHG reporting and as such does not require specific technical training. Nevertheless, the directorate and/or its sister directorate DGSP would participate in capacity building and appreciate assistance in the following fields (without set priority):

1. *EU harmonization and EU Directives*: Need to understand the current and forecasted EU regulations on LULUCF inventory, accountability and reporting, and promote harmonization of current inventory practices.
2. *Correct data collection and integrity of data*: enhancing (procedures of) data collection to increase data quality, avoid data-loss, and enhance National GHG Reporting on the LULUCF sector.
3. *Spatial data analysis*: participate in introductory training in the use of spatial datasets (e.g. CORINE, Sentinel 1 and 2, GokTurk1), and spatial data analysis through GIS systems.
4. *Collective data needs*: assistance support through an external consultant in identification of collective data needs of the relevant and participating departments/directorates.
5. *Activity Data and Emission Factors*: identify the main needs and gaps in terms of AD and EF by comparing the existing data with the EU regulations.
6. *Working with LULUCF (sub-) categories*: determining the actual total land area and area per (sub) category.
7. *Experience sharing*: international sharing of Best Practices in LULUCF and GHG Inventory

### **Training Needs GDF**

As mentioned in the report on Activity1.2, within the regional structure of GDF, there are qualified and well trained staff available, with a background and experience in field data collection. However, it is noted that the directorate is in need of some specific training. The directorate seems to find it difficult to work with specific equations and algorithms. In particular related to carbon tracking in the living biomass and dead organic matter pools, which suggest that there may be incomplete carbon tracking and that removals in forest land are perhaps overestimated due to the failure to incorporate the impact on biomass carbon stocks of all human and natural disturbances, including illegal harvesting. Such has also been recognized and recommended upon by the ERT.

Besides other needs mentioned, the directorate in particular mentioned that it has difficulties in adequately recognizing land categories and land use changes. For the latter, it has no good data on emissions and removals since 1990 of the important changes that occurred in forest management practices (lacking information on historical trends).

Summarized, specific training requirements of GDF and other directorates within MoFWA (i.e. DGSHW and DGDEC) can be listed as (with relative prioritization from highest to lowest):

1. *Activity Data and Emission Factors*: improved modelling, calculations and use of algorithms for carbon stock changes in carbon pools, and overall emissions and removals. E.g.:
  - a. understanding the role of AD, resulting in improved estimates or calculations for carbon and carbon stock changes in the different carbon pools and under land use changes (conversion of land from one category to another);
  - b. calculations of above- and below-ground carbon sinks and sources, for all land categories and sub-categories, and conversions of land use and for biomass increments and carbon fraction assessment, soil organic matter, and litter/deadwood;

- c. determining human influence for land categories resulting in carbon removals and/or emissions, with focus on peatlands and wetlands.
2. *Spatial data analysis*: training on CORINE and LPIS, i.e. on
  - a. common understanding of basic processes of CORINE and LPIS (interpretation and processing);
  - b. characterization of land and (historical) land use through spatial changes in land use. Moving from (currently) assumptions on historical land use change to calculation of conversion of FL to other land categories based on satellite information from Envanis. Related to Activity 4.2 *Implementation of satellite-based land monitoring system for Turkey*;
  - c. harmonization and integration of satellite-based information with land-based information ("ground-truthing"). An anticipated 3-day training would include input from European Expert to assess datasets and recommend on methodology how to integrate satellite information with land-based information.
3. *Land use change matrices and Land use / land use change monitoring system*: preparing land use change matrices for historical time-series, and develop a land use and land use change monitoring system for Turkey; related to Activity 4.2.
4. *LULUCF (sub-) categories*: determining key land categories with good calculations of total land area and area per (sub-) category.
5. *Carbon fluxes in the forest area*: Estimation/calculations of carbon stocks and carbon emissions from HWP.
6. *Calculation of emissions and removals*: quantification of carbon stocks and fluxes of CO<sub>2</sub>, (CH<sub>4</sub>), and (N<sub>2</sub>O), specifically for wetlands and land converted to forest.
7. *Grassland inventory*: collecting specific data for grassland inventory (methodology) and determining the actual total land area and per grassland (sub-)category.
8. *Land use management practices*: overall LULUCF training and understanding of good Land Use Management with emphasis on how land use management practices affect carbon stocks and GHG emissions and removals. Attention to be provided to the impact of disturbances on carbon stocks and GHG emissions and removals, to prepare a disturbance matrix, and the effect and impact of logging and necessary counter-measures.
9. *Uncertainty calculations*: a better understanding of the estimation methods used for forest land, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs for each pool.
10. *Soil classification and soil maps*: basic training in general soil-science with focus on soil-carbon content and carbon fluxes, connecting soil information/classification to soil-characteristics, and relating this to carbon sinks and emissions.
11. *Basic training in grass-cover / cropland characteristics*: understanding the relationship of forest land activities to land use change (e.g. FL–GL and FL-CL).
12. *Monitoring & Evaluation of GHG development in Turkey*: estimation and calculation of carbon stocks and removals/emissions associated with LULUCF activities, with trend analysis and forecasting. This could come in the form of technical assistance.
13. *Improvement of overall GHG reporting skills*: emphasis on consistency and accuracy (training elements from the above) with adequate QA/QC procedures.

### **Training Needs GDAR**

Feedback on the consolidated preliminary table in Annex 3, and personal communication from the meeting with the directorate, show that GDAR more or less has similar training requirements as GDF, although with a slight different priority. Requested capacity building and assistance for GDAR focusses on (priority from highest to lowest):

1. *Spatial data analysis*: training on CORINE and LPIS, with focus on
  - a. common understanding of basic processes of CORINE and LPIS (interpretation and processing);
  - b. harmonization and integration of satellite-based information with land-based information ("ground-truthing") from ENVANIS.
2. *Land use change matrices and Land use / land use change monitoring system*: preparing land use change matrices for historical time-series, and develop a land use and land use change monitoring system for Turkey; related to Activity 4.2. High priority!
3. *LULUCF (sub-) categories*: determining key land categories with good calculations of total land area and area per (sub-) category.

4. *Land use management practices*: overall LULUCF training and understanding of good Land Use Management with emphasis on how land use management practices affect carbon stocks and GHG emissions and removals in different land categories and sub-categories. Attention to be provided to the impact of disturbances on carbon stocks and GHG emissions and removals.
5. *Activity Data and Emission Factors*: improved modelling, calculations and use of algorithms for carbon stock changes in carbon pools, and overall emissions and removals. E.g.:
  - a. identification of AD and understanding its role, in order to determine land use and land use change in LULUCF sector, resulting in improved estimates or calculations for carbon and carbon stock changes in the different carbon pools and under land use changes (conversion of land from one category to another). AD should be clarified and focused on the situation in Turkey;
  - b. greenhouse gas emission and sink calculations for sub-sectors (cropland, grassland, wetland, settlements and other lands);
  - c. improved common understanding of AD and the implementation in algorithms. To enhance exchange of knowledge between different departments and directorates within MoFAL.
6. *Grassland inventory*: collecting specific data for grassland inventory (methodology) and determining the actual total land area and per grassland (sub-)category.
7. *Improvement of overall GHG reporting skills*: training to the Core Group members for the writing and preparation of the National Greenhouse Gas Emission Inventory.

## CONCLUSIONS AND RECOMMENDATIONS

Desk analysis of available (project) reports and documentation, personal analysis supplemented by feedback obtained during personal meetings with the respective agencies (departments and directorates), and on feedback from the expert review team's (ERT's) assessment of the 2016 inventory submission against the UNFCCC review guidelines, all showed a need for capacity building and support to improve the Greenhouse Gases (GHG) Inventory in the LULUCF sector in Turkey.

Despite specific training needs on departmental and directorate level, there are some relevant cross-cutting capacity building and training needs that serve improvement on the reporting for the entire LULUCF sector. Basically priority setting boils down to having good quality datasets available to determine the key land categories for Turkey, monitor and report on land use and land use changes (e.g. historical data sets on the conversion of land), and the need for enhanced capacity to assess and use national activity data and emission factors for adequate calculating emissions and/or removals from LULUCF activities.

### Conclusions

With the Ministry of Environment and Urbanisation (MoEU) as the coordinator agency, the Department of Climate Change (DCC) under the DG Environmental Management (DGEM) of the MoEU the competent body with strong technical expertise and dedicated staff, climate governance in Turkey is well organized. It is DGEM that coordinates with other institutions in taking the necessary measures to combat global climate change and implement climate change policies, strategies and plans. For the LULUCF sector it is guiding the two line ministries (MoFWA and MoFAL) in preparing the baseline calculations for the 6 land categories, while it cooperates with Turkstat to compile the data in preparation of the National Inventory Report. As such, the current institutional arrangements for Turkish Greenhouse Gases reporting work to the satisfaction of all involved for over a decade.

Regarding the underlying data and information for the NIR, however, some flaws and deficiencies have been noticed. Overall improvements in *activity data* (AD), enhanced capacity regarding the *use and integration of spatial datasets*, and stronger capacity in *modelling and calculations of carbon stock and carbon change* for all land use categories and sub-categories have been found a priority.

Regarding the first, while *emission factors* to some extent can be taken from international databases, this is not the case for *activity data*, which have to be collected based on information from the country<sup>7</sup>. This involves common understanding of AD and the effective implementation in algorithms, using equations for the respective tiers Turkey is reporting on. Also, and due to limited knowledge and consequently use of activity data, currently there are difficulties to properly determine land use and

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<sup>7</sup> LULUCF Project TOR

land use change in LULUCF sector, resulting in flawed estimates or calculations for carbon and carbon stock changes in the different carbon pools and under land use changes..

Concerning availability of good quality datasets, all stakeholders involved in GHG Inventory believe it pertinent to have improved capacity regarding the use and integration of spatial datasets, in particular satellite-based and land-based information. Such integration and harmonization of data, currently available in different formats (scale, resolution, quality, etc.), will allow the preparation of a critical consistent land use change matrix with information on historical and current conversions of land categories and sub-categories.

With respect to modelling and calculations on carbon stock and carbon change, particular focus needs to be on greenhouse gas emission and sink calculations for sub-sectors in all of the 6 land categories. As it concerns the entire LULUCF sector, one training session for all relevant directorates for the responsible ministries would be required.

Besides these three main deficiencies currently obstructing internationally valued GHG reporting, a number of other training and assistance needs have been identified, consolidated and integrated into a comprehensive training approach, listed in Table 2 and 3 of the next section, under.

### Recommendations

The training subjects identified and recommended are inputs to the training programme to be developed under Activity 2.2. supporting the GHG Inventory in the LULUCF sector in Turkey, and are listed in Table 2.

The training subjects identified are in line with the generic training areas listed in the Inception Report<sup>8</sup> and are listed according by order of priority. Priority is based on personal analysis and feedback provided by the different agencies. For each subject a more detailed description of anticipated training ingredients is provided, together with the target group and the type of training to be given, either Mentor style (on-the-job training) or Workgroup style, depending on the actual audience. Direct training allows focussed capacity building on a particular subject and adheres to the specific demand of the department or directorate, while workshops will increase the overall knowledge of the LULUCF Core Group on various subjects of the inventory process.

Table 3 lists additional support to the agencies.

**Table 2 - Consolidated training needs to improve GHG inventory for LULUCF in Turkey**

Training subject	Details	Target Group / Agency	Format	Priority
<b>GENERAL METHODOLOGIES AND APPROACH TOWARDS NATIONAL GHG INVENTORY</b>				
<b>LULUCF inventory assessment training</b>				
<i>Selecting Activity Data and Emission Factors</i>	Generic training in identification, use and development of AD and EF. Training elements: (i) improved common understanding of AD and the implementation in algorithms, resulting in enhanced understanding and exchange of information and knowledge between different departments and directorates within the ministries (ii) identification and further enhancement of AD and EF for different land categories in Turkey (iii) understanding the role of AD in order to determine land use and land use change in LULUCF sector, resulting in improved estimates or calculations for carbon and carbon stock changes in the different carbon pools and under land use changes (conversion of land from one category to another) (iv) Identification of main needs and gaps by comparing	Core Group	High	Workshop

<sup>8</sup> Inception Report for Technical Assistance for Developed Analytical Basis for Land Use, Land Use Change and Forestry (LULUCF) Sector

	the existing data with the EU regulations			
<i>Working with LULUCF (sub-) categories</i>	Understanding the process of defining land categories and sub-categories, and determining the key land categories with good calculations of total land area and area per (sub-) category in Turkey	Core Group	High to Moderately High	Workshop
<i>Land use management practices</i>	LULUCF training and understanding of good Land Use Management with emphasis on how land use management practices affect carbon stocks and GHG emissions and removals in different land categories and sub-categories. Attention to be provided to the impact of disturbances on carbon stocks and GHG emissions and removals, and the effect and impact of logging and necessary counter-measures.	Core Group	Moderately High	Workshop
<i>Grass-cover / cropland characteristics</i>	Basic understanding of the relationship of forest land activities with land use change to other land categories (e.g. FL–GL and FL–CL).	Core Group	Moderately High	Workshop
<i>EU harmonization and EU Directives</i>	Understanding of current and forecasted EU legislation and regulations on LULUCF inventory, accountability and reporting, improvement of the reporting process (i.e. recover the gaps in the inventory process) and promote harmonization of current inventory practices	Core Group	Moderately High	Workshop
<i>Impact of disturbances on C stocks and GHG emissions</i>	Understanding the uncontrolled impacts on land use and GHG emissions resulting thereof. Elements: (i) Understanding and managing uncontrolled deforestation and logging, both legal and illegal (ii) Fire, pests and other uncontrolled impacts on grass- and cropland (iii) preparing a disturbance matrix	Core Group	Low to Moderately High	Workshop
<b>Methodologies for assessing C stocks, CSC and emissions and removals of GHG for land use categories</b>				
<i>Soil classification and soil maps</i>	Training in general soil-science with focus on soil-carbon content and carbon fluxes, connecting soil information/classification to soil-characteristics, and relating this to carbon sinks and emissions.	GDF GDAR	High to Moderately High	Mentoring
<i>Grassland inventory</i>	Solving the miss-match between responsible directorates by defining common definition of grassland (type and condition) and application to inventory and data sets. Focus on (i) collecting specific data for grassland inventory (methodology) (ii) determining the actual total land area and per grassland (sub-)category	GDAR GDF	Moderately High	Mentoring
<i>Monitoring &amp; Evaluation of GHG development in Turkey</i>	Moving up higher inventory reporting tiers using national and spatially-related data improving accuracy of estimation and calculation of carbon stocks and removals/emissions associated with LULUCF activities. Inclusive of trend analysis and forecasting.	Core Group	Moderately High	Workshop
<i>Data collection and integrity</i>	Enhancing (procedures of) data collection to increase data quality, avoid data-loss, and enhance National GHG Reporting on the LULUCF sector. Elements include: (i) Relevance of data integrity and data harmonization (ii) Basics of database management (iii) Data availability and -exchange (iv) Data quality and integrity as part of QA/QC (v) Relationship data quality and consistency in NIR	Core Group	Low to Moderately High	Workshop
<b>Representation of land areas and methodologies for spatially explicit land identification including existing available systems used in Turkey</b>				
<i>Spatial data analysis</i>	Estimation of land cover and land categories, and monitoring land use change through (i) Common understanding of satellite-based information sources (e.g. CORINE, Sentinel 1 and 2,	Core Group	High	Workshop

	<p>GokTurk1) and land-based data sources (e.g. LPIS); focus on interpretation and processing</p> <p>(ii) Understanding and enabling analysis of land use change and calculation of conversion of land from one category to the other. Training elements include categorization of land (land use and land units) and (historical) land use change using satellite-based information</p> <p>(iii) Harmonization and integration of satellite-based information with land-based information (e.g. ENVANIS), while enhancing consistency by comparing the land cover map with LPIS database</p>			
<b>GHG Reporting skills</b>				
<i>Overall GHG reporting skills</i>	<p>Improving the consistency and accuracy (training elements from the above) for the writing and preparation of the National Greenhouse Gas Emission Inventory using adequate QA/QC procedures. The training includes:</p> <p>(i) Relevance of Transparency, Accuracy, Completeness, Comparability and Consistency (TACCC)</p> <p>(ii) Role of good QA/QC procedures and uncertainty assessment</p> <p>(iii) Use of notation keys and entries in the CRF tables (e.g. reported as "NE", "NA" or "NO")</p> <p>(iv) Relationship of annual inventory reporting (NIR) and other reporting obligations of Annex 1 countries, i.e. BUR and NC</p>	Core Group	Moderately High	Workshop
<b>TECHNICAL CAPACITY TO PREPARE GOOD QUALITY NATIONAL GHG INVENTORY</b>				
<b>Modelling and development of scenarios for LULUCF and HWP calculations</b>				
<i>Land use change matrices and LULUCF monitoring system</i>	<p>Preparing a consistent land use change matrix for historical time-series by merging the relevant datasets (e.g. from satellite- and land-based information), and develop a land use and land use change monitoring system for Turkey; related to Activity 4.2.</p>	Core Group	High	Workshop
<i>Improving GHG calculations -1</i>	<p>Common understanding of modelling, calculations and use of algorithms for carbon stock changes in carbon pools, and overall emissions and removals. E.g.:</p> <p>(i) estimation of GHG emissions/removals which take place from changes in land use, and the amount of carbon sequestered in soil, dead wood, wetlands and grasslands</p> <p>(ii) overview of adequately determining above- and below-ground carbon sinks and sources, for all land categories and sub-categories, and conversions of land use</p> <p>(iii) greenhouse gas emission and sink calculations for all (sub-)sectors</p> <p>(iv) using appropriate activity data and emission factors in GHG calculations for all land categories</p> <p>(v) analysis and further enhancement of EF used</p> <p>(vi) Adequate use of algorithms for assessing GHG for all land categories and all 5 pools for Tier 2 and Tier 3</p>	Core Group	High	Workshop
<i>Improving GHG calculations -2</i>	<p>Improved modelling, calculations and use of algorithms for carbon stock changes in carbon pools, and overall emissions and removals. E.g.:</p> <p>(i) calculations of above- and below-ground carbon sinks and sources, for forest land (FL), and conversions of land use and for biomass increments (e.g. volume/DBH to biomass equations)</p> <p>(ii) calculations for soil carbon stock changes for climate</p>	GDF	High	Mentoring

	(ecozone) and various soil types, including carbon fraction (CF) assessment, soil organic matter, and litter/deadwood (iii) greenhouse gas emission and sink calculations for relevant sub-sectors, i.e. CF and EF for peatlands (iv) using appropriate activity data and emission factors in GHG calculations for FL land category, but with particular focus on AD for wetlands and peatlands (v) carbon fluxes in the forest area looking at estimation/calculations of carbon stocks and carbon emissions from HWP			
<i>Improving GHG calculations -3</i>	Improved modelling, calculations and use of algorithms for carbon stock changes in carbon pools, and overall emissions and removals. E.g.:  (i) calculations of above- and below-ground carbon sinks and sources, for all land use categories and sub-categories (including Forestry), and subsequent land use conversions (ii) modelling and calculations related to carbon fraction (CF) assessment (i.e. for perennial croplands), flux measurements, soil carbon stock changes (incl. soil organic matter), and for biomass increments in all land use categories (iii) greenhouse gas emission and sink calculations for sub-sectors (cropland, grassland, wetland, settlements and other lands (iv) using appropriate activity data and emission factors in GHG calculations for all land categories	GDAR	High	Mentoring
<b>QA/QC procedures, uncertainty assessments and key category analysis</b>				
<i>Uncertainty calculations</i>	Developing a better understanding of the estimation methods used for forest land, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs for each pool, improving overall accuracy and consistency of NIR.	Core Group	High to Moderately High	Workshop
<i>Key category analysis</i>	Understanding and enabling appropriate key category analysis (level and trend) for the LULUCF sector in Turkey, including effective disaggregation subcategories. Training includes determining the Key Category for Land Use, based on appropriate choice of AD and EF and subsequent calculation of emissions/removal.	Core Group	High to Moderately High	Workshop
<i>QA/QC procedures</i>	Understanding the role of and need for quality assurance and quality control for internationally accepted GHG reporting. Training elements include: (i) quality and consistency of data and information (ii) sources of error (e.g. sampling; assessment; classification; modelling) and error propagation (iii) how to execute quality control checks (iv) the role of internal and external expert (peer) review (v) reporting on procedures of QA/QC in NIR	GDF GDAR	Moderately High	Mentoring

**Table 3 - Consolidated assistance needs to improve GHG inventory for LULUCF in Turkey**

<b>Subject</b>	<b>Details of assistance</b>	<b>Agency</b>	<b>Priority</b>
<i>Data inventory</i>	Gap analysis of spatial and non-spatial data stored in different data-sets (satellite-based and land based), available in various levels of scale and quality, and advise on harmonisation process	GDF GDAR	Moderately high
<i>National Forest Inventory</i>	How to use NFI in relationship to Forest Management plans supporting GHG Inventory for Turkey. Includes the selection and use of appropriate algorithms and subsequent calculations of	GDF	Low to Moderately

	carbonstock and carbonstock changes		High
<i>Experience sharing</i>	International sharing of Best Practices in LULUCF and GHG Inventory	Core Group	Low to Moderately high

## Annex 1 People met

Date	Name	Title	Organisation
25 April 2018	Prof. Dr. Yusuf Serengil	Team Leader - Technical Assistance for Developed Analytical Basis for Land Use, Land Use Change and Forestry (LULUCF) Sector	AESA
	Ms Neslihan Ağartan	Environmental and Urbanization Expert	Ministry of Environment and Urbanisation, Department of Climate Change
	Ms Hilal Samray Çelik	EU Expert	Ministry of Food, Agriculture and Livestock, General Directorate of European Union and Foreign Affairs
	Ms Nurdan Buğday	Agricultural Engineer	Ministry of Food, Agriculture and Livestock
26 April 2018	Mr Ümit Turhan	Division Director	Ministry of Forestry and Water Affairs, Directorate of External Relations, Education and Research
	Mr Eray Ozdemir	Expert	Ministry of Forestry and Water Affairs, Directorate of Forestry
	Mr Davut Atar	Expert	Ministry of Forestry and Water Affairs, Directorate of Forestry, Department of Forestry Management

## Annex 2 Harmonizing GHG Inventory with EU regulations<sup>9</sup>

EU's commitment under the Paris Agreement on climate change to reduce greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels. Current EU regulations stipulate that, up to 2020, EU Member States are committed under the Kyoto Protocol to ensure that greenhouse gas emissions from land use are compensated by an equivalent absorption of CO<sub>2</sub> made possible by additional action in the sector. The European Commission now aims to enshrine this principle (the so-called "no-debit rule") in EU law for the period 2021-2030, by incorporating land use and forestry into the EU's emission-reduction efforts for the first time.

### LULUCF

EU greenhouse gas emissions and removals from land use, land-use change and forestry (LULUCF) in the 2030 climate and energy framework, covering the 2021-2030 period, had not been previously included in the EU effort to fight greenhouse gas emissions. In December 2017 the European Parliament and Council reached a provisional agreement on this key legislative proposal for implementing the EU's 2030 climate objectives. The regulation on LULUCF will incorporate greenhouse gas emissions and removals related to agricultural land and forestry into the EU's climate framework from 2021. The new rules will enhance the role of land and forests as sinks of carbon and will incentivise their productive and sustainable use, enhancing the bio-based economy and climate-smart agriculture.

The proposal for LULUCF was presented by the Commission on 20 July 2016 as part of the "Driving Europe's transition to a low-carbon economy" package. It proposed binding greenhouse gas emission reductions for Member States for the 2021-2030 period (Effort Sharing Regulation) and as such set clear and fair guiding principles to Member States to prepare for the future and keep Europe competitive. This is part and parcel of the Energy Union and a forward-looking Climate Change policy.

The guiding principles form part of the EU's policy to drive Europe's transition to a modern and clean economy. In line with the Paris Agreement the proposal also points out the critical role of the land use sector in reaching our long-term climate mitigation objectives.

The proposal sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO<sub>2</sub> from the atmosphere through action in the sector, what is known as the "no debit rule." Although Member States undertook this commitment under the Kyoto Protocol up to 2020, the proposal enshrines the commitment in EU law for the period 2021-2030.

The new rules will provide Member States with a framework to incentivize more climate-friendly land use, without imposing new restrictions or red tape on individual actors. This will help farmers to develop climate-smart agriculture practices and support foresters through greater visibility for the climate benefits of wood products which can store carbon sequestered from the atmosphere.

Emissions of biomass used in energy will be recorded and counted towards each Member State's 2030 climate commitments. This addresses the broad criticism that emissions from biomass in energy production are not currently accounted for under EU law. As forest management is the main source of biomass for energy and wood production, more robust accounting rules and governance for forest management will provide a solid basis for Europe's future post-2020 renewables policy.

The Commission's proposal simplifies and upgrades the current accounting methodology under the Kyoto Protocol, and establishes a new EU governance process for monitoring how Member States calculate emissions and removals from actions in their forests and agricultural land use.

The proposal allows some flexibility for Member States. For instance, if a Member State has net emissions from land use and forestry, they can use allocations from the *Effort Sharing Regulation*<sup>10</sup> to

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<sup>9</sup> Adopted from (i) LULUCF in the EU - Land use and forestry proposal for 2021-2030 ([https://ec.europa.eu/clima/policies/forests/lulucf\\_en](https://ec.europa.eu/clima/policies/forests/lulucf_en)); and (ii) Press Release Database of the European Commission, 14 December 2017

satisfy its "no debit" commitment. They can also buy and sell net removals from and to other Member States. This encourages Member States to increase CO<sub>2</sub> removals beyond their own commitment.

### **Forestry<sup>11</sup>**

The strategy underlines that *forest-linked EU policies* should fully be taken into account in national forest policies.

Proper forest management can mitigate climate change if forests' role as sinks in the carbon cycle is maintained or enhanced and by providing bio-materials that can act as temporary carbon stores or as 'carbon substitutes', replacing carbon-intensive materials and fuels. The EU recently adopted rules for accounting, monitoring and reporting on LULUCF under which Member States will, for example, provide information on their plans for enhancing sinks and reducing forest-related emissions. The EU and Member States have also made LULUCF-related commitments to be achieved by 2020, the 2nd Commitment Period under the Kyoto Protocol.

Member States should demonstrate how they intend to increase their forests' mitigation potential through increased removals and reduced emissions, including by cascading use of wood, taking into account that the new LIFE+ subprogram for Climate action and Rural Development funding can promote and support new or existing forest management practices that limit emissions or increase net biological productivity (i.e. CO<sub>2</sub> removal). The deadline to do this was mid-2014 and in the context of their information on LULUCF actions.

#### **Main achievements of the new legislation:**

- Accounting rules to measure the carbon emissions and removals from cropland, grassland, managed forest land, afforested and deforested land and wetland, including possible updates to be fit for purpose under the Paris Agreement;
- A basic commitment for each Member State to comply with the 'no-debit' rule by ensuring that for each 5-year compliance period (2021-25, 2026-30), the amount of carbon absorbed in the LULUCF sector is at least equivalent to that emitted, in accordance with the accounting rules;
- The Regulation does not lay down any obligations for private parties, including farmers and foresters;
- A balanced package of flexibilities, to cope with the large variety of national circumstances. Most notably, flexibility has been introduced by the Parliament and the Council on the accounting of forests for Member States where these represent an important carbon sink. To ensure that the integrity of the non-ETS sector target of at least 30% emission reductions is upheld, this 'Managed Forest Land' flexibility mechanism will only be activated if the EU collectively meets the 'no-debit' rule.

#### **Next steps (April 2018)**

The provisional agreement (reached in 'trilogue' negotiations between the Parliament, Council and Commission) must now be formally approved by the European Parliament and Council of Ministers. Following approval, the regulation will be published in the EU's Official Journal and enter into force 20 days later.

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<sup>10</sup> Critics argue that the proposed *Effort Sharing Regulation* makes proposals for setting national binding emission reduction targets for greenhouse gases for the sectors outside the EU ETS and on LULUCF, without indicating how these could be met in the most cost-efficient way.

<sup>11</sup> A new EU Forest Strategy: for forests and the forest-based sector, Brussels, 20.9.2013, COM(2013) 659 final

## Annex 3 Consolidated Preliminary Training and Assistance Needs assessment for Turkey's LULUCF GHG Inventory

Priority classes: 1 = Very High; 2 = High to Very High; 3 = High; 4 = Moderately High; 5 = Low to Moderately High

Category	Subject of T or A	Description	Training / Assistance	Ministry / Dept.	Priority	Comments (from GDF / GDAR)
<b>General</b>	Understanding of LULUCF procedures and requirements	- Improved understanding of content matter through adequate mastering of language, i.e. technical English	T/A	GDAR	-	This is the responsibility of the respective ministry or directorates
	EU regulations (accession and harmonization of data)	- Need to understand the current and forecasted EU regulations on LULUCF inventory accountability and reporting	T	GDF / GDAR / DGEM	2	Including regulations on FRL and FREL
<b>Data collection</b>	Collaboration between data-custodians (owners)	- Easy and unrestricted/open data access, sharing and exchange between ministries and departments	A	GDF / GDAR	4	
	National Forest Inventory	- Need of completion (complete coverage) - Definition of Forest (following FAO guidelines) and application to inventory and data sets - Harmonization and integration of satellite-based (Corine) information with land-based information (=ground-truthing); Int'l Expert to assess datasets and recommend on methodology - Use of NFI data in LULUCF and relationship to Forest Management Plans	A T/A  T/A  T/A	GDF GDF  GDF / GDAR  GDF	1 3  1  3	
	Grassland inventory	- Solving the miss-match between responsible directorates by defining common definition of Grassland (type and condition) and application to inventory and data sets	A/T	GDAR / GDF	2	How can GDAR be assisted with collecting grassland inventory datas?
	LULUCF (sub-) categories	- Determining the actual total land area and per (sub-category)	T/A	GDF / GDAR	1	DGSHW, DGDEC, and DGSP need to be included in the training
	Land identification and assessment	- Determining land use and land use change through:	T	GDF / GDAR		

		<ul style="list-style-type: none"> <li>○ the use of appropriate models and methodologies</li> <li>○ targeted <i>technical training</i> on spatial and non-spatial tools (e.g. RS/IP; GIS, Excel)</li> <li>○ good understanding of AD and EF</li> </ul>			2	
	Carbon fluxes in the forest area, i.e. calculations on Harvested Wood Products (HWP)	- Estimation/calculations of carbon stocks and carbon emissions from HWP, and appropriate use of Tier 2 formula (2006 IPCC Guidelines)	T	GDF	2	
<b>Data management and analysis</b>	Relational database sets	- Improve quality, availability and exchange of datasets through <ul style="list-style-type: none"> <li>○ Overall training in DBMS to allow, improve and support the consistency and exchange of data between inter-departmental platforms and to improve QA/QC i.e. ORBIS (within GDF), MERBIS</li> </ul>	T	GDF / GDAR	3	
	Spatial analysis	- Estimation of land cover and land categories, and monitoring land use change through <ul style="list-style-type: none"> <li>○ Common understanding of basic processes of CORINE and LPIS (interpretation and processing)</li> <li>○ Use of ENVANIS</li> <li>○ Integration of ENVANIS, CORINE and LPIS to harmonize the datasets</li> <li>○ Advanced spatial analysis by using data from RS/IP sources (Sentinel ½; GokTurk1; etc.) to estimate spatially-explicit land change.</li> </ul>	T	GDF / GDAR	3	Necessary to enable appropriate merging of data of variable sources to the Land Use Matrix
				GDF	4	
				GDF / GDAR	1	
				GDAR	2	
		- Use of LIDAR Terrain Scanner for SFM plans, inventory and data collection as input for data analysis	T	GDF / GDAR	4	
	Statistical calculations	- Uncertainty assessment	T	GDF / GDAR	2	
		- Use of algorithms for assessing GHG for all land categories and all 5 pools for Tier 2 + Tier 3	T/A	GDF / GDAR	2	
<b>GHG inventory</b>	Land use management practices	- Overall LULUCF training with emphasis on <ul style="list-style-type: none"> <li>○ how land use management practices affect</li> </ul>	T	GDF / GDAR	1	

		<ul style="list-style-type: none"> <li>carbon stocks and GHG emissions and removals</li> <li>o impact of disturbances on carbon stocks and GHG emissions and removals; focus on logging and to prepare disturbance matrix</li> </ul> <p>- Understanding of good Land Use Management, i.e.</p> <ul style="list-style-type: none"> <li>o conservation agriculture</li> <li>o rangeland management &amp; rehabilitation</li> <li>o forest management &amp; rehabilitation</li> <li>o land preparation</li> <li>o wetland management</li> </ul>		GDF / GDAR	1	
	Determining human influence on land categories resulting in carbon removals and/or emissions	<ul style="list-style-type: none"> <li>- Determining applicable and appropriate national activity data (AD) for land categories in Turkey, i.e. assessing AD for <ul style="list-style-type: none"> <li>o Peatlands/wetlands</li> <li>o croplands</li> <li>o grasslands</li> </ul> </li> <li>- Determining AD for the conversion of land</li> </ul>	T	GDF / GDAR	1	
	The use of activity data (AD) in modelling and calculations	<ul style="list-style-type: none"> <li>- Understanding the role of AD in carbon stock changes in the different carbon pools</li> </ul>	T	GDF	2	
	Calculation of carbon change due to land conversion	<ul style="list-style-type: none"> <li>- Spatial changes in land use, e.g. <ul style="list-style-type: none"> <li>o Calculation of Forest Land to other land use categories (CL, GL, S, O)</li> <li>o Calculation of Crop Land to other land use categories</li> <li>o Calculation of Grass Land to other land use categories</li> </ul> </li> </ul>	T	GDF / GDAR	2	Based on historical data, trends, etc.
	Determining the Key Category for Land Use, based on calculation of emissions/removals using AD / EF	<ul style="list-style-type: none"> <li>- Choice of method for T1 and T2</li> <li>- Choice of activity data</li> <li>- Choice of emission/removal factors</li> <li>- Uncertainty assessment</li> </ul>	T / A	GDF / GDAR	2	
	Using uniform national forestry data in LULUCF calculations	<ul style="list-style-type: none"> <li>- Determining and using appropriate algorithms to use forest data in calculations establishing carbon stocks and translation in to CO2 emissions</li> </ul>	T	GDF	2	

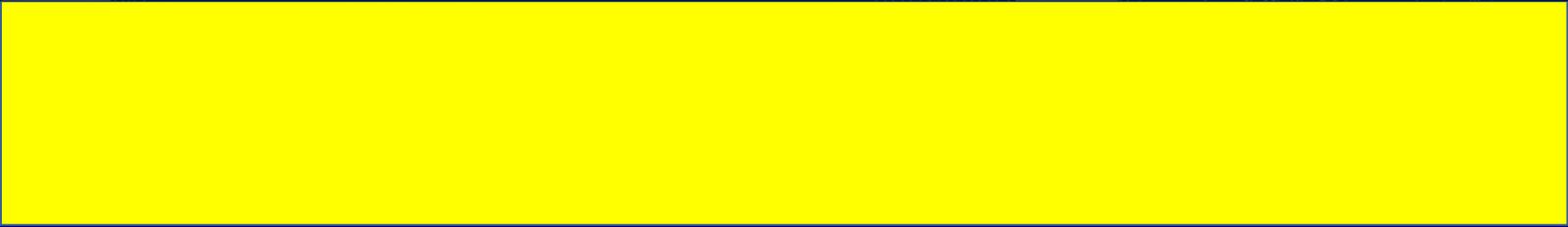
	Understanding of soils, i.e. different soil types and soil characteristics in relationship to carbon sinks and emissions	<ul style="list-style-type: none"> <li>- Common understanding of what soils are in Turkey, with emphasis on: <ul style="list-style-type: none"> <li>o Soil types and geographic spread</li> <li>o Main soil characteristics (physical and chemical processes)</li> <li>o Focus on carbon fluxes, i.e. storage and exchange/emissions</li> </ul> </li> </ul>	T	GDF / GDAR	2	
	Modelling and calculation of carbon stock <i>changes</i>	<ul style="list-style-type: none"> <li>- Improved understanding and knowledge of modelling under Tier 1 and Tier 2</li> <li>- Improved understanding of process-oriented modelling</li> <li>- Calculation of above- and below-ground carbon sinks and sources, for all land categories and sub-categories, and conversions of land use and for the following pools: <ul style="list-style-type: none"> <li>o Biomass increments and carbon fraction assessment</li> <li>o Soil organic matter <ul style="list-style-type: none"> <li>▪ Climate (eco) zones</li> <li>▪ Soil types</li> </ul> </li> <li>o Litter/deadwood</li> </ul> </li> </ul>	T	GDF / GDAR	1 2 1	
	Calculation of <i>emissions / removals</i>	<ul style="list-style-type: none"> <li>- Quantification of carbon stocks and fluxes of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), specifically to calculate emissions / removals for: <ul style="list-style-type: none"> <li>o Wetlands: All gases</li> <li>o Grassland: CO<sub>2</sub></li> <li>o Cropland: CH<sub>4</sub></li> <li>o Forestland (i.e. land converted to Forest): CH<sub>4</sub>, N<sub>2</sub>O</li> <li>o Settlements: CO<sub>2</sub></li> <li>o Other land: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O</li> </ul> </li> </ul>	T	GDF / GDAR	2	
	Monitoring & Evaluation of GHG development in Turkey	<ul style="list-style-type: none"> <li>- Estimation and calculation of carbon stocks and removals/emissions associated with LULUCF activities, with trend analysis and forecasting. Use of appropriate models</li> </ul>	T/A	GDF / GDAR	1	

	Best Practices	- Share and build upon best (international) practices on data collection and analysis	A	GDF / GDAR	2	
<b>Reporting</b>	Improve overall GHG reporting skills	- Improve overall GHG reporting skills for NIR and forward look to NC, NDC and BR, with emphasis on: <ul style="list-style-type: none"> <li>o Consistency</li> <li>o Transparency</li> <li>o Quality Assessment (QA)</li> <li>o Quality Control (QC)</li> <li>o (use of) 2006 IPCC Guidelines</li> </ul>	T	GDF / GDAR / Turkstat	2	
	Anticipate EU guidelines and reporting requirements after EU Accession	- Harmonization with EU experience and practices	A/T	GDF / GDAR / DGEM / Turkstat	2	

## Annex 4 ARR findings and recommendations compared to generic IPCC Guidelines

TACCC principles	2006 IPCC Guidelines	ARR findings of Turkish 2016 NIR	ARR recommendations
<b>Completeness</b> 1. Recalculations  2. QA/QC	<ul style="list-style-type: none"> <li>- All sources/sinks and gases included in the IPCC Guidelines</li> <li>- Other existing specific source/sink categories</li> <li>- Full geographic coverage of sources/sinks of a Party</li> </ul> <p>It is <i>good practice</i> that all losses from biomass carbon pools that result in transfers to dead organic matter pools are first accounted as changes to biomass carbon stocks.</p> <p>Consistent accounting over time of land areas included in biomass and soil C missions and removals inventory requires that activity data for all land-use categories be stratified by a common definition of climate and soil types.</p>	<p>Estimate or calculations for carbon stock and carbon stock changes under land use changes are incomplete or not reported.</p> <ul style="list-style-type: none"> <li>- CSC in mineral soils for CL-FL and GL-FL not reported</li> <li>- CSC in mineral soils for GL is reported as NE</li> <li>- CSC in organic soils for FL-GL is reported as NE</li> <li>- CSC in mineral soils for WL-GL is reported as NE</li> <li>- CL-SL and GL-SL for organic soils NE</li> <li>- FL-SL is reported as NO</li> <li>- FL-OL reported as NO</li> <li>- CL-OL reported as NE</li> <li>- Direct N<sub>2</sub>O emissions from N mineralisation's due to Organic matter gain/loss was reported NE for GL-CL conversions. Other conversions were reported as NO.</li> </ul>	<p>Include detailed information on the performed recalculations in the specific NIR chapters and relevant CRF tables and provide explanatory information, including the rationale for the recalculations</p>
	<p>It is <i>good practice</i> to supplement the general QA/QC related to data processing, handling, and reporting and documenting, with source-specific category procedures.</p> <p>The basis for the estimates must be reviewed and described as part of the QC process. Documentation is a crucial component of the review process because it enables reviewers to identify inaccuracy, gaps and suggest improvements.</p> <p>Area totals should be summed across all land-use categories to ensure that total area involved in the inventory and its stratification across climate and soil types remains constant over time</p>		<p>Implement the QA/QC procedures envisaged in the QA/QC plan, strengthening the quality of the reporting, paying particular attention to the general and specific QC procedures of the inventory; and fully implement the recommendations related to QA/QC procedures made in previous review reports, such as:</p> <ol style="list-style-type: none"> <li>1) Improvement of the QC procedures at all stages of inventory preparation</li> <li>2) Implementation of sector-specific QA/QC procedures</li> </ol>
<b>Institutional arrangements</b>	(no guidelines on Institutional arrangement)	<p>Integration of land-use data remains an unsolved question. There is still a need to improve the coherence of the LULUCF chapter</p>	<p>There is a disconnection between the components prepared by the two Ministries. Turkey needs to strengthen its institutional arrangements to improve the inventory preparation process, specifically the integration of the data and information in the LULUCF sector and the preparation of a more coherent and transparent LULUCF chapter of the NIR, in accordance with the outline contained in the UNFCCC reporting guidelines. Therefore, strengthen the institutional arrangements to improve the inventory preparation process, specifically</p>

			the integration of data and information for the LULUCF sector
<b>Transparency</b>	Assumptions and methodologies are clearly explained and documented to facilitate replication and assessment. A country should be able to provide supporting documentation to demonstrate meeting of the any of the other principles		Fully and transparently describe actions taken and decisions made during the inventory preparation process, as well as the expert judgment used for the selection of AD, EFs and methodologies
<b>Consistency</b>	<ul style="list-style-type: none"> <li>- Inventory must internally be consistent in all its elements with inventories from previous years;</li> <li>- Same methodologies for the base year and all subsequent years should be used</li> <li>- Consistent data sets should be available to estimate emissions and removals from sources/sinks</li> </ul>		Provide adequate and detailed descriptions of the key drivers for the emission trends in the country
<b>Accuracy</b>	<ul style="list-style-type: none"> <li>- Relative measure of the exactness of emission / removal estimates</li> <li>- Estimates must be systematically neither over nor under true emissions/removals, as far as can be judged according to the available data and information</li> <li>- Uncertainties must be reduced as far as practicable</li> <li>- Appropriate methodologies must be used, in accordance with IPCC guidelines</li> </ul>	Turkey has, in its 2015 and 2016 NIRs, improved the description of land categories, however, it did not provide complete reporting of land.	Clarify the description of Land Categories, check the integrity of the total land area over the entire time series and report on the findings
1. Land Categories			
2. Land Use consistency			
3. Uncertainty estimates			
		Turkey cannot produce consistent reporting of land-use because the two major data sources for land-use area, ENVANIS and CORINE, have not been integrated. The Party reported that the integration is included in its improvement plans	Using domestic data information, undertake the necessary work to develop an internally consistent land framework and harmonize the two major data sources in order to produce a spatially consistent breakdown of land-use categories for the whole country, over time, and report on progress.
		Too limited, only estimated for Forest Land Category Recalculations of estimates for forest land and uptake of CO2 in forest land required, as uptake in forest land is second most important key category in the NIR of Turkey	Use the results of the uncertainty analysis to prioritize improvements to the inventory. Conduct a thorough scientific assessment of the estimation methods used for forest land, ensuring a comprehensive and balanced approach to calculating carbon inputs and outputs for each pool, and revise the estimates if needed
<b>Comparability</b>	<ul style="list-style-type: none"> <li>- Estimates must be comparable among Parties</li> <li>- Methodologies and formats as agreed by COPs</li> <li>- Allocation of source/sink categories, according to the Revised 1996 IPCC Guidelines</li> </ul>	The proper use of quotation is still questionable. As Turkey, in most cases, did not provide any support for categorizing a category as "NO" or "NE", it is difficult to judge if the notation keys were used correctly	Consistently use the notation "NO" to report an activity that does not occur, and the notation "NE" to report an activity that occurs but the emissions are not estimated



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