MRV IN PRACTICE

EXPERIENCE IN TURKEY WITH DESIGNING AND IMPLEMENTING A SYSTEM FOR MONITORING, REPORTING AND VERIFICATION OF GHG EMISSIONS

CAPACITY DEVELOPMENT PROJECT FOR THE IMPLEMENTATION
OF A MONITORING, REPORTING AND VERIFICATION (MRV)
SYSTEM FOR GREENHOUSE GAS EMISSIONS IN TURKEY

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MRV in Practice:

Experience with designing and implementing a System for Monitoring, Reporting and Verification of stationary GHG emissions in Turkey

Reference icon:

For refering to the Regulation on GHG Emissions, Communique on Monitoring and Reporting GHG Emissions, Communique on Verification of GHG Emission Reports and Authorization of Verifiers, and other relevant documents for further information.

Figure icon:

For diagram and visual expressions related to explanations.

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For tables related to explanations.

Important note icon:

For drawing attention to important notes.

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1   Summary

Monitoring, Reporting and Verification (MRV) systems are used extensively in a number of carbon pricing mechanism and trading schemes worldwide. Besides, MRV provides information about emission sources and trends, allows tracking progress towards climate change-related targets and steer mitigation actions so that the targets can be achieved. It helps companies to increase their energy efficiency and reduce their emissions. For all applications, MRV systems are key elements to guarantee transparency, precision and comparability on climate change information.

The aim of this report is to present the experiences and lessons learnt during the establishment of a tailor-made MRV system for energy and industry sector related greenhouse gases in Turkey. As a best practice, it provides guidance to ministries, programme and system administrators and other actors in the field on how an effective MRV system can be designed and implemented.

The present report includes a brief description of the regulatory MRV framework in Turkey and the roles and responsibilities of the main MRV actors. The core is the presentation of the data management system (DMS) which has been developed from scratch and has become a highly valued tool by all users. The technical architecture as well as the functional components of the DMS are presented in detail. Furthermore, the capacity development measures which make the entire MRV system so successful are outlined.

2   Introduction

The project "MRV Capacity Development for Turkey" is supported by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as part of Germany's International Climate Initiative (IKI). The IKI is a key element of Germany's climate financing and its funding commitments.

The political partner of the project is the Turkish Ministry of Environment and Urbanization (MoEU). The four and a half-year's project is implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. On the Turkish side, the project is being implemented by the General Directorate of Environmental Management (GDEM) with the Climate Change Department as the operational counterpart.

The overarching project objective is to support Turkey - on basis of the existing MRV Regulation - in the establishment of an MRV system that provides a reliable and robust source of data to identify energy and industry sector GHG emissions.

The project targets five specific project objectives:

1. The Ministry of Environment and Urbanization of the Republic of Turkey collects information on and manages GHG emissions using a data management system.

2. Sector-specific MRV guidelines for emissions-producing branches of industry and additional legal frameworks for MRV are implemented.

3. Relevant actors take responsibility for the sectoral MRV system processes.

4. Contributions are made to policies on GHG mitigation measures, such as emissions trading systems.

5. Dissemination of experience on developing an MRV system to other countries.

The aim of this publication is to present the experiences and lessons learnt during the establishment of a MRV system for energy and industry sector greenhouse gases in Turkey. As a best practice, it provides guidance to ministries, programme and system administrators and other actors in the field on how an effective MRV system can be designed and implemented. There is no one-size-fits-all solution, however, this report outlines the successful process Turkey has implemented and supports countries to develop solutions in their decision making process.

3   Why MRV?

MRV systems are used extensively in a number of carbon pricing mechanism and trading schemes worldwide. In the carbon markets MRV plays a crucial role because well-functioning trading mechanisms require trust in the market. Carbon market participants want to have the assurance that a ton of reported GHGs in one country or system must be comparable to a ton GHGs reported in another system. "*A ton is a tone*" is the guiding principle. Stringent MRV contributes to trust since MRV requires high accuracy and comparability of approaches. Furthermore, third-party verification according to common principles and standards ensures high quality data.

Monitoring, Reporting and Verification (MRV) is a concept which allows tracking progress towards climate change-related targets and steer mitigation actions so that the targets can be achieved. MRV provides information about emission sources and trends, it helps e.g. companies to increase their energy efficiency and take decisions where to reduce their emissions. MRV systems are key elements to guarantee transparency, precision and comparability on climate change information.

With the Paris Agreement MRV is gaining further importance. For the first time common MRV requirements are set out and parties are requested to develop specific modalities and guidelines by 2018. They can bring in existing MRV processes under the UNFCCC and experiences made so far.

A robust MRV system is the backbone of every carbon pricing mechanism regardless if it is a carbon tax, a cap and trade system (EU ETS, China ETS) or a reduction certificate system (CDM, VER). With the decision to align the Turkish MRV to the EU ETS MRV, linking of both systems is an option for the future.

4   Regulatory MRV framework in Turkey

Turkey's National Climate Change Strategy and Climate Change Action Plan 2011 - 2013 (NCCAP) outlined important activities in emission relevant sectors by using climate policy instruments and by developing a monitoring, reporting and verification (MRV) system.

Already in 2004 Turkey ratified the United Nations Framework Convention on Climate Change (UNFCCC). As an Annex I party to UNFCCC, Turkey is required to develop annual inventories on emissions and removals of GHG not controlled by the Montreal Protocol using the Intergovernmental Panel on Climate Change (IPCC) Guidelines. Consequently, in 2006 the "National Greenhouse Gas Inventory of Turkey" was set up based on the provisions of 2006 IPCC Guidelines. The National GHG Inventory consists of the "National Inventory Report" (NIR) and the "Common Reporting Format" (CRF) tables in accordance with the UNFCCC reporting guidelines (24/CP.19). The NIR covers time series of emissions and removals from 1990 to latest inventory year.

The Ministry of Environment and Urbanization (MoEU) is the National Focal Point of the UNFCCC, and is responsible for climate change and air pollution policies and measures. Turkey established the Coordination Board on Climate Change (CBCC) in 2001 with the Prime Ministerial Circular no.2001/2 in order to determine the policies, measures and activities to be pursued by Turkey on climate change. Under the chairmanship of Minister of Environment and Urbanization, this board is composed of high level representatives (Undersecretary and President) from Ministries related to foreign relations, finance, economy, energy, transport, industry, agriculture, forestry, health, education, TurkStat, and NGOs from business sector. The CBCC was restructured in 2013, and renamed as Coordination Board on Climate Change and Air Management (CBCCAM). The CBCCAM, a public body created by Prime Minister Circular 2013/11, is taking decisions and measures related to climate change and air management.

On April 25, 2012, the MoEU issued a bylaw on monitoring, reporting and verification of GHG Emissions mandating for the establishment of a nation- wide installation-level MRV system, the Turkish Regulation on Monitoring, Reporting, Verification of GHG Emissions (MRV Regulation). After revision process it entered into force on May 17, 2014. The MRV Regulation is adapted from Commission Regulations 600/2012/EC and 601/2012/EC excluding carbon capture and storage (CCS) and aviation.

 Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council (Accreditation and Verification Regulation, AVR) defines the requirements for verification of emission reports and accreditation of verifiers under the EU ETS.

Two subsequently developed communiques define the implementation of the regulation further:

- The Communique of Monitoring and Reporting Greenhouse Gas Emissions went into force on July 22, 2014 and specified the obligations on monitoring and reporting of the regulation.

- The Communique on Verification of Greenhouse Gas Emission Reports and Authorization of Verifiers went into force on April 02, 2015 and described details accreditation and verification rules and procedures.

The Turkish MRV Regulation makes it mandatory for energy and industry sector installation operators with defined thresholds to monitor and report their emissions on an annual basis.

The concepts used for monitoring of stationary GHG emissions and the requirements for possible monitoring approaches are laid down in the regulation. By December 2014, almost 700 monitoring plans were submitted for the first time. 2015 and 2016 emissions report emission must be submitted by October 31, 2017. The annual emissions report is the result of the annual emissions monitoring ("*monitoring plan with concrete data*").

The MRV system provides the basis for wider economy-wide emission reduction targets and climate change strategies as laid down in e.g. the Nationally Determined Contributions (NDCs). Among other options, Turkey is considering the use of market based instruments such as carbon pricing or ETS to reach its climate change mitigation targets. Deliberations regarding using carbon trading as a market instrument in order to promote clean technologies are already included in the existing Environment Law, which was published in August 1983. Article 3, sub-article (h) of the Environment Law states:
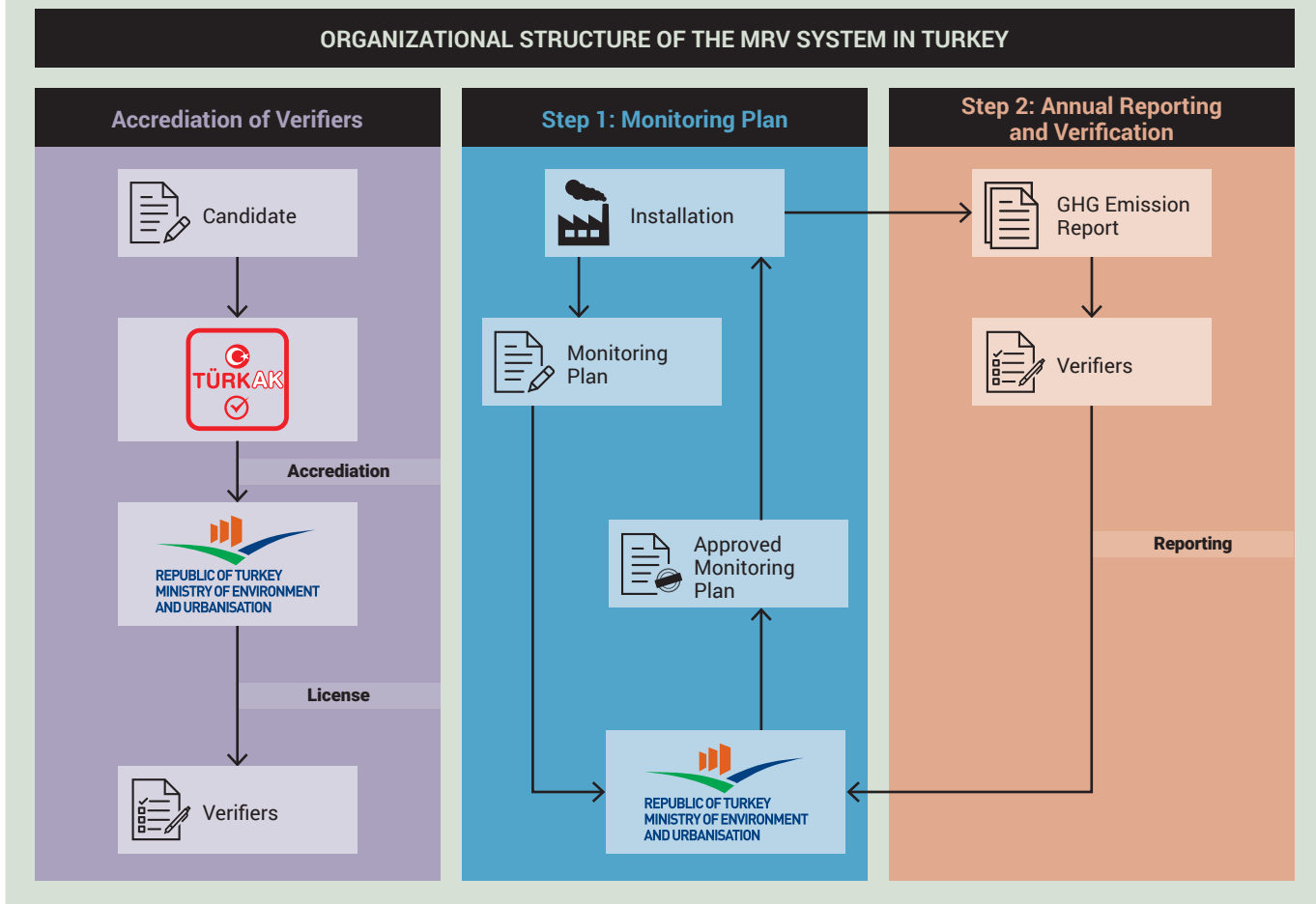
"For the purposes of protection of the environment, prevention and mitigation of environmental pollution, besides compulsory standards, market based mechanisms, economic instruments and incentives such as taxation, fee and contribution payment, promotion of renewable energy and clean technologies, emission fee and pollution charge and carbon trading shall be used."

In Turkey, the roles and responsibilities are clearly defined; the responsibility for both the regulation and the implementation of the MRV system is in the hands of the MoEU. The below figure depicts the organisational structure of the MRV system in Turkey.

Figure 1: Organizational structure of the MRV system in Turkey

ORGANIZATIONAL STRUCTURE OF THE MRV SYSTEM IN TURKEY

| Accrediation of Verifiers | Step 1: Monitoring Plan | Step 2: Annual Reporting and Verification |

4.1. MRV actors in Turkey

MoEU: The MoEU acts as the so called Competent Authority (CA). CA is derived from the EU ETS and refers to the responsible institution for managing an ETS, typically on all issues related to Monitoring, Reporting, interaction with verifiers, operating a registry, allocation of allowances to operators, surrendering of allowances and enforcement of compliance. In Turkey, the Department for Climate Change in the Directorate of Environment Management of the MoEU is responsible for providing guidance to the installation operators, checking and approving monitoring plans and checking verified emission report and to ensure overall compliance with the MRV regulation.

Third-party verifiers: Third-party verifiers confirm that an emission report is free of misstatements and assess whether it is in compliance with the MRV Regulation. The General Directorate of Environmental Impact Assessment (GDEIA) within the MoEU is responsible for the authorization of lead verifiers, verifiers and verification companies till 2019.

TURKAK: The Turkish Accreditation Agency TURKAK sets the verification and accreditation standards. TURKAK will accredit the verifiers, lead verifiers and verification bodies after 2019. Additionally TURKAK will assess the verifiers' competence to carry out verifications and whether if verifiers perform the verifications in accordance with the regulation.

Operators: Operators have to report their emissions in compliance with the regulation and submit their verified emission reports timely.

5 Facts about the Turkish DMS

For the effective functioning of an MRV system, a robust data management system is required. Therefore, one component of the MRV Capacity Building Project focused on the establishment of a data management system for the emission data submitted by the operators.

The Turkish DMS is a compact online tool designed for different parties to implement the Regulation on Monitoring, Reporting and Verification (MRV) of greenhouses gases in Turkey. The parties of the regulation are installations of covered sectors, the competent authority (the Ministry of Environment and Urbanization, MoEU) and the verifiers. The DMS creates a web-based user-friendly platform, where installation operators can submit their monitoring plans and report their emissions annually through verified emission reports Furthermore, Policy makers can access these verified data from DMS to develop policies. In addition, the DMS provides different statistical queries of the emission data for competent authority from source stream level up to country level. For all users with QA/QC (quality assurance/quality control) protocols it provides a secure submission portal.

Table 1: The functionalities of the DMS at a glance

Functionalities of the Turkish DMS			
Competent Authority	**Operators**	**Verification Bodies**	**Lead Verifiers**
Checking and approving monitoring plans	Submission of Monitoring plans	Checking of monitoring plans	Submitting verification reports to the verification bodies
Checking verified emissions reports	Submission of verified emission reports to CA	Verification of emission reports	Checking of monitoring plans
Checking improvement reports	Submission of improvement reports	Submission of verification reports to operators	Verification of emission reports
Inspecting the verification bodies	Analysis of emission data	Assigning verification team	Preparing verification report
Analysis of installation and sector specific emissions	Submission of supporting documents		
Analysis of data on source stream level	Linking with verification bodies		

Box 1: In-house development of DMS

For the design of the DMS some deciding factors were formulated: Development and maintenance cost as well as development time must be reasonable; the DMS must be flexible enough to respond to future requirements and regulatory amendments or changes; training and capacity building to ensure that the system is used effectively, user-friendliness.

The Turkish MoEU opted to develop the data management system in-house. The most significant initial challenge was to identify the experts to design and develop the system. An interdisciplinary team consisting of a national IT-expert, national technical experts who have conducted training for installation operators on monitoring plans and emission reports and the international GIZ advisor worked closely with the MoEU to develop the DMS. The in-house approach contributed greatly to build and internalize local capacity.

During the development phase, the German Emission Trading Authority (DEHSt) provided valuable input. Study visits to Berlin and on-demand communication facilitated the know-how exchange.

The DMS is designed as an independent system for all covered installations, verification bodies, verifiers and the MoEU to manage the data collected through the monitoring plans and annual verified emission reports.

The application and the database are hosted within the MoEU's premises. Network, server and database security and maintenance are provided by the IT department of MoEU. Therefore, it was one requirement that the application and the database management system are strictly in compliance with the current systems. The system database runs on the MoEU's central *ORACLE* database clusters with Turkish local settings. The MRV application is deployed on a separate server maintained by the IT department of the MoEU.

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Box 2: Technical information of data base

- The MRV system uses ORACLE database, the data model is independent from the database software and can be implemented in any industry standard relational database.

- Operations of the queries and data manipulation are implemented at the database level using stored procedures and views with caching mechanisms. This makes MRV system exceptionally fast.

- MRV database is backed up regularly to prevent data loss. Any data can be accessed for any past time by the help of Point in Time recovery feature.

5.1. Specification of data modeling

The structural basis for the data model consists of the EU *Monitoring Report Template* as well as the *Annual Emission Report Template*. These Excel templates are publicly available on the EU ETS website.

The data model was created in a way to handle all relations between monitoring plans, emission reports, verification reports and the related actors;

operators, verifiers, verification bodies and competent authority. No data is deleted physically on the system but instead data is removed whenever it needs to be deleted. This allows authority to audit any kind of data and action retroactively.

User actions like submission, approval, and rejection of plans are logged at the data level. This transaction mechanism helps audit process in case of a suspicious action.

The data model of the MRV system is hierarchical. All data are linked to each other so that an installation, monitoring plan or verification report can be queried with their constituents. This makes statistical analysis flexible and easily customizable.

Figure 2: Operator home screen
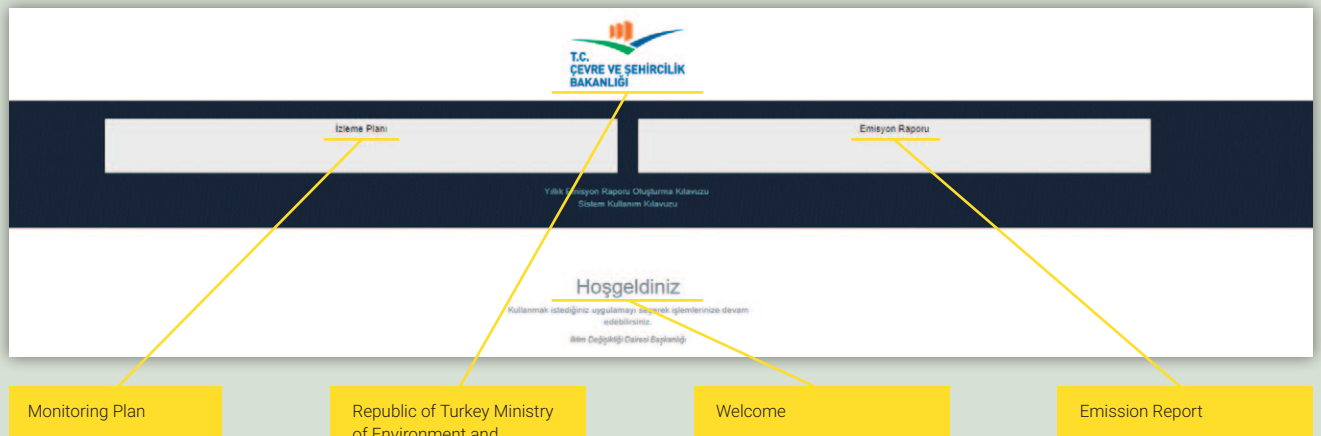
Figure 3: Data model of the DMS
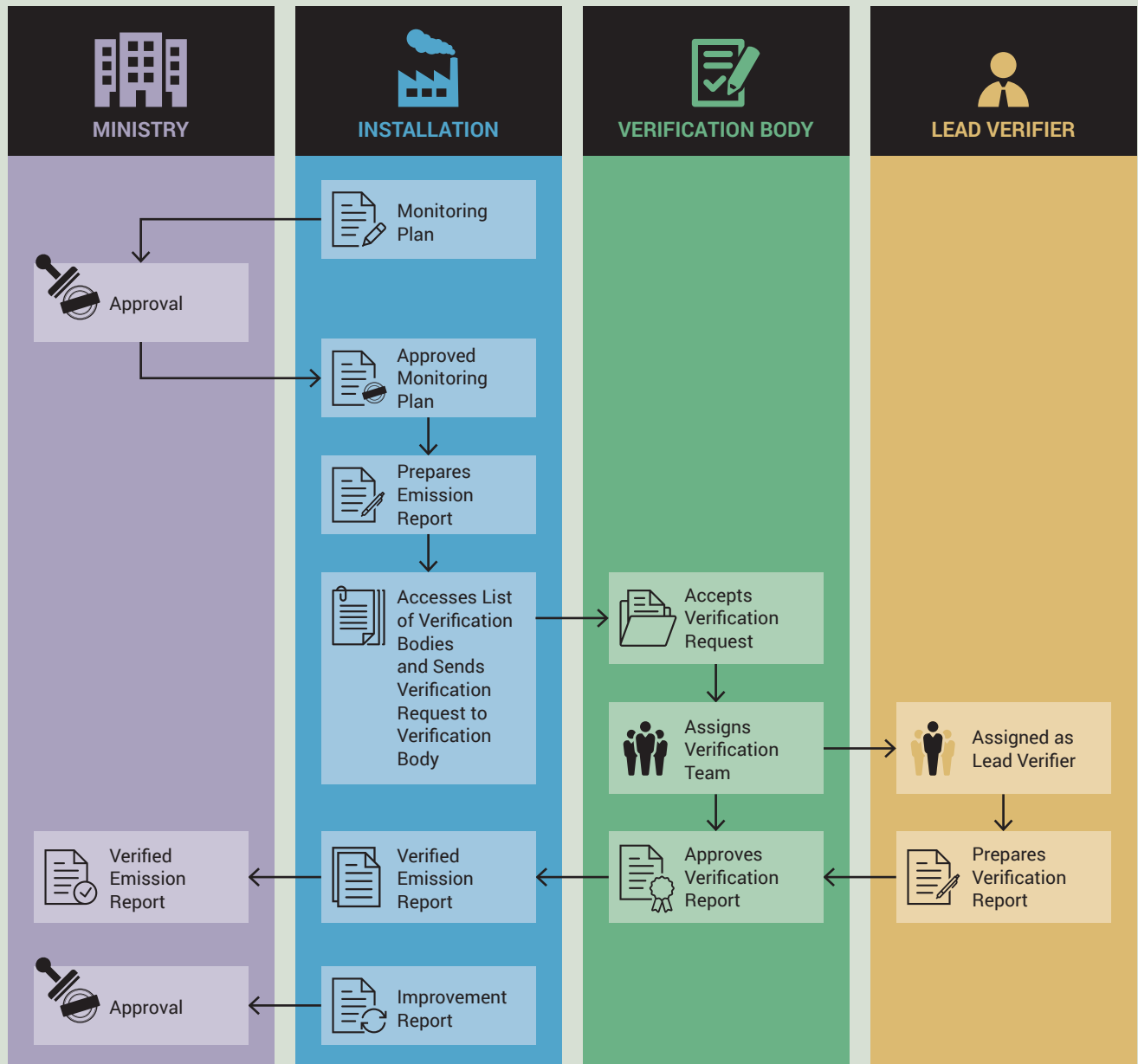
Figure 4: Dialogue box: Emission report development wizard

Monitoring Plan Selection

Republic of Turkey Ministry of Environment and Urbanisation

Figure 5: Dialogue box: Operator control screen

Monitoring Plan

Mainpage

Monitoring Plan number

Monitoring Interval

Status

Creation Date

Figure 6: Dialogue box: Operator notification screen

Notifications

5.2. Quality assurance (QA) and quality control (QC) feature

The DMS database has strict constrains on data types and relations between monitoring plans, emission reports and verification reports. All data quality checks are done before saving the data both at the database level and the application level to achieve data integrity. All the data stored for monitoring plans and emission reports are hierarchical. Whenever a change occurs in an entity, MRV system checks all related entities to maintain the data integrity. It means users cannot make a change on an entity that has side effects to related data.

Verifiers are guaranteed to have the latest data in their verification processes. Whenever a facility modifies the data after verification process starts, verifiers are notified to have the right data in their verification reports. This security and integrity checks allow all the partners of the system to work in harmony and flawlessly.

Checking monitoring plans and emission reports can be supported by a DMS to a certain extend. Which steps of the checking process can be supported by the DMS depends on the functionalities of the system. Automatically checks can be conducted inter alia:

• To check data consistency over years or for different processes;
• To check the completeness for a source stream or a measuring device;

- To calculate expected emissions;

- To calculate the threshold of minor source streams and if the threshold is exceeded;

- To check the consistencies between source streams and total emissions of the installation

- To check the tier applied;

- To check the accreditation of a laboratory.

Automated checks help to reduce the burden of the assessment process. At the same time it is a tool for transparent documentation of the checking results.

Figure 7: Example of QA/QC function

Errors

- Total emissions exceed the range given as estimated emissions
- Difference between the total and estimated emissions: -90%

5.3. Statistical analysis

The Turkish DMS can provide statistical analysis of the every data that is provided by the operator and verifiers. This will help policy makers to understand the emission profile of the sectors, detailed breakdown of the emission, process specifications, burned fuels and sector specifications. For example with the queries tool of the DMS, MoEU can determine hard coal usage in the lime sector. Also, bottom-up data collection method will decrease the assumptions on emission calculations and increase the precision of the data. This will help the policy makers to see the real situation in the sub-sectors and facilitates the decision making process during the decision processes.

Below, examples of the queries are presented;

- Approved/Not Approved Monitoring plans (by sector, by installation type, by region, etc...)

- Approved/Not Approved Improvement reports (by sector, by installation type, by region, etc...)

- Submitted Emission reports (by sector, by installation type, by region, etc...)

- Emissions of the specific source streams (by sector, by installation type, by region, etc…)
- Calculation factor/activity data of the specific source streams (by sector, by installation type, by region, etc…)
- Categorization of the installations by calculation type
- Analysis results of the specific source streams (by sector, by installation type, by region, etc…)
- Tier level of the specific source streams (by sector, by installation type, by region, etc…)
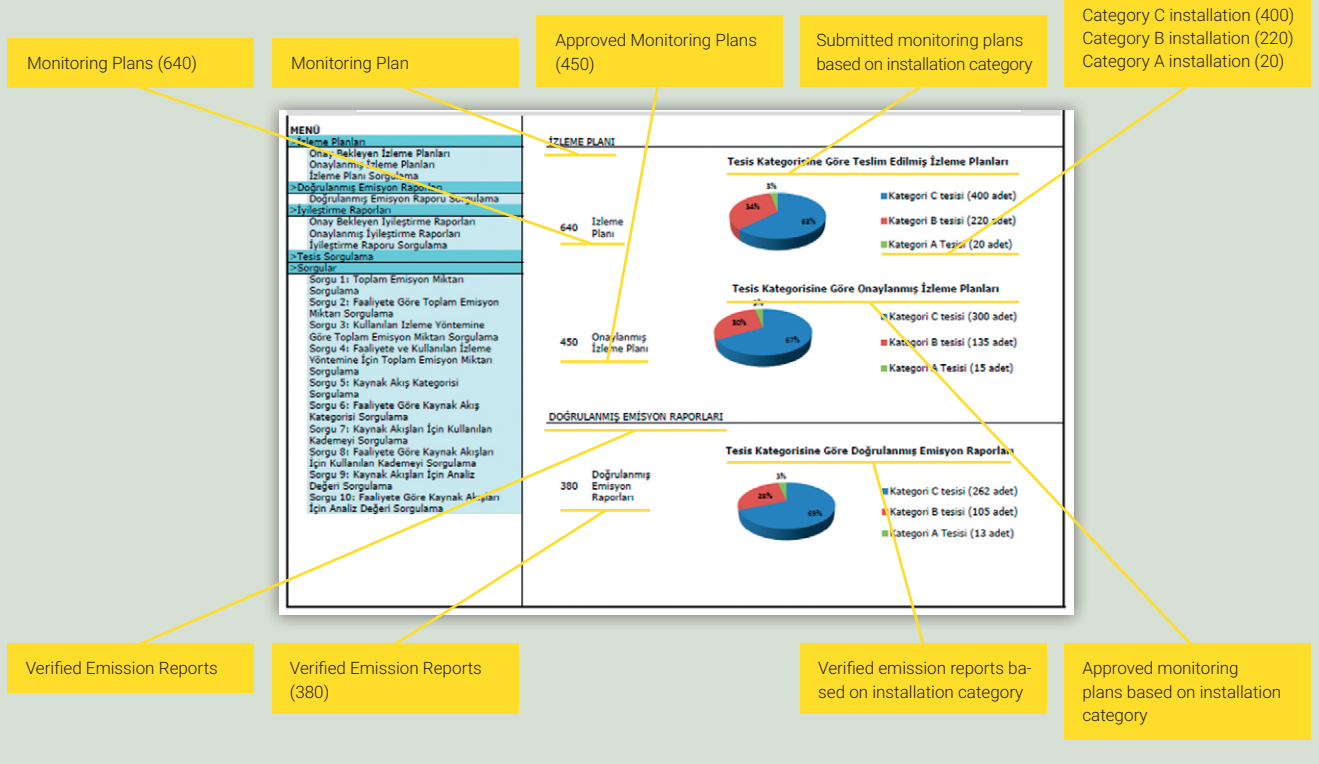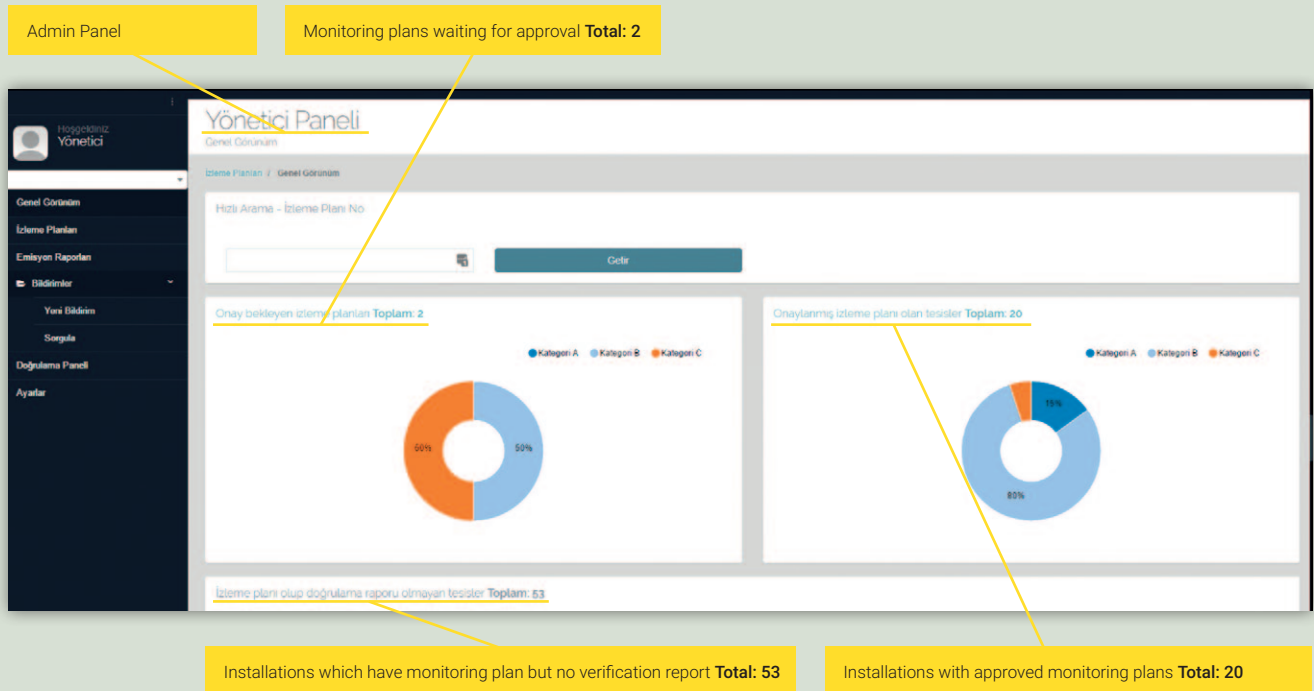
Figure 8: Examples of queries

Monitoring Plans (640)

Monitoring Plan

Approved Monitoring Plans (450)

Submitted monitoring plans based on installation category

Category C installation (400)
Category B installation (220)
Category A installation (20)

Verified Emission Reports

Verified Emission Reports (380)

Verified emission reports based on installation category

Approved monitoring plans based on installation category

Figure 9: Example of data queries function

Admin Panel

Monitoring plans waiting for approval **Total: 2**

Installations which have monitoring plan but no verification report **Total: 53**

Installations with approved monitoring plans **Total: 20**

5.4. Document management and report generation

It is a necessity that monitoring plans and emission reports include supporting documents. The system allows installation operators to upload unlimited documents. These documents can be linked to some parts of the plans and reports such as procedures, device definitions, source streams, calculation methods, etc.

The competent authority and verifiers can access and download the documents while inspecting.

The competent authority is provided with some query and statistical analysis tools. By using these tools, emission factors, emissions, facility groups can be queried and transported to excel or PDF reports. Excel export feature gives authority freedom to create their custom reports and make custom analysis.

Monitoring plans and emission reports can be transported to a PDF digitally identified with a QR code. This QR code assures the concurrency of the document with the actual database.

Figure 10: Dialogue box: Emission report wizard

Installation Information

Emission report

Step 1 Explanations

Create new emission report

Step 2 Report year

Step 3 Main Sector

Step 4 Monitoring plan selection

Summary

Step 5 Creation
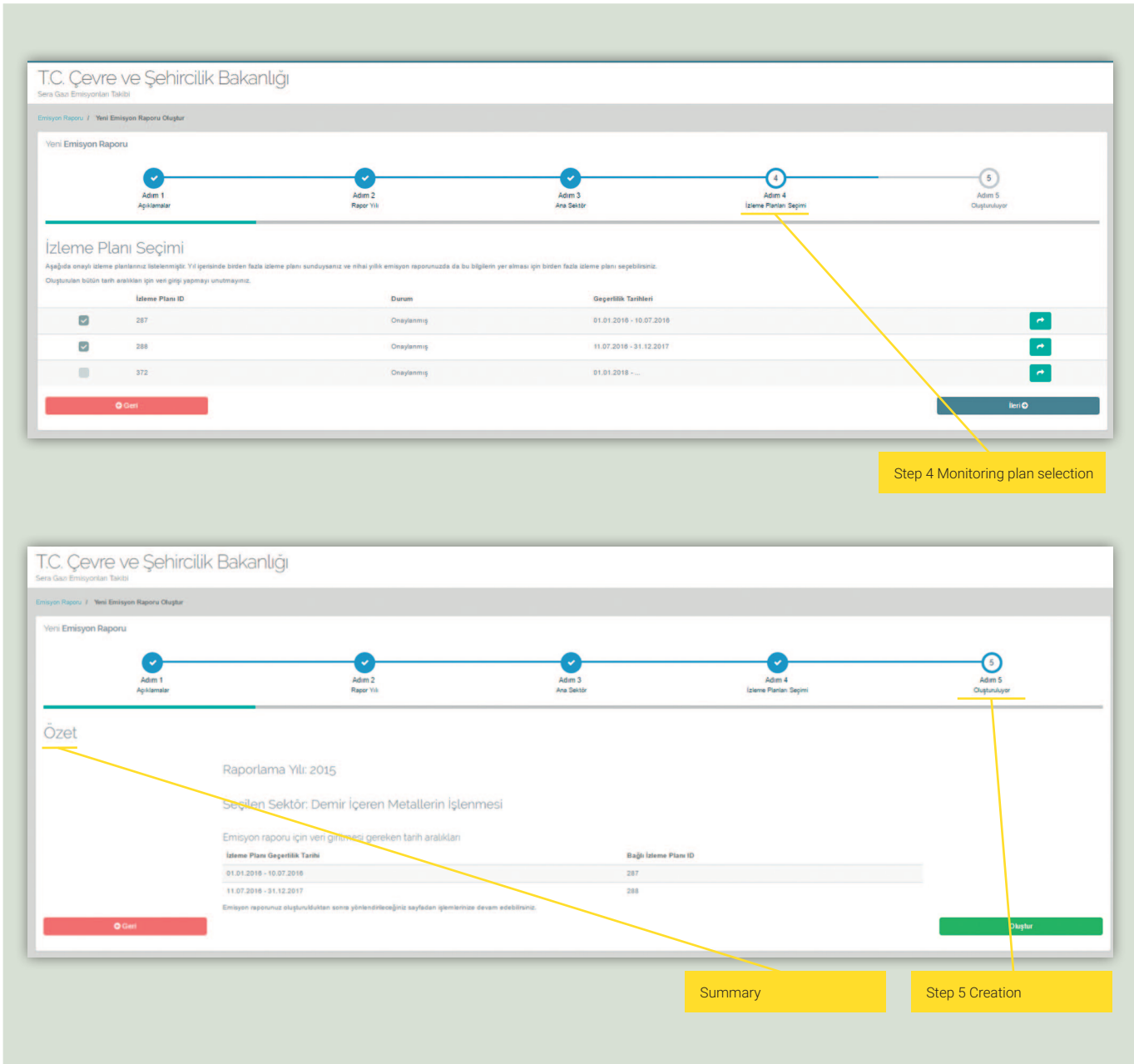
5.5. Confidentiality

The DMS has four actors: operators, lead verifiers, verification bodies and the competent authority. User actions like submission, approval, and rejection of plans are logged at the data level. Each user has specific user rights. This transaction mechanism helps audit process in case of a suspicious action.

Data is available to its related actor or actors. Installation operators can only modify their monitoring plans, emission reports and access their verification reports in read-only-mode.

Verifiers are only allowed to access monitoring plans and emission reports in read-only-mode if they have the permission from facilities. No actor is allowed to access any data other than they are granted.

5.6. In a nutshell: Stepwise approach to develop the DMS in Turkey

Step 1. Analyze and understand the regulation

It essential to develop a system in line with the minimum requirements of the MRV regulation. In the MRV regulations different monitoring and calculation methodologies are defined for the different sectors and different tier level requirements are defined related to the installations size and source stream size. Furthermore, some exemptions are defined for the tier level requirements. The DMS has to deliver the outputs which are required under the regulation, the monitoring plan and the verified emission report. Hence, the DMS has to be designed accordingly. DMS has to provide all these options and should be both flexible and applicable for all covered sectors.

Step 2. Define the needs and the purpose of the regulation

Every regulations has its own purpose and defined methodologies to achieve this purpose. Main purpose of the MRV regulation is to gather the highest quality MRV data according to the methodologies defined in defined timescales. The Turkish MRV Regulation makes it mandatory for covered operators to submit their monitoring plans to the CA for the approval and report their verified emissions on an annual basis in order to ensure the high quality data. Also annual submission of GHG emission data means that a huge amount of data needs to be structured, stored and managed. Therefore, data collection has to be standardized to ensure efficient data collection, comparability of submitted data as well as transparent processes. At the same time data collection must allow for certain flexibility to address the diversity of installations. The DMS is designed to gather highest quality data and provide the services defined in the regulation.

Step 3. Define the users and the purpose to use the DMS:

The MRV Regulation has five actors: Installation operators, lead verifiers, verification bodies, National Accreditation Body (for now MoEU) and the MoEU (competent authority). Thus the DMS should provide specialized accounts for the each actor type so that they can fulfill the requirements of the MRV regulation via DMS. In addition to that the Turkish DMS supports data collection, facilitates the standardization of submission procedures for easy submission and thus ensures comparability of data over time. Automated submission procedure reduces the burden for data collection as well as quality assessment and assurance. QC and QA can be supported by DMS to a certain extend. Therefore, automated checks and routines have be incorporated into the system.

Step 4. Connect the users as defined in the regulation

Communication with the other actors is the key of providing the high quality data. The DMS establishes the connection between related actors. For instance, operators can submit their monitoring plans to the CA and the CA can comment on the monitoring plan. Also they can submit their draft emission report based on the approved monitoring plan to the verification bodies for verification. Verification bodies and lead verifiers can submit their verification reports to the operators. Like this, the DMS establishes a secure continuous connection between the parties that reduce the e-mail traffic and make easy to track the issues.

Step 5. Define the way of processing the data

The different users have different expectations towards the DMS which have to be met be the system. Besides submission of data, the DMS enables the uploading of supporting documents which can be linked to the monitoring plans and emission reports. The MoEU is provided with queries for QA and QC and statistical analysis tools to create specific reports and perform analyses.

Step 6. Finalize the system

As the MRV system expands, new mandatory requirements emerged. In Turkey, the different functions of the DMS where developed one after the other and almost in parallel with introduction of new MRV requirements. This gave both the DMS and its users

time to mature and tailor it to its needs. In addition, each systems needs a testing period where modifications and adjustments can be made to ensure that the system runs in a healthy state.

Step 7. Guidelines, capacity building trainings and workshops for users

To ensure that all users have access to the information and skills necessary to work with the DMS different documents have been prepared: Monitoring plan and emission reporting application user manual for installation operators, system management reference guide for MoEU experts and system administration and maintenance document for the IT staff at the MoEU. A series of practical trainings were conducted for the different user groups.

Table 2: Estimation on necessary resources to develop the DMS

Activity	Tentative no of expert days
Design setting	50
Development of data model	50
Programming of data base	50
Development of web tool	50
Programming of queries	50
Advice to MoEU to facilitate decision making process	100
Fine tuning of system	50

6   Building capacities for the MRV actors

Providing support and building the capacities for MRV and DMS users are key to ensuring that the system is used effectively. In the frame of the four years' project capacity building measures for all actors have been conducted. The project pursued different capacity development approaches for the different actors involved according to their future responsibilities. To transfer profound know-how the approach was to include to a maximum extend practitioners from both government institutions and consulting companies.

The project cooperated with international experts with long standing practical experience under the EU ETS. Throughout the entire process, the project cooperated closely with the competent authority in Germany, the German Emission Trading Authority (Deutsche Emissionshandelsstelle, DEHSt). The cooperation started with a study visit to Berlin where MRV practitioners presented insights from a living system. In the course of cooperation DEHSt provides experts for the trainings as well as their expertise on specific issues on demand.

Important cooperation partner on issues related to accreditation and accreditation standards is the German Accreditation Authority (Deutsche Akkreditierungsstelle, DAkkS). In cooperation with the Turkish Accreditation Body TURKAK, the rules and procedures for verification and accreditation in Turkey were defined.

MoEU

1. The first training "Training on the Assesment of the Monitoring Plans" took place from Juy, 7-9, 2014 for 6 experts of the Climate Change Department of the MoEU. This three days intense training provided a general infroduction into the structure and elements of a monitoring plan as well as the tasks of a competent authority during the assessment of monitoring plans.

2. The second training for the experts in the Climate Change Department followed the practical training for the installation operators. It was a three-day training from September 29 to October 1, 2014 which focused on the assessment of sector specific monitoring plans. Prior to the training a checklist has been prepared by the consultants which shall give support to the experts when checking the monitoring plans. The checklist contains some recommendations regarding a pragmatic checking procedure considering the experience from the EU ETS. By that time the DMS was ready for use and MoEU staff was introduced into its use.

3. Capacity building for the Provincial Environmental Directorates of the MoEU. The Turkish MoEU has a decentralized structure with 81 provincial directorates. The provincial directorates operate under the General Directorate of Environmental Impact Assessment, and are the executing arm of the MoEU. A one day training was implemented on November 13, 2014 to raise awareness in the region on the MRV Regulation, the DMS and more importantly the installations with their monitoring and reporting obligations.

Installation operators

The installation operators were provided with a series of trainings to enable them to develop their monitoring plans and emission reports according to the MRV Regulation.

1. The first round of trainings with the title "Sector Specific Trainings to Develop Monitoring Plans According to the Turkish MRV Regulation" took place from September 8-12, 2014 and September 22-26, 2014. It was conducted for engineers who in future have to work on monitoring plans. Mainly installations in the sectors of paper, glass, iron and steel, refinery, ceramics, brick and roof tile, foundry, lime, electricity and lastly cement were covered. The training was supposed to provide know-how from hands-on experience to installation operators and enable them to develop their monitoring plans from scratch. The training content was aligned with the structure of the monitoring plan, like this the installation operators accustomed themselves to the logic of a monitoring plan.

   After a theoretical introduction into the structure and the elements of a monitoring plan, including the description of the installation, emission sources, emission points, calculation of the estimated yearly emission, tier approach, etc., sessions on development of exemplary monitoring plan were conducted. During these session, the DMS was used and as a result, the participants not only learnt to develop monitoring plans they also learnt how to use the DMS.

2. A second training, the "Sector specific training to develop emission reports according to the Turkish MRV Regulation" for installation operator was carried out from November 23 to December 4, 2015. The aim of this training was to build the capacities to prepare emission reports and undergo the verification process.

3. The last sector specific training the "Integrated monitoring and reporting training according to the Turkish MRV Regulation" was a two-day follow-up training for installation operators conducted from April 21 to 22, 2015. The aim of this training was to fill the remaining gaps with regard to monitoring plans and particularly with regard to emission reporting.

Capacity building for verification

The General Directorate of Environmental Impact Assessment (GDEIA) acting as the executing branch of the MoEU, took over the responsibility for the capacity development of the verifiers.

- During an intense ten-days training Verification of GHG Emission reports in Turkey – Training for Verifiers from 21 to 29 January 2016, 272 participants were trained. Afterwards the training an exam for verifiers was conducted and the candidates who passed this exam became verifiers. Also these candidates were entitled to take the second exam for lead verifiers.

- From October 20 to 29, 2015 experts from the General Directorate of Environmental Impact Assessment and General Directorate for Environmental Management as well as experts from TURKAK participated in an eight-day study tour. The main purpose of this tour was to round-off the theoretical knowledge by site visits at high emitting companies to see verification in practice sectors such as iron & steel, cement. aluminum, brick and petrochemical industries.

The development of guideline and training materials for the different MRV users are another element for successful data management. In the course of the project the following documents which are available at the MoEU/ project website www. carbon-turkey.org have been developed.

Guidelines and sample documents prepared:

- Monitoring Plan Guideline (in Turkish)
- Annual Emission Reporting Guideline (in Turkish)
- Sectoral Calculation Examples (in Turkish)
- Monitoring and Reporting Online System Manual (in Turkish)
- Verification Guideline (in Turkish)

Figure 11: Monitoring Plan Guideline

Institutionalization of capacity building activities through a training center

In order to strengthen the capacity building capacities and to ensure a sustainable implementation of relevant training activities, the Ministry for Environment and Urbanisation (MoEU) in cooperation with GIZ established a dedicated training unit under the roof of TUCEV (Turkey Environmental Protection Foundation, which is an affiliated body of the MoEU).

This MRV Training and Support Center (KAREM) aims to mainstream educational and training seminars on monitoring, reporting and verification of GHG emissions specifically and in more general terms aims at raising both awareness and knowledge about climate related issues in the related sectors, such as industry, academics, specialists and engineers.

KAREM is on the operational level established as a training unit that should be able to finance its own operational costs through the trainings after one year of initial support. In that aspect, it is following the established operational and business plan and is expected to run based on its own income.

More generally the trainings (either to trainers or to experts on the sector) aim at establishing a sustainable knowledge platform amongst the involved persons with regards to monitoring, reporting and verification. The continuous education of key target groups is a key element of sustainable goal achievement.

7   Achievements at a glance

- Around 700 installation operators now have the competences to develop their monitoring plans and annual emissions reports. This is an important step on the road towards GHG emissions reporting within the context of the national MRV system which is envisaged for 2017.

- Training measures are mainstreamed through the Carbon Management Training Center of Turkey (KAREM). Within this context, training of trainers to provide training support, development of training modules and realization of trainings on MRV and ETS for installation operators including GHG monitoring and reporting, market mechanisms, verification processes can be provided once the project is terminated.

- The MRV system provides accurate emission data in emission relevant sectors such as electricity generation, iron & steel, cement, pulp & paper, glass, refineries, ceramic, lime, gypsum, sugar and automotive industry.

- The emission data can be used to establish benchmarks, to develop sectoral low carbon development strategies for these sectors and thereby help to implement the Turkish NDCs.

Lessons learnt

The most important lessons learnt were:

- Early involvement of private sector stakeholders facilitated good cooperation spirit which remains throughout the implementation of the project.

- In-house development of DMS guided by an interdisciplinary expert team in close cooperation with the MoEU has proven to be cost-effective and very successful.

- Combining capacity development for monitoring plans and emission reports with use of data management system has proven to be effective.

- Engaging practitioners into capacity development is key for profound know-how transfer.

- Long-term institutionalization of capacity building through Training Center (KAREM).

Abbreviations

BMUB	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit
	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
CA	Competent Authority
DMS	Data Management System
GDEM	General Directorate of Environmental Management in the Ministry of Environment and Urbanization
GDEIA	General Directorate of Environmental Impact Assessment in the Ministry of Environment and Urbanization
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
	German International Cooperation
IKI	Internationale Klimaschutz Initiative
	International Climate Initiative
MoEU	Ministry of Environment and Urbanization of Turkey
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contributions

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