ENVIRONMENTAL AND CLIMA REGIONAL NETWORK FOR ACCESSION - ECRAN

WORKSHOP REPORT

ECRAN Activity No 3.2

REPORT ON REGIONAL TRAINING ON GHG INVENTORY DEVELOPMEMT PROCESS WITH A FOCUS ON THE ENERGY SECTOR

Module 1

March /2014

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I. Background/Rationale

In the Framework of the climate component of ECRAN the ''National inventory systems and the EU Monitoring Mechanism Regulation'' Working Group has been formed. This Working Group's objective is to provide the essential elements for the establishment of and contribute to a fully functioning monitoring mechanism of greenhouse gas emissions in the beneficiaries, in line with the EU Monitoring Mechanism Regulation.

The following results are expected for this Working Group

- Improved overall quality of the GHG inventory work in the beneficiaries countries
- Institutional, legal and procedural arrangements identified for a national system which is linked to the planning, preparation and management of the inventory
- Improvement of the data quality and technical capacity for preparing GHG emissions inventory elements of the biennial reports and national communications

The proposed activities are a follow-up of the activities on the monitoring mechanism implemented in the framework of RENA, the so called "MMD Exercise". The main purpose of the exercise was to start improving knowledge and capacity and to gradually improve/increase the technical and institutional ability of the then RENA countries to prepare submissions of the National Inventory Reports in the framework of the MMD.

The exercise concentrated on improving the process of the preparation of sound inventories towards a full and harmonised combustion fuel sector GHG inventory using the appropriate guidelines and tools. The focus was on the CRF fuel combustion activities 1A. The project deliverables were:

- A description of the national systems in the beneficiaries with emphasis on activity data flow scheme
- Status of national energy balances, calculation of CO_2 emissions and first data filled in for fuel combustion activities using the CRF Reporter tool
- Completing CO_2 emissions estimates from CRF fuel combustion activities

IN order to follow up on that work, the following Modules will be implemented in the framework of ECRAN:

- *Module 1: Regional training on GHG inventory development process with a focus on the energy sector* (this training)
- *Module 2: Regional training on handling the CRF Reporter software and tier 1 uncertainty assessment*
- *Module 3: Field training on and assessment of GHG inventories from the fuel combustion activities and fugitive emissions from fuels*

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The ECRAN beneficiaries include the representatives of Ministries of Environment of Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Kosovo*[1], Montenegro, Serbia and Turkey. In addition other ministries and other bodies and institutions will be actively engaged in so far as their work is relevant for the scope of ECRAN-CLIMA (such as in the fields of energy, transport, agriculture, economy, health, finance). These include environment and other agencies, statistical institutions, inspectorates, and other relevant central, regional and local public authorities working on climate issues in the beneficiary countries, and environmental CSOs (NGOs). Other stakeholders will be involved as appropriate.

The target group for this training were government officials and experts from background institutions from the ECRAN beneficiaries responsible for, or involved in greenhouse gas inventory work in the framework of the international obligations in relation to the preparation of national GHG inventories

In order to ensure the optimal results, participation from the representatives of beneficiary countries will have **to be continuous** for all three modules.

This report describes the results of the implementation of the Module 1 training. The Module 1-training was carried out as a three-day regional training workshop on utilizing the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories,* the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* as well as elements of *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* for the fuel combustion activities and fugitive emission from fuels. The training was held in Croatia, the first day in Zagreb and the second and third day on site at a power plant (Plomin) and cement plant (Koromačno) resepectively in Istria/Croatia.

The training has been organized in collaboration with DG Climate Action and the TAIEX unit.

Chapter 2 describes the objectives of the workshop and the topics addressed. Chapter 3 provides an outline of the relevant EU Climate policy and legislation. Chapter 4 presents the workshop highlights and Chapter 5 presents the evaluation. Furthermore the following Annexes are attached:

- Annex I: Agenda;
- Annex II: List of participants;
- Annex III: Power point presentations (downloadable under separate cover: http://www.ecranetwork.org/Climate/GHG
- Annex IV: Training Materials

[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ opinion on the Kosovo declaration of independence.

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II. Objectives of the training

General objectives

The **wider** objective is to strengthen regional cooperation between the EU candidate countries and potential candidates in the fields of climate action and to assist them on their way towards the transposition and implementation of the EU climate policies and instruments which is a key precondition for EU accession.

Specific objectives

The **specific objective** of the workshop was to promote basic understanding and knowledge on the inventory development process, including planning, preparation and management as described in CMP Decision 19/CMP.1 Guidelines for national systems under Article 5.1. of the Kyoto Protocol and the application of the decision tree approach for selection of steps to be followed in order to develop GHG inventory for the Energy sector in accordance with the principles of good practice and in line with national circumstances.

Results/outputs

The workshop targeted the following topics and results/outputs:

- Requirements for National systems for estimation of GHG emissions by sources and removals by sinks under the UNFCCC
- Requirements for National inventory system under EU mechanism for monitoring and reporting
- Introduction to 1996 IPCC Guidelines and 2000 Good Practice Guidance with emphasis on Energy sector
- GHG emissions Inventory development process – step by step
- Decision trees for selecting the method, activity data and emission factors for estimation of GHG emissions from stationary combustion
- GHG emissions calculation and reporting obligations of cement plant Holcim and power plant Plomin under national regulation
- Practical on-site exercises on GHG emissions calculation from the energy sector (focus on energy production and cement production].

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III. EU policy and legislation covered by the training

Monitoring mechanism Regulation –Reporting requirements on greenhouse gas emissions

Effective monitoring, reporting and verification (MRV) of greenhouse gas (GHG) emissions is critical for tracking progress towards the achievement of emission reduction targets. The ultimate goal of the UN Framework Convention on Climate Change (UNFCCC) is to stabilise atmospheric concentrations of GHGs at a level which prevents dangerous human interference with the climate system.

As Parties to the UNFCCC and its Kyoto Protocol, the European Union and Member States are required to report annually on their GHG emissions. They also have to report regularly on their climate change policies and measures through National Communications.

The EU inventory reflects the sum of national inventories, based on Member States' monitoring of their own GHG emissions. This national monitoring is required under the **GHG monitoring mechanism** which was established in 1993 and revised two times, in 2004 and in 2013, as part of the EU's preparations for meeting its Kyoto Protocol emissions target. The annual EU GHG inventory report is prepared on behalf of the European Commission by the European Environmental Agency each spring. In line with UNFCCC reporting requirements, each Member State's annual inventory covers emissions up until two years previously.

The latest revision concerns the new Monitoring Mechanism Regulation (MMR) which entered into force on 8 July 2013[2]. This mechanism now provides the legal basis to implement revised domestic commitments set out in the 2009 climate and energy package (20-20-20 commitments)[3], as well as to ensure timely and accurate monitoring of the progress in implementation of these commitments.

The key objectives of the GHG Monitoring Mechanism Regulation are to:

- Monitor all anthropogenic (man-made) GHG emissions covered by the Kyoto Protocol in the Member States;
- Evaluate progress towards meeting GHG reduction commitments under the UNFCCC and the Kyoto Protocol;
- Implement the UNFCCC and the Kyoto Protocol as regards national programmes, greenhouse gas inventories, national systems and registries of the EU and its Member States, and the relevant procedures under the Kyoto Protocol;
- Ensure the timeliness, completeness, accuracy, consistency, comparability and transparency of reporting by the EU and its Member States to the UNFCCC Secretariat.

[2] Regulation (EU) No 525/2013 of the European parliament and of the Council on mechanisms for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC

[3] http://ec.europa.eu/clima/policies/package/index_en.htm

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It aims to improve the quality of data reported, help the EU and Member States keep track of progress towards meeting their emission targets for 2013-2020 and facilitate further development of the EU climate policy mix.

The new MMR also introduces new elements, such as reporting of:

- Member States' and the EU's low-carbon development strategies;
- Financial and technical support provided to developing countries, and commitments arising from the 2009 Copenhagen Accord and 2010 Cancún Agreements;
- Member States' use of revenues from the auctioning of allowances in the EU emissions trading system (EU ETS). Member States have committed to spend at least half of the revenue from such auctions on measures to fight climate change in the EU and third countries.
- Emissions and removals from land use, land-use change and forestry (LULUCF);
- Member States' adaptation to climate change;

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IV. Highlights from the training workshop

Reference is made to Annex I for the agenda and Annex III for the presentations.

Day 1 – Boot camp Zagreb, 5 March 2014:

Requirements for National systems for estimation of GHG emissions by sources and removals by sinks under the UNFCCC

- A description was given on the Guidance for National Systems as per Decision 19/CMP.1. It described in detail the (A) Inventory Planning Requirements ; (B) the Inventory Preparation requirements and (C) the Inventory Management Requirements
- The Reporting Requirements as per EU MMR were presented as well, including the required UNFCCC reporting guidelines and the use of the CRF Reporter software. In addition the reporting as per National Inventory Report (NIR), National Communications (NatCom) and Biennial Reporting (BR) were described
- The steps in the UNFCCC review process of NatComs was presented

Requirements for National inventory system under EU mechanism for monitoring and reporting

- The EU GHG inventory process was outlined, including the legal basis ands the institutional arrangements

- The improvements as regards data and methods were highlighted, including the requirements to use data and methods under the EU ETS Directive, the F-gases regulation EPRTR and energy statistics (Article 5).
- The EU inventory system was described, outlining the responsibilities and tasks of the different parties (JRC, Eurostat. DG Clima, the EEA and the Member States)
- The Quality Assurance and Quality Control (QA/QC) processes were outlined, including the responsibilities of Member States, DG Clima and the EEA (plus ETC/ACM)
- Documentation and Archiving: A presentation was given of the EEA's Central Data Repository (CDR) and the ETC/ACM archive database. The Union Inventory files are also uploaded to the EEA's EIONET Forum (Draft and final Union NIRs, CRF tables, relevant source category files, etc.)
- Examples of QC procedures were outlined in detail including the timelines applied for the regular checks and examples of QA/QC during compilation.

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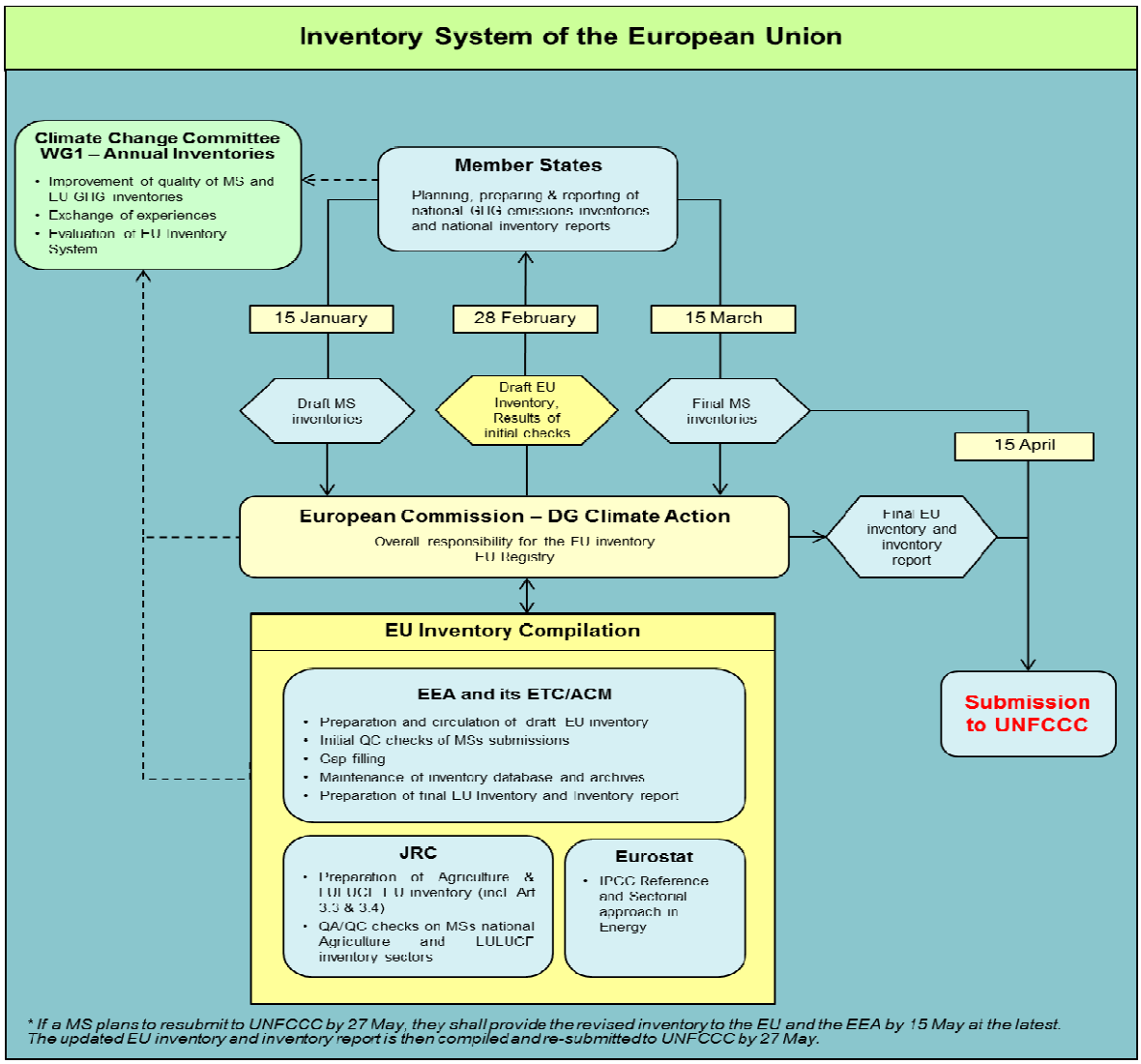
- A key issue is related to EU-ETS reporting and GHG inventories (Transparency of how ETS is reflected (by MS) in the EU inventory, due to confidentiality issues on activity data and emission factors)



- Related EEA products were presented (GHG data viewer; EU ETS data viewer; the EEA publication of the EU GHG inventory [4])

Introduction to 1996 IPCC Guidelines and 2000 Good Practice Guidance with emphasis on Energy sector

- The scope of the presentation included the revised 1996 IPCC Guidelines; the Good Practice Guidance 2--- for the Energy Sector and the 2006 Guidelines (mandatory use from 2015 onwards).
- 2006 IPCC guidelines[5] have the best available scientific information for estimating and reporting GHG emissions and removals. The same basic methodology approaches are used as those in Revised 1996 Guidelines, but this time it is „All in One" document (with integrated Good Practice Guidance Documents).

[4] http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2013
[5] http://www.ipcc-nggip.iges.or.jp/public/2006gl/

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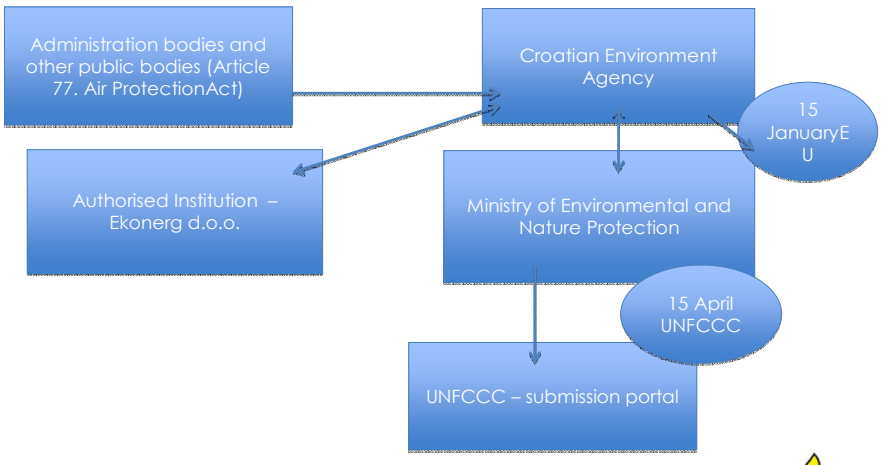
In the 2006 IPCCC Guidelines the general methods are improved with new scientific findings. It also includes general guidance and reporting (horizontal for all sectors). Default data (Net Caloric Values, Emission Factors) are updated and improved; more gases are included and there is improved consistency with indirect CO_2 and N_2O emissions (AFOLU). No more „potential emissions“, just „actual“ emissions are to be reported.

- Refinement of methods for the Energy Sector:
  - Fuel combustion: Tier 3 now explicitly mentions continuous emissions monitoring (CEM) as a way of estimating emissions.
  - Stationary combustion: The 2006 IPCC Guidelines provide a new approach for estimating the fuel consumption for a certain technology in the Tier 3 approach based on technology penetration. Generally in the 2006 IPCC Guidelines, more detailed information is given on discriminating between process emissions to be reported in the IPPU sector and energy emissions in the energy sector. Furthermore, detailed guidance is available on avoiding double counting of activity data between the energy and other sectors.
  - Mobile combustion: full oxidation of fuels is also assumed for the transport sector when choosing default emission factors. For the Road transport the Tier 3 methodology for estimating CH4 and N2O emissions from mobile combustion now also includes cold start emissions. Cold start emissions correspond to fixed values depending on fuel type, vehicle type, emission control technology, and operating conditions. For Off-road:, a Tier 3 methodology includes the estimation of emissions “from annual hours of use and equipment-specific parameters, such as rated power, load factor, and emission factors based on power usage”. In adtio Tier 3 methids are described for the railway sector and the aviation sector.

Case study: “Development of Croatian National system”

- The Croatian legal background and the flowachart of information was described, as well as the flowchart for the preparatrion of the National Inventory Report.

COMMUNICATION SCHEME



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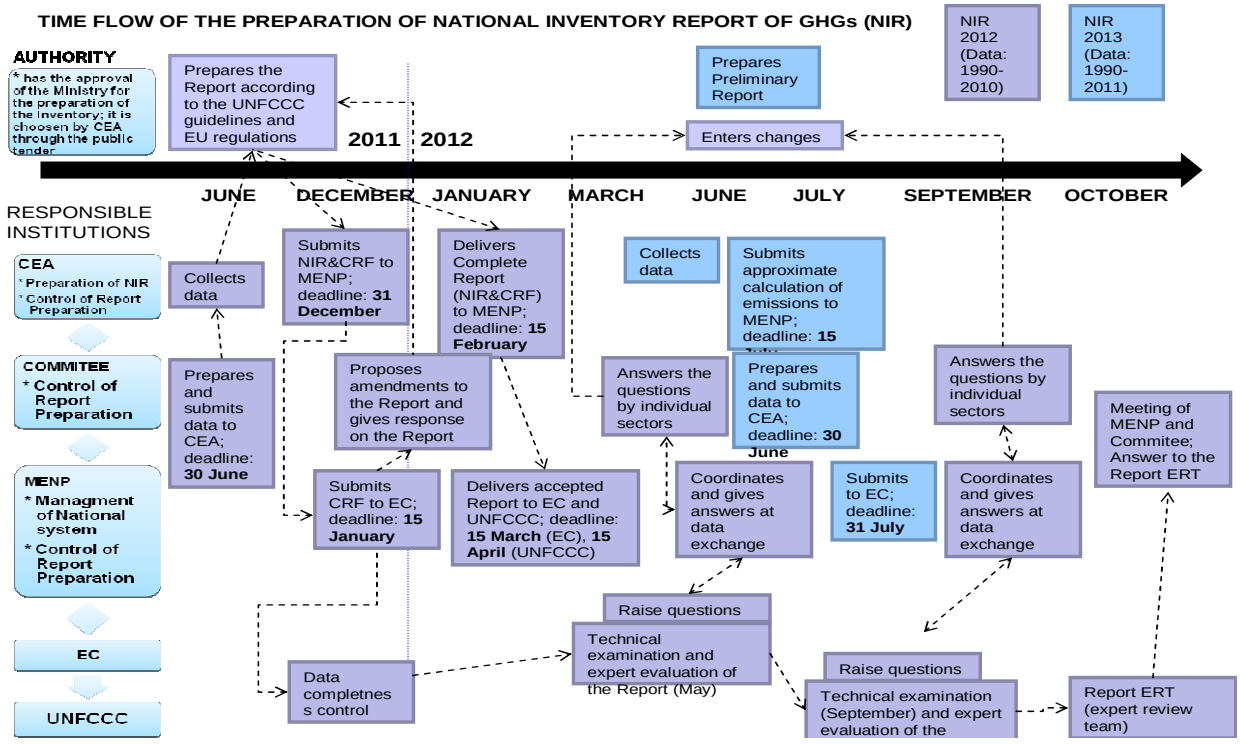

GHG emissions Inventory development process – step by step

- The required steps towards a well functioning national inventory system were outlined.
- First things first:

1. Start thinking about national inventory system setup (centralized, decentralized, outsourced, insourced)
2. Select a team of national inventory trainees/experts you trust.
3. Close colaboration between inventory trainees/experts and focal points is essential.
4. Be result oriented (process is important but result is what counts).
5. Explain data providers what you need asap.

- Step 1: Inventory Planning
  - Designate a single **national entity** with overall responsibility for the national inventory;
  - Define and allocate **specific responsibilities** in the inventory development process, including those relating to choice of methods, data collection, particularly activity data and emission factors from statistical services and other entities, processing and archiving, and QC/QA.
  - Elaborate an inventory **QA/QC plan** which describes specific QC procedures to be implemented during the inventory development process, facilitate the overall QA procedures to be conducted, to the extent possible, on the entire inventory and establish quality objectives;

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- Establish processes for the **official consideration and approval of the inventory**, including any recalculations, prior to its submission and to respond to any issues raised by the inventory review process under Article 8.

- Step 2: Inventory Preparation
  - Identify **key source categories** following the methods described in the IPCC good practice guidance (chapter 7, section 7.2);
  - **Prepare estimates** in accordance with the methods described in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, as elaborated by the IPCC good practice guidance, and ensure that appropriate methods are used to estimate emissions from key source categories;
  - Collect sufficient **activity data**, process information and emission factors as are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources and removals by sinks;
  - Make a quantitative estimate of i**nventory uncertainty** for each source category and for the inventory in total, following the IPCC good practice guidance;
  - Ensure that any **recalculations** of previously submitted estimates of anthropogenic GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance and relevant decisions of the COP and/or COP/MOP;
  - **Compile the national inventory** in accordance with Article 7, paragraph 1, and relevant decisions of the COP and/or COP/MOP;
  - Implement general inventory **QC procedures** (tier 1) in accordance with its QA/QC plan following the IPCC good practice guidance.

- Step 3: Inventory Management
  - **Archive inventory information** for each year. This information shall include all disaggregated emission factors, activity data, and documentation about how these factors and data have been generated and aggregated for the preparation of the inventory. This information shall also include internal documentation on QA/QC procedures, external and internal reviews, documentation on annual key sources and key source identification and planned inventory improvements;
  - Provide review teams under Article 8 with access to all archived information used by the Party to prepare the inventory, in accordance with relevant decisions of the COP and/or COP/MOP;
  - Respond to requests for clarifying inventory information resulting from the different stages of the review process of the inventory information, and information on the national system, in a timely manner in accordance with Article 8.

Day 2 – The Heat is on – Plomin Power Plant , 6 March 2014

Decision trees for selecting the method, activity data and emission factors for estimation of GHG emissions from stationary combustion were presented in detail

- The training included
  - methodologies for emission estimation - Reference and sectoral approach
  - Structure of energy sector
  - Methods for estimating emissions

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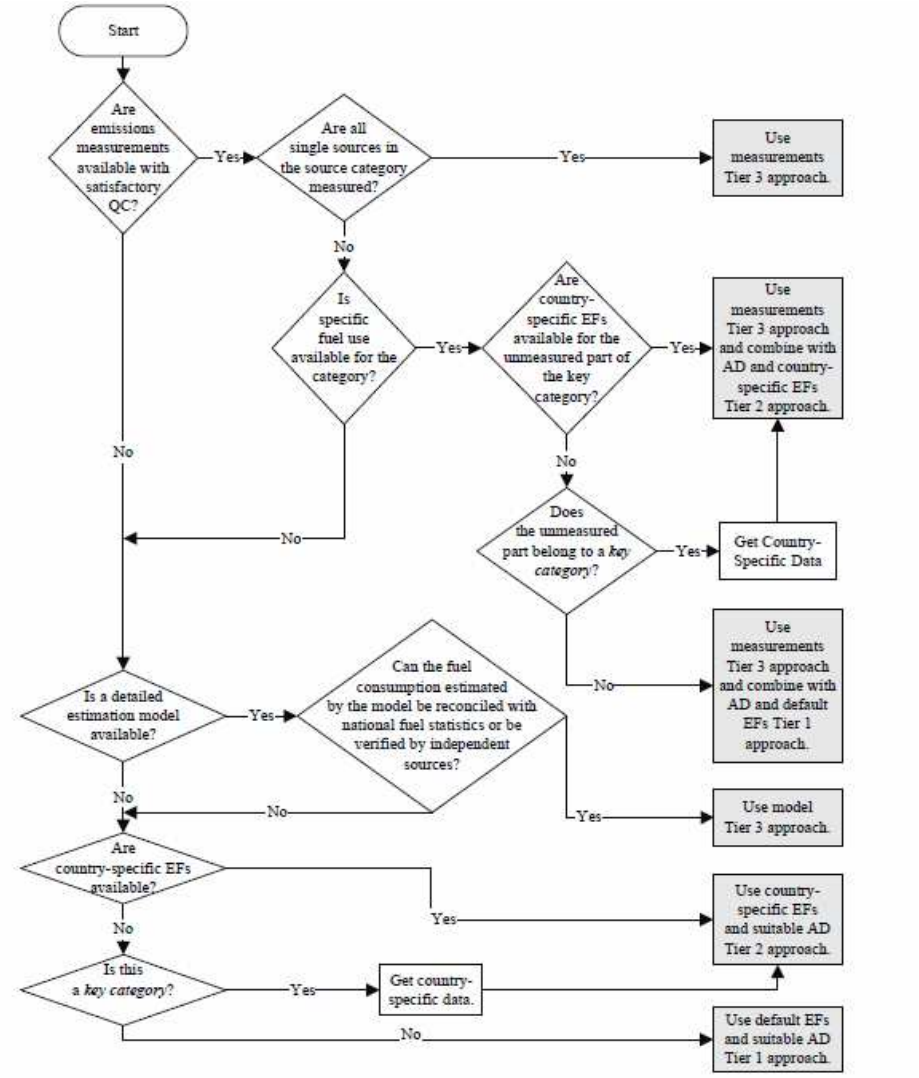
- Selecting Tiers for stationary combustion and road transportation:



- Methods for stationary combustion sector are provided for sectoral approach in three tiers wre outlined, as an example:
  - Tier 1: Fuel combustion from national energy statistics and default emission factors
    Emissions GHG, fuel = Fuel Consumption fuel • Emission Factor GHG, fuel •Ox

    Where:

EmissionsGHG ,fuel	=	emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumptionfuel	=	amount of fuel combusted (TJ)
Emission FactorGHG,fuel	=	default emission factor of a given GHG by type of fuel (kg gas/TJ).
Ox	=	carbon oxidation factor

For more information and detailes on the methods on other tiers and sectors see the relevant presentation

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- Decision Trees for stationary combustion and Transport- conclusions
  - The tier used to estimate emissions will depend on the quantity and quality of data that are available
  - If a category is key, it is *good practice* to estimate emissions using a Tier 2 or Tier 3 approach
  - It is *good practice* to improve the data quality if an initial calculation with a Tier 1 approach indicates a *key source*, or if an estimate is associated with a high level of uncertainty
  - The decision tree and *key source* category determination should be applied to CO2, CH4 and N2O emissions separately

<u>GHG emissions calculation and reporting obligations of TPP Plomin under national regulation</u>

- The calculation of CO2 emissions from coal were presented:

<u>CO2 (COAL) = consumption (t) x NCV (TJ/t) x EF (tCO2/TJ) x OF</u>

$$MCVcoal_i = \frac{\sum_1^n (Cons_{coal}1 \times NCV_{coal}1 + Cons_{coal}2 \times NCV_{coal}2 + \ldots + Cons_{coal}n \times NCV_{coal}n)}{\sum Cons_{coal}}$$

$$EF_{coal} = \frac{\sum_1^n (Cons_{coal}1 \times EF_{coal}1 + Cons_{coal}2 \times EF_{coal}2 + \ldots + Cons_{coal}n \times EF_{coal}n)}{\sum_1^n Cons_{coal}}$$

- In addition the methods for calculating emissions from limestone and light oil and diesel oil were presented (See presentations in Annex III for details
- Uncertainty for calciulation based methods were outlined

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Practical exercise on GHG emissions calculation

Reference is made to Annex IV for the training materials.

Main goal of this exercise was to simulate key steps in GHG emission inventory development process with focus on inventory preparation phase for energy sector (CRF 1), and within a given training timeframe.

As part of the inventory preparation, each training team (TT) were required to perform the following activities according to Decision 19/CMP.1 Guidelines for national systems:

1. Compile sufficient activity data, process information, emission factors and other calculation parameters which are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources in Energy sector;
2. Prepare CO_2 emissions estimates in accordance with the methods described in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by the IPCC good practice guidance;
3. Compile the national inventory in part related to Energy sector (CRF 1) in accordance with Article 7, paragraph 1, and relevant decisions of the COP and/or COP/MOP.

The final result of this training exercise were:

- Filled CRF tables 1s1, 1s2, 1.A(a)s1, 1.A(a)s2, 1.A(a)s3 and 1.A(a)s3
- Preparation of draft chapter Energy (CRF 1), including:
  - Short overview of energy sector (level and trend)
  - Short overview of CO_2 emissions from Energy sector (level and trend)
  - Short description of methodology, alternative calculation methods used, NVC and EFs applied

It turned out that this exercise was considered far too complex for many participants. However, the exercise was too easy for the participants from Turkey, as they have already experience with the development of their annual GHG inventory.

The solution / results were presented in plenary by the facilitators.

Day 3 – The only easy day was yesterday": – Cement plant Holcim, Koromačno, 7 March 2014

GHG Inventory quality assurance/quality control (QA/QC)

- The presentation included (1) the definition of QA/QC; (2) Development of QA/QC system; (3) Elements of QA/QC system, (4) QC procedures (tier I and tier II) (5) QA procedures and (6) Documentation and archiving
- Implementing QA/QC procedures requires resources, expertise and time. In developing any QA/QC system, it is expected that judgements will need to be made on the following:
  - Resources allocated to QC for different source categories and the compilation process;
  - Time allocated to conduct the checks and reviews of emissions estimates;
  - Availability and access to information on activity data and emission factors, including data quality;
  - Procedures to ensure confidentiality of inventory and source category information, when required

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- The following are the major elements to be considered in the development of a QA/QC system :
    - An inventory agency responsible for coordinating QA/QC activities;
    - A QA/QC plan;
    - General QC procedures (Tier 1);
    - Source category-specific QC procedures (Tier 2);
    - QA review procedures;
    - Reporting, documentation, and archiving procedures.
- As part of general QC procedures, it is *good practice* to document and archive all information required to produce the national emissions inventory estimates.

GHG emissions calculation and reporting obligations of cement plant Holcim under national regulation

- Calculations of fuels are based on annex II of EU regulation No 601/2012[6]
    - CO2 (t) = conc. volume (t) x NCV (GJ/t) x EF (t CO2/GJ) x OF
    - Main sources – coal and petcoke. Consumed volumes calculated from purchased volumes (from invoices) and stock differences. NCV and EF taken from delivered certificates (labs certified according to ISO 17025). Oxidation factor (OF) = 1
    - Alternative fuels – „de minimis" sources (except tires)

[6] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0601&from=EN . Croatian version available on http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R0601

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- Tires – part of biomass (27%) included in calculation
- Animal meal and saw dust – 100% biomass fuels

- Calculation methodology for process emissions are based on annex IV of EU regulation No 601/2012
  - Methodology A – based on kiln feed quantity
  - CO2 (process) = CO2 (calcination) + CO2 (filter dust) + CO2 (noncarbonated C)
  - CO2 (calc) = consumed vol. of kiln feed (t) x EF (t CO2/t) x CF. Kiln feed volume measured by Poldos dosing unit (presure vessel). EF measured by accredited lab every 50 000 t (min 6xyear). Conversion factor (CV) = 1 (complete calcination of kiln feed)
  - CO2 (CKD) = discharged volume of CKD (t) x EF (t CO2/t). CKD = cement kiln dust = filter dust; Part of CKD discharged and used in cement mill as legal additive; CKD is only partially calcinated and EF of kiln feed is corrected by calcination rate measured in own lab („de-minimus")
  - CO2 from noncarbonated/organic carbon. C from raw material already included in EF of kiln feed; CO2 from urea reagent calculated from urea quantity and stoichiometric emission factor - urea used for NOx reduction at kiln inlet

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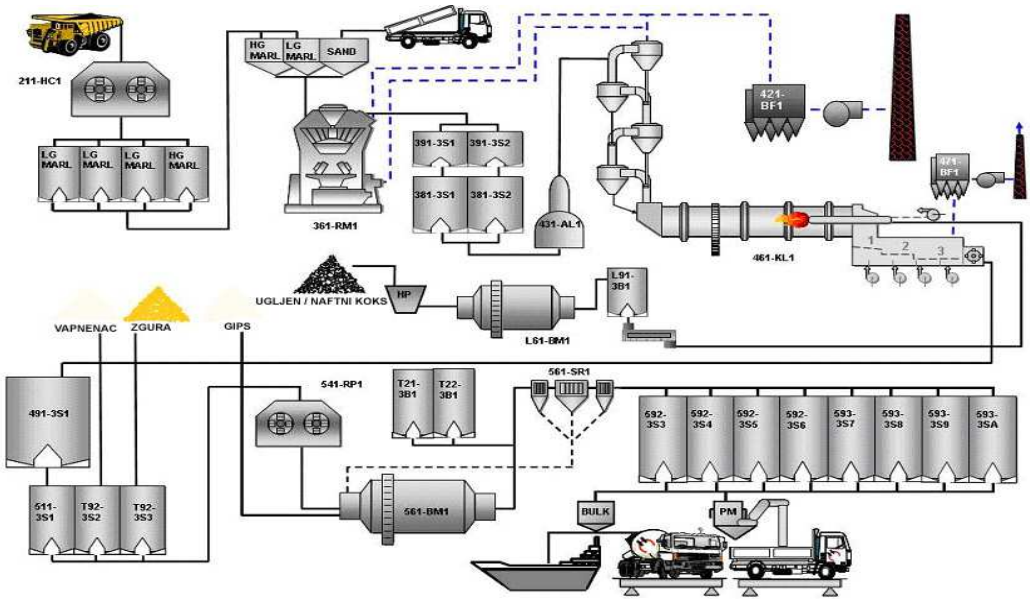

Practical exercise on GHG emissions calculation (Continuation of day 2)

Reference is made to Annex IV for the training materials.

As part of the inventory preparation, each training team (TT) were required to perform the following activities according to Decision 19/CMP.1 Guidelines for national systems:

1. Compile sufficient activity data, process information, emission factors and other calculation parameters as are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources in Energy sector;
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The solution / results were presented in plenary by the facilitators.

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V. Evaluation

Summary of the training evaluation report, developed on the basis of analysis of the training questionnaires.

Most trainees indicated their overall satisfaction with the training content. There was an issue as regards the level of skills and understanding on the subject of trainees. Overall the majority of trainees indicated that the training was of high level and sometimes too complicated as evidenced during the exercises (i.e. most participants were not able to complete the training exercises in time). However, the trainees from Turkey indicated that the training content was already known to them so their expectations for the training were not met. This aspect of the level of knowledge of trainees should be considered during the next rounds of training.

Statistical Information

1.1	Workshop Session	Regional Training on the greenhouse gas inventory development process with a focus on the energy sector
1.2	Facilitators name	Imre Csikós/ Davor Vesligaj /Iva Sedek /Spyridoula Ntemiri/Matej Gasperic
1.3	Name and Surname of Participants (evaluators)	As per participants' list.

Your Expectations

Please indicate to what extent specific expectations were met, or not met:

My Expectations	My expectations were met		
	Fully	Partially	Not at all
1. Filling gaps in knowledge	IIIII III (40%)	**IIIII IIIII II (60%)**	
2. Information about and better understanding of the MMR requirements as regards GHG inventories (CRF sector 1)	IIIII II (35%)	**IIIII IIIII III (65%)**	
3. Practical exercises have been an appropriate tool to learn to work with the MMR requirements (incl the IPCC Revised Guidelines)	IIIII (24%)	**IIIII IIIII IIIII I (76%)**	
4. Getting prepared for GHG inventory work in the field of the CRF 1 Sector	IIIII III (38%)	**IIIII IIIII III (62%)**	

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Workshop and Presentation

Please rate the following statements in respect of this training module:

Aspect of Workshop	Excellent	Good	Average	Acceptable	Poor	Unacceptable
1 The workshop achieved the objectives set	III (15%)	**IIIII IIIII IIII (70%)**	I (5%)		II (10%)	
2 The quality of the workshop was of a high standard	IIIII (26%)	**IIIII IIIII (53%)**	III (16%)	I (5%)		
3 The content of the workshop was well suited to my level of understanding and experience	IIII (21%)	IIIII IIIII (52%)	IIII (21%)	I (5%)		
4 The practical work was relevant and informative	IIIII I (30%)	**IIIII II (35%)**	IIIII I (30%)	II (10%)		
5 The workshop was interactive	**IIIII IIIII I (52%)**	IIIII II (33%)	I (5%)	II (10%)		
6 Facilitators were well prepared and knowledgeable on the subject matter	**IIIII IIII (43%)**	IIIII III (37%)	II (10%)	II (10%)		
7 The duration of this workshop was neither too long nor too short	IIIII (28%)	**IIIII IIII (50%)**	I (6%)	I (6%)	II (10%)	
8 The logistical arrangements (venue, refreshments, equipment) were satisfactory	**IIIII IIII (47%)**	IIIII I (32%)	III (16%)	I (5%)	I (5%)	
9 Attending this workshop was time well spent	IIIII I (32%)	**IIIII IIII (46%)**	II (11%)	II (11%)		

Comments and suggestions

I have the following comment and/or suggestions in addition to questions already answered:

Workshop Sessions:

- Maybe to provide hardcopies of the workshop materials will be helpfull for me (so not only electronic versions)
- In general the workshop was demanding in terms of timetable. Travelling everyday was unneccesary. It was more study visit than workshop and it should have been arranged during more (5-6) days
- More time on exercises, less on presentations
- Spend more time on calculations
- Conceptual presentations lasted for a huge time, therefore the time for practice was not enough. Wish we could have covered all of the exercises
- For this workshop meeting room is not well organised to follow the presentation was very difficult for the participant in a far position from the screen. So it would be better to provide the presentation before the meeting. Participants can then follow

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via their own copies

Facilitators:

- Very good and facilitators have very good knowledge
- Good (2x)
- Facilitators were good at their area

Workshop level and content:

- Very high level. This workshop is meant for experts which already have some experience
- This workshop was very well prepared
- Maybe more exercises and practical work
- It was very good (2x)
- Fine, maybe to add projections (?)
- The background and experience level of the participants were not uniform. So in order to catch an average speed of learning, time was wasted. Perhaps level of participants may be taken into account first,
- I think the workshop level is low. In fact when I looked at the agenda the first time I had expected t get too much information related to the inventory work. But it is okay. However, for upcoming technical workshops level can be higher a little bit
- Workshop level is somehow under my level since we are already doing emission estimation. But we have also some difficulties to allocate emissions to appropriate CRF sector sometimes. For me it would be better to have an opportunity to clarify these kinds of issues.

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ANNEX I – Agenda

5 March 2014 "Day 1 - GHG inventory boot camp":

Venue: EKONERG, Zagreb				
Start	**Finish**	**Topic**	**Speaker**	**Sub topic/Content**
08:30	**09:00**	**Registration**		
09.00	09.15	Welcome and Introduction	Imre Csikós, ECRAN	• Introduction of participants • Objectives of the module 1 training • Approval of the agenda
09.15	09.45	ECRAN Climate Action	Imre Csikós, ECRAN	• ECRAN Climate – Working Groups • ECRAN Climate – Goals and expectations • Short discussion, Q/A
09.45	10.15	Overview of Activity 3.2. *Inventory systems and the EU Monitoring Mechanism Regulation*	Davor Vešligaj, ECRAN	• Tasks • Sub-tasks / Modules • Training approach, goals and expectations • Q/A
10.15	10.30	***Coffee Break***		
10.30	11.30	Requirements for National systems for estimation of GHG emissions by sources and removals by sinks under the	Matej Gašperič, Energy expert and UNFCCC reviewer	• General reporting requirements (National Inventory Reports, National Communication and Bienial reports) • Decision 19/CMP.1 – key elements and requirements • Main elements of UNFCCC review process • Discussion, Q/A

		UNFCCC		
11.30	12.30	Requirements for National inventory system under EU mechanism for monitoring and reporting	Spyridoula Ntemiri, EEA	• New EU Regulation 525/2013 – key elements and requirements for national inventory system • Differences in comparison to Decision 280/2004 and 2005/166 • Inventory submission deadlines and inventory compilation work by EEA • Discussion, Q/A
12.30	13.30	***LUNCH***		
13.15	14.15	Introduction to 1996 IPCC Guidelines and 2000 Good Practice Guidance with emphasis on Energy sector	Matej Gašperič, Energy expert and UNFCCC reviewer	• 1996 IPCC Guidelines • 2000 GPG • 2006 IPCC Guidelines – short introduction • Discussion, Q/A
14.15	15.00	Case study: "Development of Croatian National system"	Vlatka Palčić, Croatian Ministry of Environmental and Nature Protection	• Structure of national system • SWOT analysis • Planned improvements
15.00	15.15	***Tea***		
15.15	16.15	GHG emissions Inventory development process – step by step	Davor Vešligaj, ECRAN	• Inventory planning • Inventory preparation • Inventory management • Discussion, Q/A
16.15	16.30	Discussion and preparation for Day 2 training	All participants	
16.30	**19.00**	**Trip Zagreb – Plomin/Rabac (215 km) and dinner at hotel**		

Participants will stay at hotel in Rabac near Plomin

6 March 2014 "Day 2 – The heat is on":

Venue: Thermal Power Plant Plomin				
Start	**Finish**	**Topic**	**Speaker**	**Sub topic/Content**
9.00	**9.30**	**Trip Rabac – Plomin (20 km)**		
9:30	**9:45**	**Coffee and Registration**		
9.45	10.00	Welcome and Introduction	Imre Csikós, ECRAN Host, TPP Plomin	• Introduction of participants • Objectives of the Day 2 training • Approval of the agenda
10.00	11.00	Decision trees for selecting the method, activity data and emission factors for estimation of GHG emissions from stationary combustion	Davor Vešligaj, ECRAN Iva Švedek, Expert for GHG emissions from energy sector, EKONERG Institute	• 1996 IPCC Guidelines • 2000 GPG • Discussion, Q/A
11.00	11.30	GHG emissions calculation and reporting obligations of TPP Plomin under national regulation	Host, HEP TPP Plomin, Ivana Laković	• GHG Monitoring plan under EU ETS • Preparation of Emission reports under EU ETS • Reporting of GHG emissions to PRTR • Discussion, Q/A
11.30	13.00	TPP Plomin 1 and 2 site tour	Host, HEP TPP Plomin, Ivana Laković	• Key features and performance parameters • GHG emission sources

13.00	14.00	***LUNCH***		
14.00	15.30	Practical exercise on GHG emissions calculation – part I	Davor Vešligaj, ECRAN Iva Švedek, Expert for GHG emissions from energy sector, EKONERG Institute	Participants will be splitted in 2-3 inventory teams and will be working on activity data collection, estimation of missing activity data by interpolation and extrapolation and calculation of emissions from energy sector, stationary combustion Inclusion of verified emissions from Plomin TPP into the national emissions total for the energy sector
15.30	15.45	***Tea***		
15.45	16:30	Practical exercise on GHG emissions calculation – part II	Representatives of inventory teams	Representatives of inventory team will present results of GHG emissions calculation
16.30	17.00	Discussion and preparation for Day 3 training	All participants	

Participants will stay at hotel in Rabac near Plomin

7 March 2014 "Day 3 – The only easy day was yesterday":

Venue: Cement plant Holcim, Koromačno				
Start	**Finish**	**Topic**	**Speaker**	**Sub topic/Content**
09:00	**09:30**	**Trip Rabac – Koromačno (35 km)**		
09:30	**10:00**	**Coffee and Registration**		
10.00	10.15	Welcome and Introduction	Imre Csikós, ECRAN Host, Holcim	• Introduction of participants • Objectives of the Day 3 training • Approval of the agenda
10.15	11.30	GHG Inventory quality assurance/quality control (QA/QC)	Davor Vešligaj, ECRAN Iva Švedek, Expert for GHG emissions from energy sector, EKONERG Institute	• Key elements of QA/QC programme • Key elements of QA/QC plan • Tier I general and Tier II source specific QC procedures • QA/QC practice in Croatia
11.30	12.00	GHG emissions calculation and reporting obligations of cement plant Holcim under national regulation	Host, Holcim, Žarko Horvat	• GHG Monitoring plan under EU ETS • Preparation of Emission reports under EU ETS • Reporting of GHG emissions to PRTR • Discussion, Q/A
12.00	13.00	***LUNCH***		
13.00	14.00	Cement plant site tour	Host, Holcim, Žarko Horvat	• Key features and performance parameters • GHG emission sources
14.00	15.30	Practical exercise on GHG emissions calculation – part I	Davor Vešligaj, ECRAN Iva Švedek, Expert for GHG emissions	Participants will be split in 2-3 review inventory teams and will be working on review of calculations from Day 2 - 3 with emphasis on completeness, transparency and consistency.

			from energy sector, EKONERG Institute	Case Holcim
15.30	16.00	***Tea***		
16.00	17:00	Practical exercise on GHG emissions calculation – part II	Representatives of inventory teams	Representatives of inventory team will present results of review their findings
17.00	17.30	Conclusion and recommendations for follow-up	Imre Csikós, ECRAN Davor Vešligaj, ECRAN	

ANNEX II – Participants

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First Name	Family Name	Institution Name	Department	Country	Email
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Žarko	Horvat	Holcim		Croatia	
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ANNEX III – Presentations (under separate cover)

Presentations can be downloaded from

http://www.ecranetwork.org/Climate/Climate-Policy

ANNEX IV – Training Materials

TABLE OF CONTENTS

Section 1. Introduction

Regulatory framework

Regulation (EU) No 525/2013 of the European parliament and of the Council on mechanisms for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC(hereinafter: Monitoring Mechanism Regulation or MMR) fully substitutes the Decision No 280/2004/EC (Monitoring Mechanism Decision or MMD) and as such will provide the legal basis to implement revised domestic commitments set out in the 2009 climate and energy package (20-20-20 commitments), as well as to ensure timely and accurate monitoring of the progress in implementation of these commitments.

The opportunity has also been taken to propose improvements in the legislation in the light of experience gained in implementing the Monitoring Mechanism Decision including its implementing provisions (Decision 2005/166) as well as in response to the international negotiations and United Nations Framework Convention on Climate Change (UNFCCC) requirements.

The new Regulation:

- implements the monitoring and reporting requirements of the Effort Sharing Decision and the revised EU ETS Directive through:
  - establishing a review and compliance cycle under the Effort Sharing Decision;
  - incorporating the reporting requirements for the use of revenues from auctioning carbon allowances, as stipulated in the revised ETS Directive;
- enhances the current monitoring and reporting framework so as to meet the needs of future EU and international legislation through establishing a basis for monitoring and reporting emissions from non-CO2 climate impacts from aviation, LULUCF, and adaptation;
- enhances EU and Member State reporting on financial and technology support provided to developing countries, thereby ensuring adherence to international commitments under the UNFCCC;
- enhances consistency of reporting under this Decision with reporting under other EU legal instruments that address air pollutants;
- enhances reporting of actual emissions, projections, policies and measures taking into account lessons learned from past implementation.
- besides the annual inventory reports it requires, that the Union and Member States shall submit biennial reports in accordance with Decision 1/CP.16 and national communications in accordance with article 12 of the UNFCCC to the UNFCCC Secretariat

Purpose of training exercise

The proposed training exercise is a follow-up of the activities on the monitoring mechanism implemented in the framework of RENA, the so called "MMD Exercise". The main purpose of the exercise was to start developing better knowledge and capacity and in gradually improving/increasing the technical and institutional ability of the RENA countries to prepare submissions of the National Inventory Reports in the framework of the MMD.

The exercise concentrated on improving the process of the preparation of sound inventories towards a full and harmonised combustion fuel sector GHG inventory using the appropriate guidelines and tools. The focus was on the CRF fuel combustion activities 1A. The project deliverables were:

- A description of the national systems in the beneficiaries with emphasis on activity data flow scheme
- Status of national energy balances, calculation of CO_2 emissions and first data filled in for fuel combustion activities using the CRF Reporter tool
- Completing CO_2 emissions estimates from CRF fuel combustion activities

This activity will build on the experiences and results of the above "MMD exercise" under RENA. Work will expand to other CRF sectors and assistance will be provided to the beneficiary countries to start developing robust national inventory systems that are capable of preparing complete, accurate and transparent annual greenhouse gas inventories and inventory related chapters of biennial reports and national communications in line with the requirements for UNFCCC Annex-I Parties and the EU Monitoring Mechanism Regulation (MMR).

This workplan covers the full period of ECRAN (i.e. October 2013 – October 2016). Under this workplan, the following specific task will be implemented:

- ***Tasks 2.1:*** *Capacity building on GHG inventory process for the Energy Sector (CRF Sector 1) in line with the MMR and the UNFCCC requirements*
- ***Task 2.2:*** *Capacity building on GHG inventory process for the other Sectors (CRF Sectors 2 - 6) in line with the MMR and the UNFCCC requirements*
- ***Task 2.3:*** *Capacity building on other elements of the MMR*

Approach

The beneficiaries are the Ministries of Environment of the beneficiary countries (Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Kosovo*[7], Montenegro, Serbia and Turkey). In addition the other ministries and other bodies and institutions will need to be actively engaged in so far as their work is relevant for the scope of ECRAN (such as in the fields of energy, transport, agriculture, economy, health, finance), environment and other agencies, statistical institutions, inspectorates, and other relevant central, regional and local public authorities working on climate issues in the beneficiary countries, environmental NGOs. Other stakeholders will be involved as appropriate.

The ECRAN beneficiaries are expected to nominate the National ECRAN Climate Coordinators who will have a role of steering and advisory function as under the RENA. In order to strengthen the inter-institutional cooperation in the ECRAN activities, **National Advisory Boards** are requested to be set-up in the ECRAN

[7] This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ opinion on the Kosovo declaration of independence.

beneficiaries, consisting of the relevant line Ministries with a role in relevant climate change policy development and implementation (eg Environment, Energy, Transport, Economy, Agriculture, etc.).

Objectives

Overall objective

The overall objective is to strengthen regional cooperation between the EU candidate countries and potential candidates in the fields of environment and climate action and to assist them on their way towards the transposition and implementation of the EU environmental and climate policies and instruments which is a key precondition for EU accession.

Specific objectives

This Working Group's objective is to provide the essential elements for the establishment and contribute to a fully functioning monitoring mechanism of greenhouse gas emissions in the beneficiaries, in line with the EU Monitoring Mechanism Regulation.

The following results are expected for this Working Group

- Improved overall quality of the GHG inventory work in the beneficiariy countries
- Institutional, legal and procedural arrangements identified for a national system which is linked to the planning, preparation and management of the inventory
- Improvement of the data quality and technical capacity for preparing GHG emissions inventory elements of the biennial reports and national communications

Task 2.1: Capacity building on GHG inventory process for the Energy Sector (CRF Sector 1) in line with the MMR and the UNFCCC requirements

This will include field training for staff compiling the National Inventories and National Communications. Purpose of the field training is to fill gaps and check the quality of implemented emission factors and reported Activity Data (ADs) for **fuel combustion activities (CRF 1.A) and fugitive emissions from fuels (CRF 1.B)** in the RENA beneficiaries. As a reference the latest submitted GHG data on fuel combustion in the framework of RENA's Activity Scheme 2.2 (EU Monitoring Mechanism scheme) will be used. The results will feed into an assessment report and a regional training workshop, and are meant to improve the activity data. If gaps are detected, proposals will be presented to rectify these. Proposals for improvement in line with the IPCC Good Practice Guidance will be made. In addition to the previous activities in the framework of RENA, a new CRF source category, i.e. fugitive emissions from fuels, will be introduced in the training exercise in order to improve completeness of emissions estimates from the Energy sector.

The training programme on the subject will be provided in three modules. In order to ensure the optimal results, participation from the beneficiary countries will have **to be continuous** for all three modules

The following sub-tasks will be implemented in the framework of this task:

- ***Sub-Task 2.1 A:*** *Module 1: Regional training on GHG inventory development process with a focus on the energy sector*
- ***Sub-Task 2.1 B:*** *Module 2: Regional training on handling the CRF Reporter software and tier 1 uncertainty assessment*

- ***Sub-Task 2.1 C:*** *Module 3: Field training on assessment of GHG inventories from the fuel combustion activities and fugitive emissions from fuels*

Hereafter a detailed description of deliverables is described:

Sub-Task 2.1 - A: Module 1: Regional training on GHG inventory development process with a focus on the energy sector

Module 1 will be the first step: Module 1 will include a three days regional training on utilizing the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories,* the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and elements of *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* for the fuel combustion activities and fugitive emission from fuels. The training will focus on inventory development process, including planning, preparation and management as described in CMP Decision 19/CMP.1 Guidelines for national systems under Article 5.1. of the Kyoto Protocol and the application of the decision tree approach in order to select steps which is need to be followed to develop GHG inventory for the Energy sector in accordance with the principles of good practice and according to national circumstances.

Section 2. GHG emission estimation from Energy sector

Structure of the Energy sector (CRF 1)

According to the Common Reporting Format (CRF) Energy sector includes two major source categories:

- A. Fuel Combustion Activities
- B. Fugitive Emissions from Fuels

A. Fuel Combustion Activities includes:

CRF	Cross-reference with energy balance
1. Energy Industries	
a. Public Electricity and Heat Production	***Transformation sector (***Thermal power plants, Public cogeneration plants and Public heating plants) ***Energy sector own use*** (Thermal power plants and Public cogeneration plants)
b. Petroleum Refining	***Transformation sector (***Petroleum Refineries and Industrial cogeneration plants in petroleum Refineries) ***Energy sector own use*** (Petroleum Refineries)
c. Manufacture of Solid Fuels and Other Energy Industries	***Transformation sector (***NGL-plant, Gas works, Industrial cogeneration plants in gas productin) ***Energy sector own use*** (NGL-plant, Gas works)
2. Manufacturing Industries and Construction	Industrial cogeneration plants Industrial heating plants Industry
a. Iron and Steel	Industrial cogeneration plants for Iron and steel pr. Industrial heating plants for Iron and steel pr Industry for Iron and steel pr
b. Non-Ferrous Metals	Industrial cogeneration plants for Non-ferrous metals Industrial heating plants for Non-ferrous metals

	Industry for Non-ferrous metals
c. Chemicals	Industrial cogeneration plants for Chemicals Industrial heating plants for Chemicals Industry for Chemicals
d. Pulp, Paper and Print	Industrial cogeneration plants for Pulp, Paper… Industrial heating plants for Pulp, Paper Industry for Pulp, Paper and Print
e. Food Processing, Beverages and Tobacco	Industrial cogeneration plants for Food Processing Industrial heating plants for Food Processing Industry for Food Processing
f. Other *(as specified in table 1.A(a) sheet 2)*	
Mineral industry	Industrial cogeneration plants for Mineral Industry Industrial heating plants for Mineral Industry Industry for Mineral Industry Other sectors- Construction
Petrochemical Production	
3. Transport	
a. Civil Aviation	Air, domestic
b. Road Transportation	Road transport Public transport
c. Railways	Rail transport
d. Navigation	Sea and River
e. Other Transportation *(as specified in table 1.A(a) sheet 3)*	
Other non-specified	
4. Other Sectors	

a. Commercial/Institutional	Other Sectors- Services
b. Residential	Other Sectors- Households
c. Agriculture/Forestry/Fisheries	Other Sectors- Agriculture
5. Other *(as specified in table 1.A(a) sheet 4)*	
a. Stationary	
Other non-specified	
b. Mobile	
Other non-specified	

B. Fugitive Emissions from Fuels includes:

1. Solid Fuels
a. Coal Mining and Handling
b. Solid Fuel Transformation
c. Other *(as specified in table 1.B.1)*
Other non-specified
2. Oil and Natural Gas
a. Oil
b. Natural Gas
c. Venting and Flaring
Venting
Flaring
d. Other *(as specified in table 1.B.2)*
Other non-specified

In addition, Energy sector in CRF reporting tables includes so called Memo items with following explanation:

Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the Energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-Use Change and Forestry sector.

Methodological guidance

The methodologies used in the calculation of CO_2 emissions are based on:

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Revised Guidelines) and
- IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC Good Practice Guidance or GPG) prepared by the Intergovernmental Panel on Climate Change (IPCC).

Copies in both electronic format and hard-copy of IPCC Guidelines and IPCC Good Practice Guidance were provided to training teams.

Activity data (AD)

Fuel combustion activities

Activity data which are commonly used for estimation of GHG emissions from fuel combustion activities from energy sector includes primarily data from national energy balance, which could be prepared according to International Energy Agency (IEA) or Eurostat methodology and nomenclature.

There are cases when country-specific energy balances are available which contains more detailed activity data on different aspects of fuel production and consumption.

Energy balance for each type of energy carriers, including fossil fuels, includes data on:

- production
- imports
- exports
- international marine bunkers
- stock changes
- total primary energy supply
- transformations
- distribution losses
- final consumption

Sectors which are included in energy balance are:

- Energy sector
- Industry sector
- Transport sector
- Other sectors
- Non-energy use (fuels used as a feedstock)

Types of energy carriers/fuels according to IEA nomenclature are:

- coal
- crude oil
- petroleum products
- natural gas
- hydro
- geothermal, solar, wind
- combustable renewable energy sources and waste
- electricity

Types of energy carriers/fuels according to Eurostat nomenclature are:

- hard coal
- coke
- lignite
- crude oil
- feedstocks
- refinery gas
- LPG
- motor spirit
- kerosens, jet fuels
- naphta
- gas/diesel oil
- residual fuel oil
- other petroleum products
- natural gas
- derived gas
- total RES (solar heat, geothermal heat, biomass, wind energy, hydro energy, derived heat)
- electrical energy

Other sources of activity data (bottom-up) which are used for estimation of GHG emissions from energy sector include:

- Annual GHG Emission Reports which are part of EU ETS, and/or
- Reports which are prepared under E-PRTR reporting cycle

To avoid double counting, amount of fuel(s) which is(are) finally consumed at facility level should be reconsiled with data from energy balance in a manner that these amounts should be deducted from total amounts from energy balance.

Energy balance used for training purposes is prepared in separate .xls file. Be aware that energy carriers/fuels are presented in natural units (1.000 t, 1.000.000 m^3).

Fugitive emissions from fuels

This category includes all emissions from mining, production, processing, transportation and use of fossil fuels. During all stages from the extraction of fossil fuels to their final use, the escape or release of gaseous fuels or volatile components may occur.

Solid fuels

All underground and opencast coal mines release methane during their regular operation. The amount of methane generated during mining is primarily a function of the coal rank and mining depth, as well as other factors such as moisture. After coal has been mined, small amounts of methane retained in coal are released during post-mining activities, such as coal processing, transportation and utilization.

Oil and natural gas

This category includes the fugitive emission from production, refining, transportation, processing and distribution of crude oil or oil products and gas. The fugitive emission also includes the emission which is the result of incomplete combustion of gas during flaring, and the emission from venting during oil and gas production.

Feedstock and non-energy use of fuels

The feedstock use of energy carriers occurs very commonly in chemical and petrochemical industry (natural gas consumption for ammonia production, production of naphtha, ethane, paraffin and wax), construction industry (bitumen production), and other products such as motor oil, industrial oil, grease etc.

As a result of non-energy use of bitumen in construction industry there is no CO_2 emission because all carbon is bound to the product. The fraction of carbon stored in products is suggested in Revised 1996 IPCC Guidelines (Workbook, auxiliary worksheet 1-1. page 1.37).

The CO_2 emissions from natural gas which is used as fuel in ammonia production are calculated under Manufacturing Industries and Construction, Petrochemical Production (1.A.2.f), while emissions of CO_2 from natural gas which used as feedstock are calculated under Ammonia production (2.B.1). Natural gas which is used as fuel in ammonia production is defined as the difference between the data on non-energy use of natural gas in energy balance and data on consumption of natural gas used as a feedstock which could be collected by survey of ammonia manufacturer.

Carbon Emission Factors and Net Calorific Values (NCV)

For Carbon Emission Factors (CEF) and selected Net Calorific Values (NCV) please check The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook in Chapter 1. Energy, page 1.6. and other chapters which will be provided by traineers.

Alternative (re)calculation methods

One of the main goals in developing emission inventory is to systematically manage methodological change over time and ensure that trends in national emissions are consistently estimated.

Several alternative (re)calculation techniques are available. Each technique is appropriate in certain situations, as determined by considerations such as data availability and the nature of the methodological

modification. Selecting an alternative technique requires evaluating the specific circumstances, and determining the best option for the particular case. The principal approaches for inventory recalculations are summarised in table below and described in more detail below. These approaches can be applied at the level of the method (in the case of a methodological change) or at the level of the underlying data (in the case of a methodological refinement).

Approach	Applicability	Comments
Overlap	Data necessary to apply both the previously used and the new method must be available for at least one year.	• Most reliable when the overlap between two or more sets of annual emissions estimates can be assessed. • If the relationship observed using the two methods is inconsistent, the recalculation should be based on two or more annual emissions estimates. • If the emission trends observed using the previously used and new methods are inconsistent and random, this approach is not *good practice*.
Surrogate Method	Emission factors or activity data used in the new method are strongly correlated with other well-known and more readily available indicative data.	• Multiple indicative data sets (singly or in combination) should be tested in order to determine the most strongly correlated. • Should not be done for long periods.
Interpolation	Data needed for recalculation using the new method are available for intermittent years during the time series.	• Emissions estimates can be linearly interpolated for the periods when the new method cannot be applied.
Trend Extrapolation	Data for the new method are not collected annually and are not available at the beginning or the end of the time series.	• Most reliable if the trend over time is constant. • Should not be used if the trend is changing (in this case, the surrogate method may be more appropriate). • Should not be done for long periods.

Source: IPCC Good Practice Guidance

Section 3. Exercise instructions

Introduction

Main goal of this exercise it to simulate key steps in GHG emission inventory development process with focus on inventory preparation phase for energy sector (CRF 1), and within a given training timeframe.

As part of the inventory preparation, each training team (TT) shall perform following activities according to Decision 19/CMP.1 Guidelines for national systems:

1. Compile sufficient activity data, process information, emission factors and other calculation parameters as are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources in Energy sector;
2. Prepare CO_2 emissions estimates in accordance with the methods described in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by the IPCC good practice guidance;
3. Compile the national inventory in part related to Energy sector (CRF 1) in accordance with Article 7, paragraph 1, and relevant decisions of the COP and/or COP/MOP.

To this end, final result of this training exercise will be:

- Filled CRF tables 1s1, 1s2, 1.A(a)s1, 1.A(a)s2, 1.A(a)s3 and 1.A(a)s3
- Preparation of draft chapter Energy (CRF 1), including:
  - Short overview of energy sector (level and trend)
  - Short overview of CO_2 emissions from Energy sector (level and trend)
  - Short description of methodology, alternative calculation methods used, NVC and EFs applied

Calculation sheets

In order to streamline training exercise, training teams will use **CRF 1 Exercise Package** prepared by training instructors, which includes:

- Energy balance (natural and energy units) and CO_2 calulation for the period 2011-2013
- CRF tables for Energy sector for 2011, 2012 and 2013

Energy balance is given in natural units and trainees shall prepare energy balance in energy units by converting it to common energy unit – TJ; same template will be used for CO_2 emissions calculation; most EFs, NCV and oxidation factors are included in energy balance. Be aware that some AD as well as EFs, NVC and oxidation factors are missing and they should be extracted from IPCC guidelines.

Specific tasks in exercise

Training exercise includes several specific tasks in order to complete emission trend, as follows:

1. Third phase of the EU ETS has started on 1 January 2013. Country decided to use verified GHG emission reports which are due 31 March each year for previous calendar year. In this regard, coal fired power plant "Alpha" which has two combustion units "Alpha 1" and "Alpha 2" had submitted its 2013 GHG emission report for verification to accredited verifier. Please find below activity data which have to be used for CO_2 emission calculation in source category 1A1a Public electricity and heat production.

   a) Calculate CO_2 emissions per unit and total emission per facility;
   b) Estimate consumption of hard coal in 2011 (indicated in red colour as NA – not available) using one of alternative techniques provided in Section 2.

EU ETS facility	Fuel oil	Diesel	Hard coal
"Alpha 1" unit			
a) fuel consumption	193.476 t	0.328 t	296,779.000 t
b) NCV	0.043000 TJ/t	0.043000 TJ/t	0.024568 TJ/t
c) EF	74.000 t CO_2/TJ	74.000 t CO_2/TJ	93.099 g CO_2/MJ
"Alpha 2" unit			
a) fuel consumption	847.110 t	0.291 t	558,689.000 t
b) NCV	0.043000 TJ/t	0.043000 TJ/t	0.024986 TJ/t
c) EF	74.000 t CO_2/TJ	74.000 t CO_2/TJ	93.715 kg CO_2/GJ

2. Data on petroleum refining are missing in energy balance for the entire time series (2011-2013). Competent authority ordered refinery "Bravo" to submitt activity data to inventory compiler asap. Please find in Annex 1. activity data submitted by the refinery "Bravo".

   a) Use information provided by refinery "Bravo" to complete energy balance for entire time series;
   b) Use these activity data to calculate CO_2 emissions from 1A1b Petroleum refining

3. Sector Industry consists of fuel consumption from Industrial cogeneration plants, Industrial heating plants and Industry own use. For 2010 and 2011 fuel consumption for industry own use is divided on appropriate branches, but fuel consumption data from cogeneration and heating plants are not. For dividing fuel consumption in industrial cogeneration and heating plants, weighting factors should be used (see additional table in energy balance for help).

Sub-sectors	Weighting factor
Iron and steal	2.3
Non ferous metals	0.9
Chemicals	14
Pulp paper and print	7.3
Food processing	18.9
Other-Mineral industry	56.6

4. In energy balance total amount of natural gas used in Petrochemical industry is specified as Non-energy use. But, for the purpose of emission calculation for Industrial processes emissions, data on consumption of natural gas used as a feedstock were collected by survey of ammonia manufacturer - Fertilizer Company "Charlie".

   To calculate emissions use the approach that you consider correct (only balance or balance and survey data).

Year	Natural gas consumption / m^3
2011	267,670,049
2012	273,062,475
2013	263,268,440

5. In energy balance for 2013 only aggregated fuel consumption data for Other sectors are collected. Fuel consumption data have to be divided on appropriate subsectors using one of alternative techniques provided in Section 2. and activity data in previous years.

   Additional tasks:

6. For estimating fugitive emissions from fuels please use following information:

   1B1 Fugitive Emissions from Solid Fuels

Year	2011	2012	2013
Coal produced (Mt)	0.1737	0.154797	0.120274

   1B2 Fugitive Emissions from Oil, Natural Gas and Other Sources - Data on numbers of wells drilled for oil and natural gas are gathered. All other data for emission calculation are given in energy balance.

Year	2011	2012	2013

Oil wells (number)	674	660	593
Gas wells (number)	124	128	132

Task for real survivors:

7. For the purpose of negotiation under Effort Sharing Decision (ESD) calculate positive reduction target for Energy sector which equals +10 per cent in comparison to average emissions from Energy sector calculate in the period 2011-2013. Draw a trajectory of Annual Emission Allowances (AEA) in the period 2014-2020.

Annex.

Fuel type		Production			Transformation cogeneration plant			Transformation process			Own use		
	unit	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
Liquefied petroleum gases	1000 t	245.7	214.4	238.7			0.5						2.2
Unleaded motor gasoline	1000 t	986.1	871.1	990.4									
Standard motor gasoline	1000 t	107.7	0.0	0.0									
Petroleum	1000 t	0.1	0.0	0.0									
Jet fuel	1000 t	94.5	117.2	97.1									
Diesel oil	1000 t	1079.0	933.8	1132.8									
Light heating oil	1000 t	227.7	196.9	153.5									
Low sulphur fuel oil	1000 t	26.6	10.3	0.0									
Standard fuel oil	1000 t	841.6	721.1	562.5	185.9	156.7	131.0				58.5	39.6	22.3
Naphta	1000 t	66.2	90.1	59.0				22.9	23.2	23.4			
White spirit	1000 t	0.0	0.0	0.0									
Bitumen	1000 t	66.5	49.5	25.6									
Other oils	1000 t	13.3	9.0	12.1									
Lubricants	1000 t	0.0	0.0	0.0									

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Petroleum coke	1000 t	101.7	64.6	84.7	4.8	2.8	3.3				51.1	41.1	51.2
Ethan	1000 t	0.0	0.0	0.0									
Other derivates	1000 t	213.4	46.0	55.0									
Refinery gas	1000 t	161.5	267.1	293.8	9.0	2.5	9.2				152.5	264.6	284.6
Natural gas	1000000 m3	0.0	0.0	0.0		11.8		10.5			16.6		4.9
Refinery semiproducts	1000 t							5.6	186.5	438.3			
Additives	1000 t							67.6	77.6	63.3			

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