Environment and Climate Regional Accession Network ECRAN

Environment and Climate Regional Accession Network (ECRAN)

ECRAN -TAIEX Multi-Beneficiary Workshop on Modelling: Module 3

21-24 September 2015, Zagreb

Enviroment and Climate Regional Accession Network ECRAN

ENVIRONMENTAL AND CLIMA REGIONAL NETWORK FOR ACCESSION - ECRAN

WORKSHOP REPORT

Activity No 3.1. SUBTASK 1.1-C

ECRAN -TAIEX MULTI-BENEFICIARY WORKSHOP ON MODELLING: MODULE 3

PRACTICAL TRAINING ON QUANTITATIVE MODELS AND SCENARIO DEVELOPMENT TO BE USED TO ASSESS CLIMATE AND ENERGY POLICY OPTIONS AND TO SET EMISSION TARGETS

21-24 September 2015, ZAGREB, CROATIA

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

Table of Contents

I. Background/Rationale 1

II. Objectives of the training 3

General objectives 3

Specific objectives 3

Results/outputs 3

III. EU policy and legislation covered by the training 5

IV. Highlights from the training workshop 8

V. Evaluation 16

ANNEX II – Participants 28

ANNEX III – Presentations (under separate cover) 32

ANNEX IV – Exercises given to participants to be completed before module 4 33

LIST OF ABREVIATIONS	
CBA	Cost Benefit Analysis
EE	Energy Efficiency
ETS	Emission Trading System
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IEA	International Energy Agency
IEA DSM	International Energy Agency Demand Side Management Programme
LEAP	Long-range Energy Alternatives Planning System
MACC	Marginal Abatement Cost Curve
MMR	Monitoring Mechanism Regulation
MS	Member State
PAM	Policies and Measures
RES	Renewable Energy Sources
SEI	Stockholm Environment Institute
SLED	Support for Low Emission Development
UNFCCC	United Nation Framework Convention on Climate Change

I. Background/Rationale

There is a need to start developing concrete climate policies based on full alignment with the EU Climate acquis and GHG emission reduction target setting. At present the absence of national or regional targets and roadmaps towards implementation of these targets hamper the development of robust climate policies in the region and thus low emission development. ECRAN could provide the platform to start a regional work on this topic. Climate policy related strategy development as well as fulfilling the reporting requirements of Annex I countries towards the UNFCCC, similarly to the EU acquis requires detailed modelling of emission scenarios on country level.

In most ECRAN beneficiaries there is experience in modelling aided scenario work, especially in the framework of the preparations of National Communications. However, in many cases this work has been designed and outsourced by international organisations or other external organisations without adequate involvement or ownership of the results by the countries. As such, the knowledge base within the administrations on modelling aided scenario work is limited.

In terms of technical requirements, the focus of the training will be on one specific modelling platform, the Long-range Energy Alternatives Planning System (LEAP*)* which has been developed by the Stockholm Environmental Institute. Of the 8 beneficiaries 6 are already using LEAP, and one (Kosovo*[1]) has expressed interest in using it. The training program will be organized into four modules to be conducted during one year:

- Module 1 – Introduction to modelling techniques and assessing data needs for the base year;
- Module 2 – Development of a baseline (without measures) scenario;
- Module 3 – Development of with measures and with additional measures scenarios and sensitivity analysis and CBA;
- Module 4 – Gap analysis and identification of further technical capacity building needs

The modules 1 and 4 will be organized back to back with Regional Training Workshops to ensure that capacity building of technical skills is delivered in combination with capacity building related to the selected EU Climate Acquis. This integrated delivery of capacity building related to policy and technical skills will increase the understanding of modelling as a policy tool which can promote policy-making based on evidence and analysis.

As the aim of the exercise is to increase capacity in public administrations, the tasks will as a general rule, target staff working at the public administration. In particular, the involvement of staff working on the climate, energy and transport policy in ministries, in providing technical support at government agencies and bodies, as well as staff, working at national statistical offices, is desirable. However, the heterogeneity of institutional arrangements for modelling among the ECRAN beneficiaries warrants a flexible approach in selecting the target audience of the trainings and follow-up activities. In some cases the national public administrations are working together closely with academia and prefer the continuation of existing working arrangements. In addition, although a general focus of capacity building activities on the public administrations seems to be the preferred option, low levels of

[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.

capacity and overburdened staff may be an obstacle to active participation in trainings and follow-up activities. In such cases targeting academia in addition to staff of public administrations may be a better solution than inadequate participation on behalf of some of the beneficiaries.

To ensure active participation, ECRAN beneficiaries will be asked to commit that the experts nominated for the bottom-up exercise are allowed sufficient time for carrying out the work required under the different tasks, including attending seminars and conducting the follow-up activities. Experts from the beneficiaries are expected to spend 12 days participating in workshops, and a minimum of 15 days in follow-up activities implementing the regional pilot modelling exercise. The ECRAN team will be monitoring work progress to ensure that the exercise, which requires a significant commitment, is advancing as foreseen.

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

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 as a key precondition for EU accession.

Specific objectives

The specific objective of the training program is to increase technical capacities in the countries to allow them to carry out modelling of emission scenarios. The modelling aided scenario work will benefit countries by helping them meet their future EU and UNFCCC reporting requirements, and to form a rational position on national efforts contributing to the EU 2050 roadmap and the 2030 Framework. It may also assist them by promoting evidence based planning in energy policy, including development of an energy strategy, energy efficiency action plan and a renewable energy action plan.

Depending on the circumstances of the national public administrations and their future plans to build modelling capacity inside or outside the public administration, the technical modelling skills can be used in one of two ways. If the chosen option is to carry out modelling work within the public administration the exercise will help building technical capacity and will provide a basis for future work. If the chosen option is to outsource modelling work, the exercise can help beneficiaries gain a better understanding of modelling work which will enable better communication with consultants, thereby ensuring that modelling is relevant to policymakers and that policymakers understand the limits of the work and are able to better interpret the results.

Results/outputs

The following results were expected from the regional exercise:

- The training workshop contributes to building technical capacities to carry out modelling of emission scenarios.
- The training enhances a better understanding of modelling work which will ensure that (future) modelling is relevant to policymakers and that policymakers understand the limits of the work and are able to better interpret the results
- The training provides a proper introduction on LEAP as well as provides the initial steps in filling the LEAP structure with country relevant data and building up a basic model
- The regional network of experts is strengthened.

Aim of the workshop in Zagreb (21-24 September 2015)

The first four-day long meeting was organized in Skopje in November 2014 and aimed to give an introduction to the participants to the policy environment, give an introductory training on LEAP as well as provide initial steps in filling the LEAP structure with country relevant data, building up the basic model. The second workshop was organised in Istanbul on 26-28 May 2015 and aimed to further

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

build analytical capacity of participants. The focus of the training was on the definition of scenario types, definition and reporting on policies and measures, projections of drivers of future emissions, costs of technologies. The third workshop, held in Zagreb, aimed to further increase the knowledge of participants on scenario development and on cost-benefit analysis of the different scenarios.

The beneficiaries of the training are the Ministries of Environment of the beneficiary countries who participated in the Module 2 training. Other participants are not accepted as prior knowledge of the LEAP modelling platform is a prerequisite of participation.

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

III. EU policy and legislation covered by the training

- **Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism 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. This regulation lays down a mechanism for monitoring and reporting GHG emissions and for reporting other information at national and EU level relevant to climate change. These provisions also apply to:
    - Reporting on the EU and its MS low-carbon development strategies;
    - GHG emissions from sectors and sources and the removals by sinks covered by the national GHG inventories;
    - GHG emissions;
    - The non-CO2 related climate impacts, which are associated with emissions from civil aviation;
    - the EU and its MS's projections of anthropogenic emissions by sources and removals by sinks of GHG not controlled by the Montreal protocol, and the MS' policies and measures relating thereto;
    - MS' actions to adapt to climate change.

- **The 2030 Framework for climate and energy policies**

EU leaders agreed on 23 October 2014 to the internal 2030 greenhouse gas reduction target of at least 40% compared to 1990 together with the other main building blocks of the 2030 policy framework for climate and energy, as proposed by the European Commission in January 2014. This 2030 policy framework aims to make the European Union's economy and energy system more competitive, secure and sustainable and also sets a target of at least 27% for renewable energy and energy savings by 2030.

While the EU is making good progress towards meeting its climate and energy targets for 2020, an integrated policy framework for the period up to 2030 is needed to ensure regulatory certainty for investors and a coordinated approach among Member States.

The framework presented will drive continued progress towards a low-carbon economy. It aims to build a competitive and secure energy system that ensures affordable energy for all consumers, increases the security of the EU's energy supplies, reduces our dependence on energy imports and creates new opportunities for growth and jobs.

- Reducing greenhouse gas emissions by at least 40%

  A centre piece of the framework is the binding target to reduce EU domestic greenhouse gas emissions by at least 40% below the 1990 level by 2030.

  This target will ensure that the EU is on the cost-effective track towards meeting its objective of cutting emissions by at least 80% by 2050. By setting its level of climate ambition for 2030, the EU will also be able to engage actively in the negotiations on a new international climate agreement that should take effect in 2020.

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

To achieve the overall 40% target, the sectors covered by the EU emissions trading system (EU ETS) would have to reduce their emissions by 43% compared to 2005. Emissions from sectors outside the EU ETS would need to be cut by 30% below the 2005 level. This will need to be translated into Member State targets. The European Council has outlined the main principles to achieve this.

- Increasing the share of renewable energy to at least 27%

  Renewable energy will play a key role in the transition towards a competitive, secure and sustainable energy system. The Commission proposed an objective of increasing the share of renewable energy to at least 27% of the EU's energy consumption by 2030. The European Council endorsed this target which is binding at EU level.

- Increasing energy efficiency by at least 27%

  The European Commission proposed a 30% energy savings target for 2030, following a review of the Energy Efficiency Directive. The proposed target builds on the achievements already reached: new buildings use half the energy they did in the 1980s and industry is about 19% less energy intensive than in 2001. The European Council, however, endorsed an indicative target of 27% to be reviewed in 2020 having in mind a 30% target.

- Reform of the EU emissions trading system

  The EU ETS will be reformed and strengthened. A 43% greenhouse gas reduction target in 2030 in the ETS translates into a cap declining by 2.2% annually from 2021 onwards, instead of the rate of 1.74% up to 2020.

  In January 2014 the Commission proposed to establish a market stability reserve from 2021 onwards. This is to address the surplus of emission allowances in the EU ETS that has built up in recent years and to improve the system's resilience to major shocks. This will ensure that in the future the EU ETS is more robust and effective in promoting low-carbon investment at least cost to society.

  The European Council underlined that a reformed, well-functioning ETS with an instrument to stabilise the market in line with the Commission's proposal will be the main instrument to achieve greenhouse gas emission reductions.

- New governance system

  The 2030 framework proposed a new governance framework based on national plans for competitive, secure and sustainable energy as well as a set of key indicators to assess progress over time. The European Council agreed that a reliable and transparent governance system will be developed to help ensure that the EU meets its energy policy goals.

- Effort Sharing

The current Effort Sharing Decision (Decision No 406/2009)) establishes binding annual greenhouse gas emission targets for Member States for the period 2013–2020. These targets

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

concern emissions from most sectors not included in the EU Emissions Trading System (EU ETS), such as transport (except aviation and international maritime shipping), buildings, agriculture and waste. In the framework of the Effort Sharing Decision the sectors covered by the EU Emissions Trading System (EU ETS) would have to reduce their emissions by 30% compared to 2005. Emissions from sectors outside the EU ETS would need to be cut by 10% below the 2005 level.

In the framework of the 2030 Framework, the sectors covered by the EU ETS would have to reduce their emissions by 43% compared to 2005. Emissions from sectors outside the EU ETS would need to be cut by 30% below the 2005 level. This will need to be translated into Member State targets using the same methodology as in the current Effort Sharing Decision (Member State targets will vary between 0% -40%; Current GDP data will be updated; Member States with GDP/capita above the EU average: targets will be adjusted with cost effectiveness). The European Council agreed in October 2014 that a reliable and transparent governance system will be developed to help ensure that the EU meets its energy policy goals.

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

IV. Highlights from the training workshop

Reference is made to Annex I for the agenda, and Annex III for the presentations. Hereunder only a summary is presented of the presentations.

Introduction (Imre CSIKÓS, ECRAN)

PRESENTATIONS

Presentation on development of scenarios (without, with, with additional measures), sensitivity analysis and EU practice (László SZABÓ, REKK)

- Definition of With Existing Measures (WEM), With Additional Measures (WAM) and Without Measures (WOM) scenarios
- List of key factors which determine a scenario (economic development, population growth, fuel and resource prices, technology assumptions)
- Definition of policies and measures (PaMs) and characterisation of PaMs
- List of most relevant policies and measures for decarbonisation scenarios
- Assessment of scenarios
- EU and UNFCCC practice regarding scenarios
- Sensitivity assessment
- Example of national scenarios assessment from the Support for Low Emissions Development in South East Europe (SLED) project

Basic economic concepts of Climate Change (Cost-benefit analysis, MAC curve) (Ágnes KELEMEN, ECRAN)

- Climate/energy policy modelling methodologies:
    - Bottom-up models (e.g. optimisation or simulation engineering models): Detailed and physically realistic energy sector, explicit representation of technologies, use disaggregated data, based on an engineering philosophy, often only single sector and single country, partial equilibrium approach, exogenous inputs for useful energy demand, the drivers of demand (e.g. GDP) and prices
    - Top-down models (e.g. Computable General Equilibrium or econometric models): Aggregate representation with little attempt at physically realistic representation, uses aggregate data, based on economic foundations, focus on entire economy, can be single country, regional or global, general equilibrium approach which can address macro-economic feedbacks, endogenous prices, quantities and GDP.
- Cost-benefit analysis/NPV
    - CBA generally based on market prices, for non-market goods estimation of value needed
    - price only good indicator of value if changes are marginal and if framework conditions (competition, legislative framework, technologies, infrastructure) are unchanged
    - social cost vs private cost
    - fixed vs variable cost

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

- incremental s total cost
- calculation of Net Present Value by discounting difference between benefits and costs and summing
- calculation of equivalent annual cost

- MACC

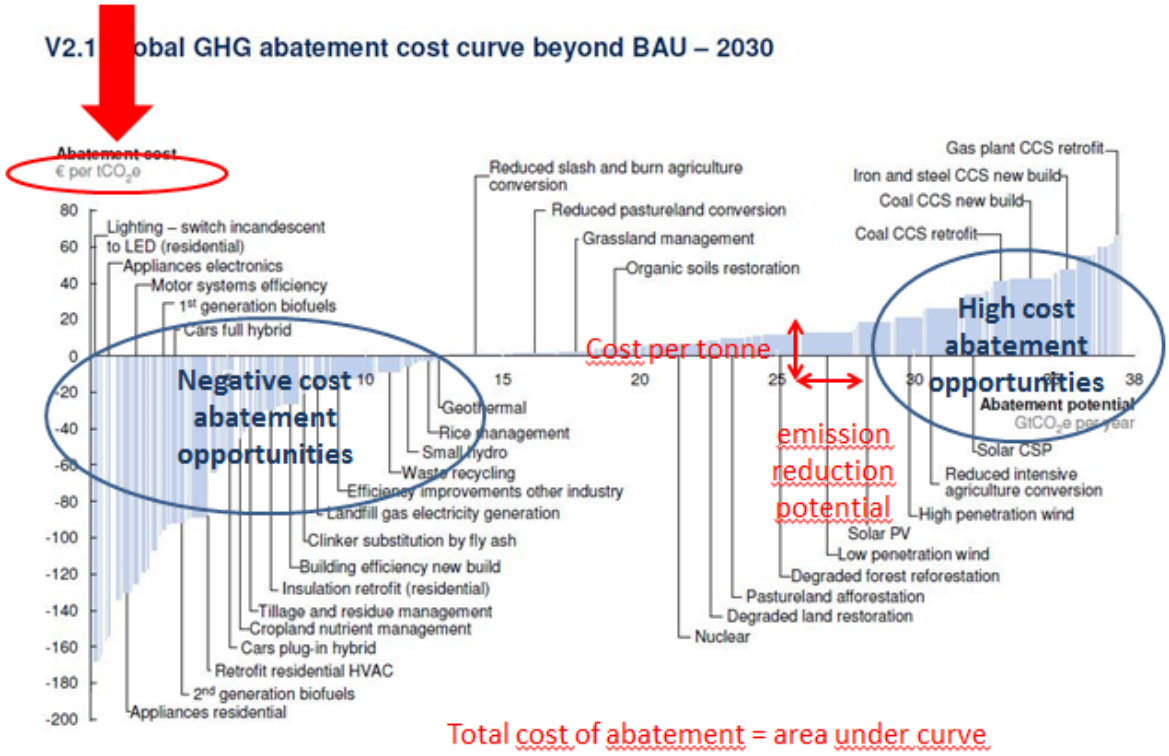


Figure 1. Interpretation of the Marginal Abatement Cost Curve

- Definition of Marginal Abatement Cost Curve (MACC)
- Steps of expert-based MACC calculation
- Differences between a simple expert MACC curve and a MACC generated as an output of modelling

The social discount rate (Ágnes KELEMEN, ECRAN)

- Mechanics of discounting (calculation of NPV and annualised cost)
- Rationale for discounting
  - private costs and benefits
  - social costs and benefits
- Theoretical basis for determining a social discount rate
  - Alternative to the investment?
    - Return on alternative investments by the government
    - Higher taxes crowding out investment or consumption or both (A. Harberger's approach and social cost of capital approach both based on these but use different weighting)
    - Government borrowing rate/government bond interest rates
    - Etc.

  - Optimal growth rate – reflects rate of growth that is optimises consumption over time, taking into account a pure time preference rate
- Demonstration of change in NPV using alternative discount rates
- Concerns of non-economists (sustainability, ethical considerations/intergenerational equity, in contrast to complexity of natural systems, false assumption of economic growth over long time period)
- Alternative approaches to address concerns:
  - Constant discount rate reflecting alternative use of government funds/source of funding
  - Constant but lower discount rate
  - Discount rate which diminishes over time
  - Zero discount rate/negative discount rate?
  - Sensitivity analysis using different discount rates
  - Use positive discount rate but add environmental constraints to avoid unsustainable outcomes

Presentation of country-example on scenarios with measures and additional measures (Tomas AUKŠTINAITIS, Ministry of Environment, Lithuania)

- Overview of Lithuanian situation
- Reporting requirements
  - Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 (hereinafter – MMR)
  - Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 (hereinafter – Implementing Regulation)
  - Biennial report and National communication
- Introduction to key policies and measures in Lithuania
- Introduction to sector-specific policies and measures in Lithuania

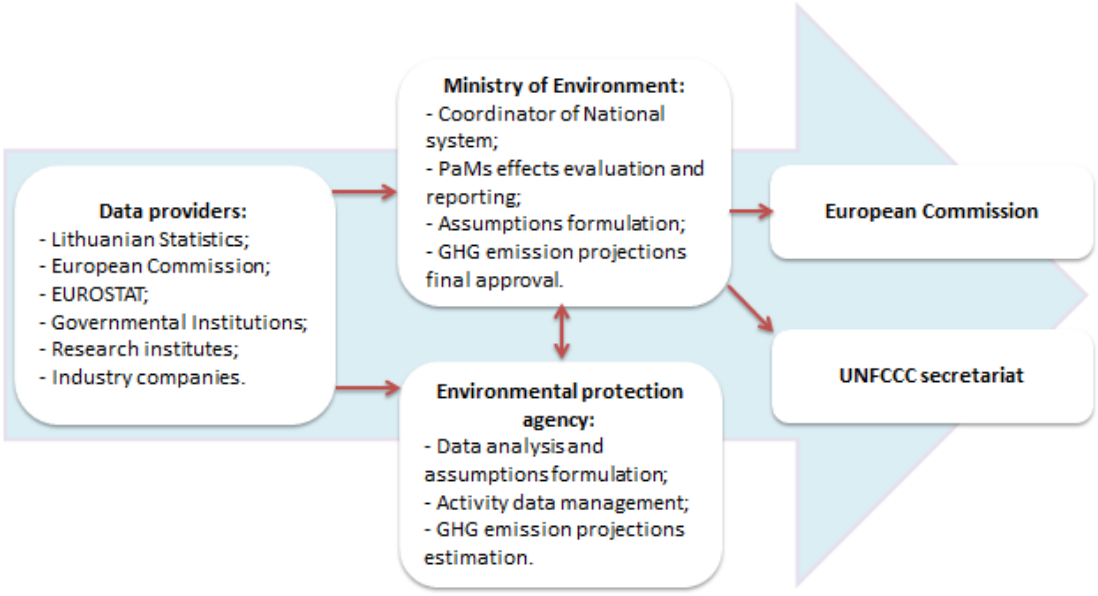


Figure 2. National system for GHG projections in Lithuania

- Steps of preparing GHG emission projections
  - Data gathering from data providers (baseline data, projection parameters, projected activity data from various sectors etc.);
  - Analysis of gathered data (identification of PaMs that have impact on GHG emissions reduction, PaMs allocation according to scenarios (with existing measures or with additional measures);
  - PaMs allocation according to specific sector (public electricity and heat production, road transport, cement production etc.);
  - Review and comparison of additional information (e.g. review of ongoing draft update for National energy independence strategy, Lithuanian energy institute study on development of centralized heat production sector etc.);
  - Consultation with external experts and companies on possible specific sectors developments (electrification of road transport – slow, fast uptake?);
  - Analysis of statistical data (GHG emissions trends, final energy consumption in different sectors etc.);
  - Activity data interpolation/extrapolation (where needed);
  - Calculation of GHG emissions using IPCC methodology based on projected activity data;
  - Comparison of results (e.g. checking if projected GHG emissions are on track with targets set in Strategy for the National Climate Change Management Policy by 2050)

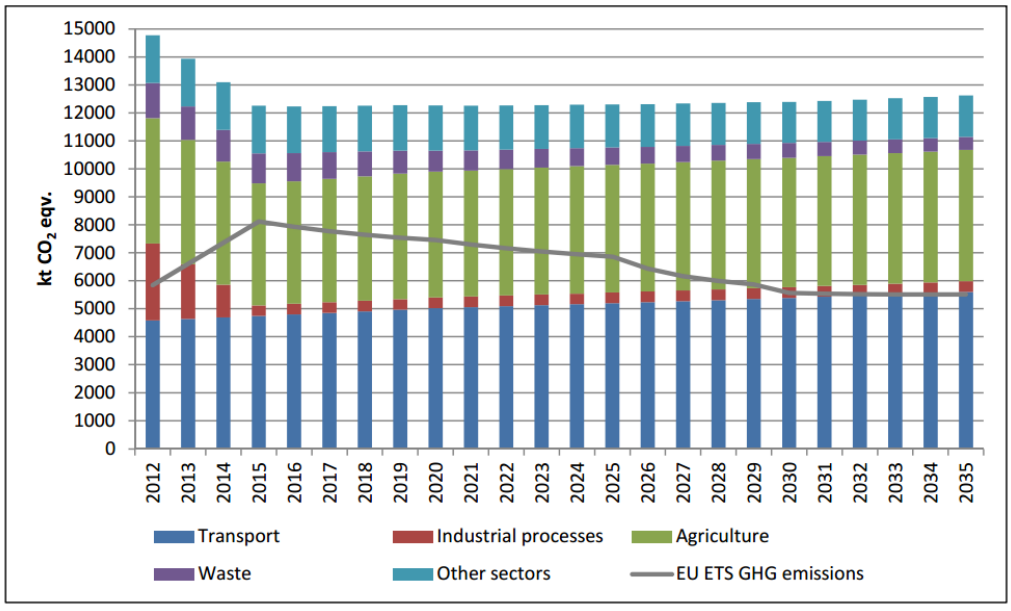


Figure 3. Results of GHG projections

- Sensitivity analysis
- Lessons learned

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

Presentation no. 1. on preparation of the Low-Carbon Development Strategy for Republic of Croatia (Vladimir JELAVIĆ, Valentina DELIJA-RUŽIĆ and Lin HERENČIĆ, Ekonerg)

- Softwares and models
  - Ekonerg model

	Top-down		Bottom-up			
	General equilibrium	Econometric	Focus on demand	Linear programming	Engineering	Simulation
International context						
World market development	I	I				
exchange rate	I	I				
International fuel prices	I	I		I		I
Macro-economic development						
Tax rates, VAT rate, social security contribution rates	I	I				
GDP	O	O				
Employment, unemployment, labour productivity	O	O				
Trade balance						
Government balance	O	O				
Sectoral value added	O	O	I			
Sectoral demand energy	O	O	O	I	I	I
Technologies						
Economic characteristics of technologies				I		I
Physical characteristics of technologies						
power plants				I	I	I
industrial installations				I	I	I
housing stock				I	I	I
Other buildings				I	I	I
transport equipment				I	I	I
Sectoral energy-efficiency improvements			I	O	O	O
Load curve electricity			O	I		
Emissions trading price	I	I		I		
Electricity consumption	O	O	O	I	I	I
Fuel consumption by fuel type	O	O	O	O	O	O
CO_2 emissions	O	O	O	O	O	O

Figure 4. Properties of the Ekonerg model

  - Overview of the EU practice and the software in use
- Development of the model
  - Cooperation with key stakeholders and partners
  - Modelling process
    - Projections of drivers for energy demand by sectors
    - Technical and economical characteristics of energy demand and supply technologies
    - Calibration on the last historical year
    - Expected impacts of existing and additional technologies
    - Expected impacts of existing and additional policy measures
- Overview of the key results
  - Energy demand and supply
  - MACC

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

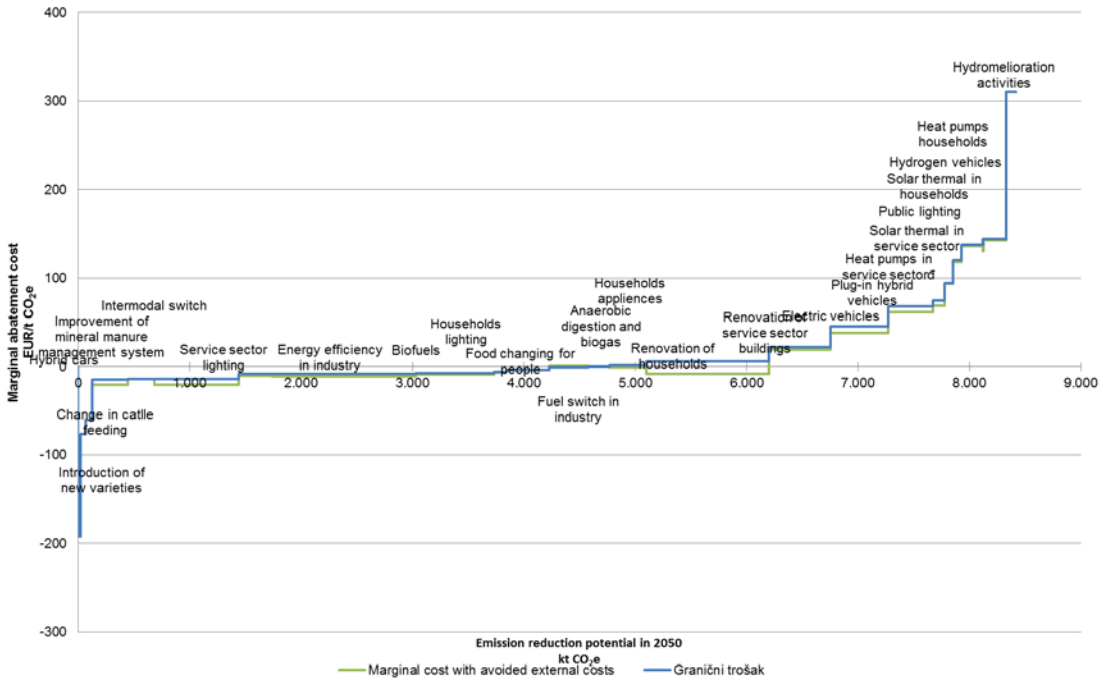


Figure 5. Preliminary results for a MACC for Croatia

- External costs
- CBA
- emissions

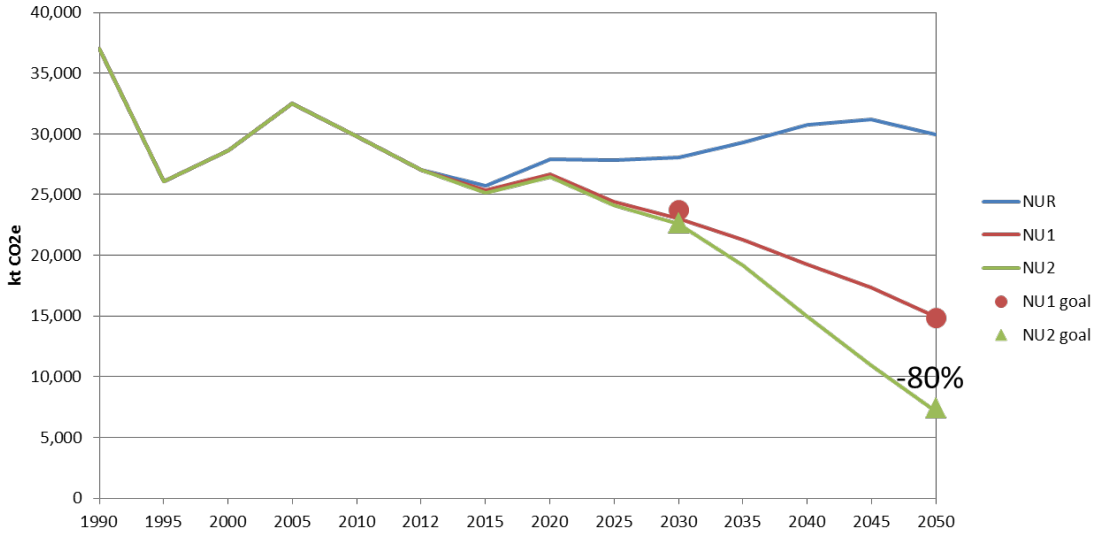


Figure 6. Preliminary results of GHG emission scenarios for Croatia

Presentation no.2. on preparation of the Low-Carbon Development Strategy for Republic of Croatia (Vladimir JELAVIĆ, Valentina DELIJA-RUŽIĆ and Lin HERENČIĆ, Ekonerg)

- Project organization and activities

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

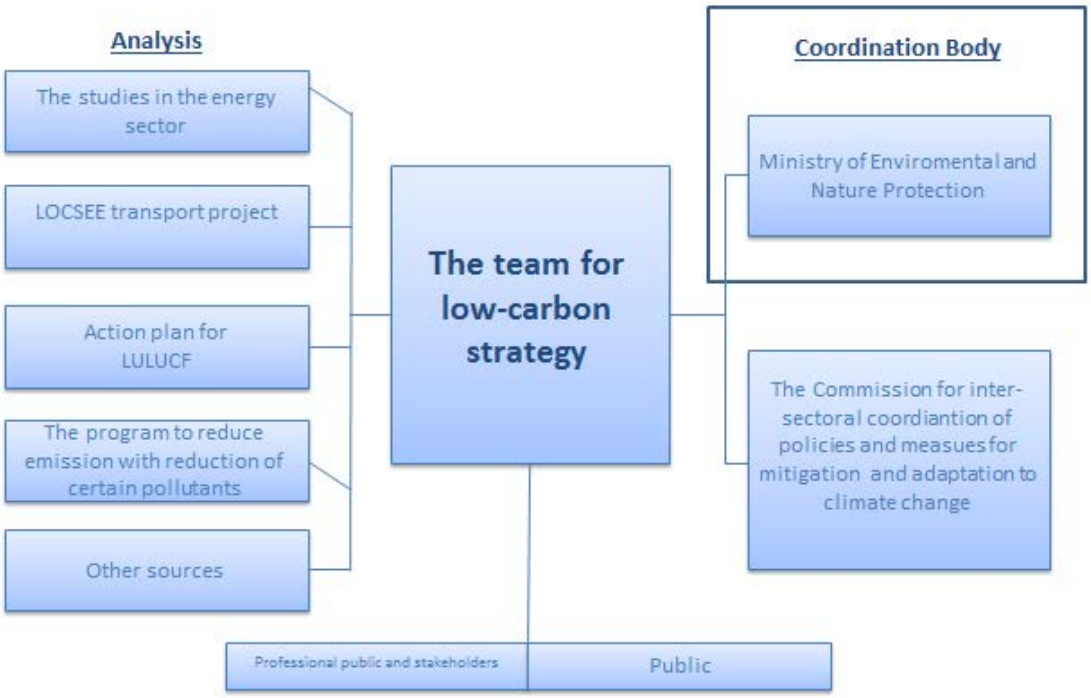


Figure7. Organisation of project team

- SWOT analysis – uncertainties and threats
  - Decrease of oil prices
  - Oil and gas shale exploration
  - Development of technology for capture and storage of CO2
  - Geopolitical uncertainty (Ukraine, Middle East, etc.)
  - Status of nuclear power
  - The success of global agreement on reducing emissions
- Goals
- Scenarios
- Effects of measures

Figure 8. Impacts of emission reduction scenarios

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

- Social Aspects
- Survey

Presentation of the organisation of modelling work for energy and climate policy (Višnja GRGASOVIĆ, Croatian Ministry of Environment and Nature Protection. and Croatian Ministry of Economy)

- Croatian legislation
- Croatian institutional arrangements
- Content of the National Inventory Report

Lessons learned about various modelling exercises in the preparation of INDCs for Albania and Montenegro (Ágnes KELEMEN, József FEILER ECRAN)

- 3 criteria used to assess existing modelling exercises:
    - modelling method
        - Technological explicitness
        - Microeconomic modelling of behaviour
        - Macroeconomic feedbacks
    - reliability of baseyear data and credibility of projections of future drivers
    - scenario definitions
        - Baseline scenario should represent current undertakings, mitigation scenario should go beyond current undertakings
        - Autonomous energy efficiency improvement should be included in baseline
        - Level of ambition should be in line with 2 degree target
        - Commitment should be fair, reflect responsibilities and respective capabilities
- No single model which was satisfactory according to all criteria
- Very different emission trends in baselines and policy scenarios in different models

LEAP TRAINING

Charles HEAPS (Stockholm Environmental Institute – US Center), with the assistance of Anna FLESSA (KEPA), Eleni-Danai MAVRAKI (KEPA), László SZABO (TAIEX), Ágnes KELEMEN (ECRAN)

The training covered the following elements:

- Short Recap of what was taught in Module 2
- Basic concepts of cost-benefit analysis in LEAP and basic concepts
- Practical exercise with the LEAP tool on CBA (Creating policy scenarios and entering costing data)
- Introduction to optimization in LEAP and basic concepts
- Example of optimisation in the electricity sector:
    - entering cost data on electricity generation
    - creating load shapes by importing hourly load data and simulation scenarios
    - incorporating externality values and identifying the least-cost scenario
    - specifying a CO2 cap and relevant results

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

V. Evaluation

Statistical information

1.1	Workshop Session	ECRAN Modelling: Training Module 3
1.2	Facilitators name	As per agenda
1.3	Name and Surname of Participants (evaluators) optional	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. The training workshop contributes/helps us for building technical capacities to carry out modelling of emission scenarios.	IIIII IIIII IIIII IIII (79%)	IIIII (21%)	
2. The training helps us to gain a better understanding of modelling work which will enable us to ensure that (future) modelling is relevant to policymakers and that policymakers understand the limits of the work and are able to better interpret the results.	IIIII IIIII IIIII II (71%)	IIIII II (29%)	
3. The training gave us a proper introduction on LEAP as well as providing insights into Cost benefit analyses issues in the LEAP structure	IIIII IIIII IIIII II (71%)	IIIII II (29%)	

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

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	IIIII IIIII IIII (58%)	IIIII IIII (38%)	I (4%)			
2 The quality of the workshop was of a high standard	IIIII IIIII I (46%)	IIIII IIIII (42%)	III (12%)			
3 The content of the workshop was well suited to my level of understanding and experience	IIIII IIIII I (46%)	IIIII IIII (38%)	III III (12%)	I (4%)		
4 The practical work was relevant and informative	IIIII IIIII II III (50%)	IIIII IIIII (42%)	II (8%)			
5 The workshop was interactive	IIIII IIIII I (46%)	IIIII IIIII I (46%)	II (8%)			
6 Facilitators were well prepared and knowledgeable on the subject matter	IIIII IIIII IIIII I (67%)	IIIII (21%)	III (12%)			
7 The duration of this workshop was neither too long nor too short	IIIII IIIII III (54%)	IIIII IIII (38%)	II (8%)			
8 The logistical arrangements (venue, refreshments, equipment) were satisfactory	IIIII IIIII IIIII IIII (79%)	IIII (17%)	I (4%)			
9 Attending this workshop was time well spent	IIIII IIIII IIIII II (71%)	IIIII I (25%)	I (4%)			

Comments and suggestions

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

Workshop Sessions:

- No comments
- The sessions were not planned as it should be. I could not see the concept of the sessions. A lot of theory without practice. If you want to learn to work with some model you need a lot of practical work with the model
- I hope that we will be invited for the next module
- No suggestions
- All very good (3 x)

Facilitators:

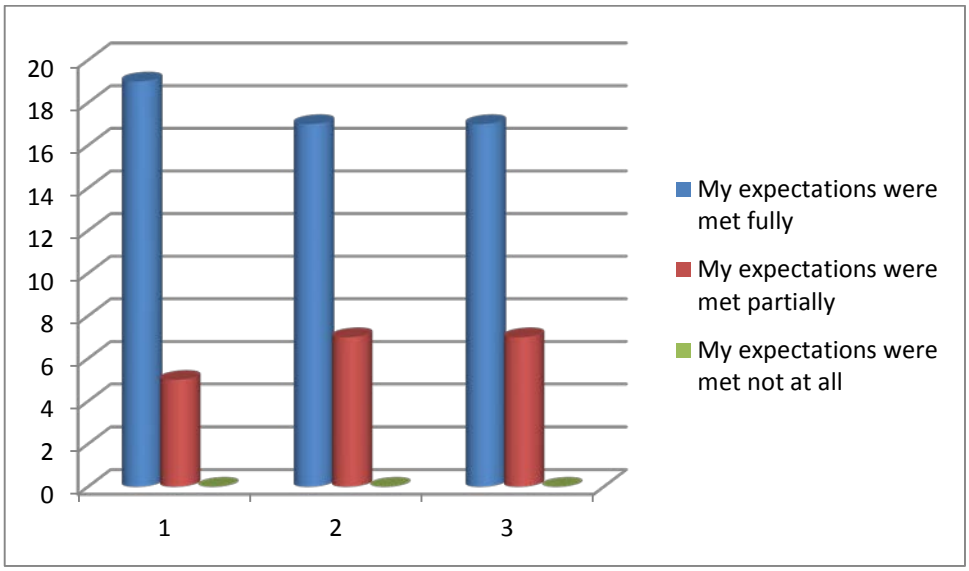
- Very good
- Lot of the facilitators were presenting things that are not relevant to this course. They were spending a lot of time on talking, not on practical work. Some of them do not know how to present.
- Excellent
- I need an intensive study on LEAP

Workshop level and content:

- The workshop was interesting
- Level and content should be focused on the practical work. The aim is to understand the work with LEAP and the modelling with LEAP
- Satisfactory on all levels

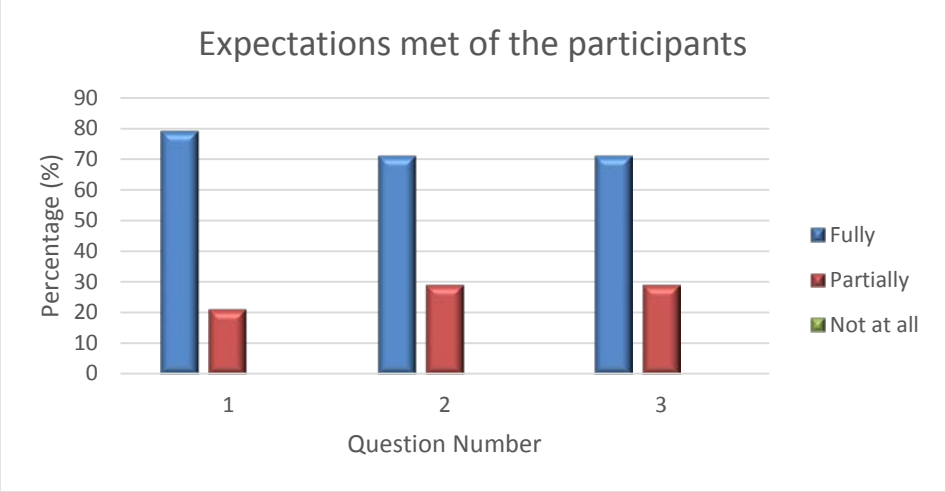
My Expectations

1. The training workshop contributes/helps us for building technical capacities to carry out modelling of emission scenarios.
2. The training helps us to gain a better understanding of modelling work which will enable us to ensure that (future) modelling is relevant to policymakers and that policymakers understand the limits of the work and are able to better interpret the results.
3. The training gave us a proper introduction on LEAP as well as providing insights into Cost benefit analyses issues in the LEAP structure

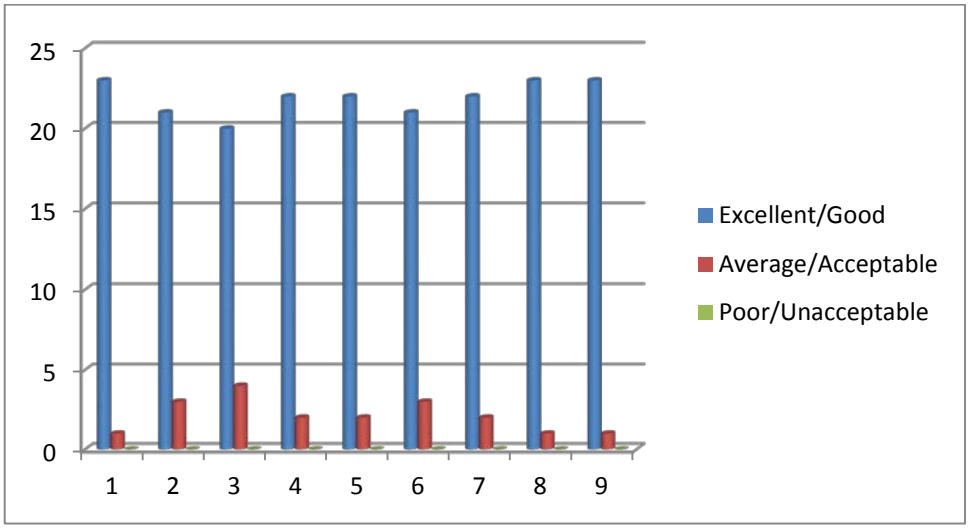


This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

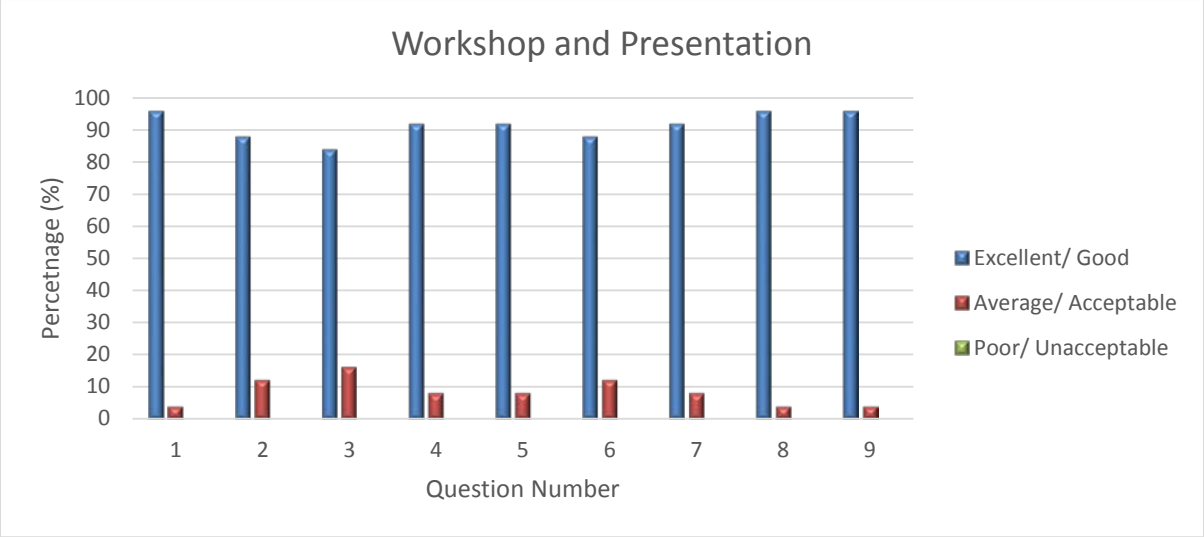


Aspect of Workshop
1 The workshop achieved the objectives set
2 The quality of the workshop was of a high standard
3 The content of the workshop was well suited to my level of understanding and experience
4 The practical work was relevant and informative
5 The workshop was interactive
6 Facilitators were well prepared and knowledgeable on the subject matter
7 The duration of this workshop was neither too long nor too short
8 The logistical arrangements (venue, refreshments, equipment) were satisfactory
9 Attending this workshop was time well spent



This Project is funded by the European Union

A project implemented by Human Dynamics Consortium



This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

ANNEX I – Agenda

Day 1: Monday 21 September 2015

Venue: Zagreb, Croatia				
Start	**Finish**	**Topic**	**Speaker**	**Sub topic/Content**
08:30	**09:00**	**Registration**		
09.00	09.15	Introduction	Imre CSIKÓS, ECRAN	
09.15	10.00	Presentation on development of scenarios (without, with, with additional), sensitivity analysis and EU practice	László Szabó, REKK	
10.00	10.45	Basic economic concepts of Climate Change (Cost-benefit analysis, MAC curve)	Ágnes KELEMEN, ECRAN	• Basic terms for energy economics and economic modelling • Cost benefit analysis • Marginal abatement curves
10.45	11.00	***Coffee Break***		
11.00	12.00	Homework from the second module	Presentations from beneficiaries and ECRAN team (10 min. max. per beneficiary)	• Country results • Challenges / bottle necks
12.00	12.30	LEAP training	Charles HEAPS, Stockholm Environmental Institute – US Center	Short Recap of what was taught in Module 2
12.30	13.30	***Lunch Break***		

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

13.30	14.30	Introduction to cost-benefit analysis in LEAP	Charles HEAPS Stockholm Environmental Institute – US Center	Basic concepts of cost-benefit analysis in LEAP use
14.30	15.30	Freedonia example: Exercise 4 on cost-benefit analysis *Creating policy scenarios and entering costing data*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
15.30	15.45	***Coffee Break***		
15.45	17.00	continued	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

Day 2: Tuesday 22 September 2015

Chair and Co-Chairs:

Venue: Zagreb, Croatia

Start	Finish	Topic	Speaker	Sub topic/Content
08:30	**09:00**	**Registration**		
09.00	10.30	Freedonia example: Exercise 4 on cost-benefit analysis *Creating policy scenarios and entering costing data*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
10.30	10.45			
10.45	13.00	Freedonia example: Exercise 4 on cost-benefit analysis *Cost-benefit results and comments*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
13.00	14.00	***Lunch Break***		
14.00	15.30	Presentation of country-example on scenarios with measures and additional measures	Dovilė Vaitkutė, Ministry of Environment, Lithuania	Case study presentation of an EU country

15.30	15.45	***Coffee Break***		
15.45	17.00	Introduction to optimization in LEAP	Charles HEAPS Stockholm Environmental Institute – US Center	Basic concepts of optimization in LEAP use

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

Day 3 : Wednesday 23 September 2015

Chair and Co-Chairs:

Venue: Zagreb, Croatia

Start	Finish	Topic	Speaker	Sub topic/Content
08:30	**09:00**	**Registration**		
09.00	10.30	Freedonia example: Exercise 6 - Least-cost electric generation data *Entering electric generation data*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
10.30	10.45	***Coffee Break***		
10.45	13.00	Freedonia example: Exercise 6 - Least-cost electric generation data *Creating Load Shapes by Importing Hourly Load Data & Simulation Scenarios*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
13.00	14.00	***Lunch Break***		
14.00	15.00	Presentation on Low-Carbon Development Strategy of Croatia and other modelling activities	Ekonerg representative tbc	
15.00	16.30	Presentation of the organisation of modelling work for energy and climate policy	Representative of the Croatian Ministry of Environment and Nature Protection. and Croatian Ministry of Economy (tbc)	

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

Day 4 : Thursday 24 September 2015

Chair and Co-Chairs:

Venue: Zagreb, Croatia

Start	Finish	Topic	Speaker	Sub topic/Content
08:30	**09:00**	**Registration**		
09.00	10.30	Freedonia example: Exercise 6 - Least-cost electric generation data *Incorporating Externality Values & Identifying Least-Cost Scenario*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
10.30	10.45	***Coffee Break***		
10.45	13.00	Freedonia example: Exercise 6 - Least-cost electric generation data *Specifying a CO_2 Cap and relevant results*	Charles HEAPS, Stockholm Environmental Institute FLESSA, Anna, KEPA MAVRAKI, Eleni-Danai, KEPA with the support of other TAIEX – ECRAN experts	Practical exercise with the LEAP tool
13.00	14.00	***Lunch Break***		
14.00	15.00	Lessons learned about various modelling exercises in the preparation of INDCs for Albania and Montenegro	Ágnes Kelemen, József Feiler ECRAN	
15.00	15.15	***Coffee Break***		
15.15	16.00	Availability of country data on fuel	Comments from beneficiaries (10 min. max. per beneficiary	Open discussion

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

		and technology costs		
16.00	16.30	Follow-up assignment		Introduction of the assignments for participants for the period between Module III and Module IV trainings
16.30	17.00	Conclusions		Comments, next modules and next steps

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

ANNEX II – Participants

First Name	Family Name	Institution Name	Country	Email
Ardian	Islami	Ministry of Energy and Industry	Albania	Ardian.Islami@energja.gov.al
Bledi	Lame	Ministry of Energy and Industry	Albania	Bledi.Lame@energjia.gov.al
Enkeleda	Shkurta	National Environmental Agency	Albania	ledi.mera@yahoo.com
Ilia	Gjermani	Ministry of Energy and Industry	Albania	Ilia.Gjermani@energjia.gov.al
Enis	Krečinić	Federal Hydrometeorological Institute	Bosnia and Herzegovina	krecinic.e@fhmzbih.gov.ba
Enis	Omerčić	Federal Hydrometeorological Institute	Bosnia and Herzegovina	eniso@fhmzbih.gov.ba
Milovan	Kotur	University of Banja Luka,	Bosnia and Herzegovina	milovan.kotur@unibl.rs
Viktor	Andonov	Ministry of Economy of Republic of Macedonia	former Yugoslav Republic of Macedonia	viktor.andonov@economy.gov.mk
Vlastimir	Trajkoviski	Ministry of Economy of Republic of Macedonia	former Yugoslav Republic of Macedonia	vlastimir.trajkovski@economy.gov.mk
Abdullah	Pirçe	Ministry of Environment and Spatial Planning	Kosovo*	abdullah.pirce@rks-gov.net
Ajet	Mahmuti	Ministry of Environment and Spatial Planning	Kosovo*	ajet.mahmuti@rks-gov.net
Besiana	Berisha	Ministry of Economic Development	Kosovo*	besiana.qorraj@rks-gov.net
Sabit	Restelica	Ministry of Environment and Spatial Planning	Kosovo*	sabit.restelica@rks-gov.net

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

First Name	Family Name	Institution Name	Country	Email
Vlora	Spanca	Ministry of Environment and Spatial Planning	Kosovo*	vlora.spanca@rks-gov.net
Aleksandar	Kojović	Institute of Hidrometeorology and Seismology of Montenegro	Montenegro	aleksandar.kojovic@meteo.co.me
Anton	Lucoviq	Ministry of Economy	Montenegro	anton.ljucovic@mek.gov.me
Ljubica	Vulović	Institute of Hidrometeorology and Seismology of Montenegro	Montenegro	ljubica.vulovic@meteo.co.me
Nebojsa	Jablan	CGES	Montenegro	njablan@gmail.com
Slavica	Micev	Institute of Hidrometeorology and Seismology of Montenegro	Montenegro	slavica.micev@meteo.co.me
Tonka	Popović	Institute of Hidrometeorology and Seismology of Montenegro	Montenegro	tonka.popovic@meteo.co.me
Vanja	Rajović	Institute of Hidrometeorology and Seismology of Montenegro	Montenegro	vanja.rajovic@meteo.co.me
Vuko	Dabovic	EPCG	Montenegro	vuko.dabovic@epcg.com
Dragana	Radulovic	Ministry of Agriculture and Environmental Protection	Serbia	dragana.radulovic@eko.minpolj.gov.rs
Ivana	Antonovic	Serbian Environmental Protection Agency	Serbia	ivana.antonovic@sepa.gov.rs
Ivana	Dukic	Serbian Environmental Protection Agency	Serbia	ivana.dukic@sepa.gov.rs
Marko	Obradović	University of Belgrade, Faculty of	Serbia	mobradovic@mas.bg.ac.rs

First Name	Family Name	Institution Name	Country	Email
		Mechanical Engineering		
Milena	Dakonovic	Ministry of Mining and Energy	Serbia	milena.djakonovic@mre.gov.rs
Vukman	Bakic	Vinca Institute for nuclear science	Serbia	bakicv@vinca.rs
Ali Osman	KILINÇARSLAN	Ministry of Energy and Natural Resources	Turkey	aokilincaslan@enerji.gov.tr
Ergün	KOÇ	Ministry of Energy and Industry	Turkey	ekoc@enerji.gov.tr
Ergün	Koc	Ministry of Energy and Industry	Turkey	ekoc@enerji.gov.tr
Pelin	HABERAL	Ministry of Energy and Natural Resources	Turkey	phaberal@enerji.gov.tr
Lin	Herencic	EKONERG	Croatia	Lin.herencic@ekonerg.hr
Nina	Suman	Centre for Monitoring Business Activities in the Energy Sector and Investments	Croatia	Nina.suman@cei.hr
Tatjana	Antolic	Ministry of Environmental protection and Nature	Croatia	Tatjana.Antolic@mzoip.hr
Visnja	Grgasovic	Ministry of Environmental protection and Nature	Croatia	Visnja.Grgasovic@mzoip.hr
Vladimir	Jelavic	EKONERG	Croatia	Vladimir.jelavic@ekonerg.hr
Anna	Flessa	KEPA	Greece	aflessa@kepa.uoa.gr
Eleni-Danai	Mavraki	KEPA	Greece	edmavraki@kepa.uoa.gr
Laszlo	Szabo	Budapest Corvinus University	Hungary	lszabo@uni-corvinus.hu

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

First Name	Family Name	Institution Name	Country	Email
Tomas	Aukstinaitis			
Agnes	Kelemen	ECRAN	United Kingdom	Agnes.KELEMEN@klimapolitika.com
Charley	Heaps	ECRAN	Sweden	charlie.heaps@sei-us.org
Imre	Csikos	ECRAN	Netherlands	imre.csikos@ecranetwork.org
Jozsef	Feiler	ECRAN	Hungary	jozsef.feiler@ecranetwork.org

ANNEX III – Presentations (under separate cover)

Presentations can be downloaded from:

http://www.ecranetwork.org/Files/Workshop_Presentations,_Module_3,_September_2015,_Zagreb.zip

Homework exercise can be downloaded from:

http://www.ecranetwork.org/Files/Modelling_Module_3_Homework_Instructions.doc

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

ANNEX IV – Exercises given to participants to be completed before module 4

Exercise for participants

The following exercise is a part of module 3 of the ECRAN modelling training on LEAP. The exercise consists of two (2) parts. Participants are requested to complete all tasks and report on their progress to the ECRAN team by the deadlines indicated. If you are having difficulties in carrying out these tasks, please contact ***Jozsef Feiler*** immediately at jozsef.feiler@ecranetwork.org, who will appoint members of the helpdesk to assist you. For this purpose please appoint a single contact point in your country who will communicate any difficulties to the ECRAN team.

Based on the Zagreb workshop, the following tasks should be developed in accordance with the LEAP needs, having in mind the presentations of creating scenarios and the last day exercise steps on building your national High Ambition Mitigation (HAM) scenario.

Task 1.

The completion of **Module 2 homework** is necessary in order to proceed with the following tasks. If you haven't done the previous homework, **FIRST** finish it and *then* work with the below.

Step 1: Review one or two sectors of your choice (a single demand sector, or a single demand sector plus the electricity generation sector) in the LEAP starter dataset for your country. Make suggestions how to improve this part of the tree based on the data identified in the Task 1 of Module 2.

Step 2: Populate the variables of the chosen sector(s) with the historical data identified in the Task 1 of Module 2, from the base year (2005 or earlier where applicable) to 2011 or 2012 depending on the country time-series data. Where the data is not available, try to find data in literature (national reports, etc.). At this point, use only the "Current Accounts" of LEAP2. Remember to keep the sources of your data for references. Use the "Notes" tab in the Analysis View so as to indicate your data sources for the data of all variables.

Step 3: Identify reliable data on current costs of fuels and technologies into LEAP.

Step 4: Insert the above data from Steps 2 and 3 in your LEAP dataset that you have created in Module 2 homework.

Step 5: Make the necessary assumptions for your Reference Scenario (ex. add endogenous capacity if necessary). This involves making assumptions related to the future trends of drivers of emissions, such as population, GDP, etc. It also involves making assumptions related to the future development of cost of fuels and technologies, which can be based on existing information sources, e.g. from the IEA or IRENA. Input data into LEAP should be based primarily on reliable national data sources. Where such data is not available, please use other credible data sources (e.g. IEA, IRENA, JRC, US EIA, etc.). Please resort to expert judgement only as a last resort, after you have exhausted other possibilities.

[2] Electricity Generation: find data on Power Plant Capacities, Historical Production, Efficiencies and Load Duration Curve.

Deadline: November 6th 2015

Expected submission: Updated LEAP dataset with Data sources.

Task 2.

You are expected to create a High Ambition Mitigation Scenario[3] of your country. Please recall, that the EU emission reduction target for 2030 is 40% and the target for 2050 is 80-95%, with emissions in 2050 to be reduced to around 2 tCO2e/capita.

Step 1: Write the description of your scenario (what sectors and emissions are included, what are the characteristics, assumptions, measures, etc.). These should not be based on official sources but should reflect a very ambitious mitigation scenario which is physically feasible.

Step 2: Based on available data, create in LEAP the HAM scenario and insert the relevant functions, with time horizon from approximately 2010 (or another convenient base year for which historical data is available) to 2030 and 2050 (Basic Parameters --> Years --> End Year: 2050).

Deadline FOR FIRST DRAFT: November 30th 2015.

Expected submissions:

1. Brief report on your national HAM scenario - If you are aware of problems with data availability, don't wait until the deadline, the sooner you mention it, the better are the chances to find a solution.
2. The HAM mitigation scenario in LEAP file - **draft** version
3. Short description on what is needed to be finalized - future steps

Deadline FOR FINAL VERSION: January 15th 2016.

Expected submissions:

1. The HAM mitigation scenario in LEAP file - **final** version
2. Brief report with commenting on the results (Final Energy Consumption, Electricity Generation, Global Warming Potential graphs[4], information on cost of emission reduction, etc.).
3. Please also discuss briefly the other costs and benefits of your HAM scenario (e.g. air pollution, development, employment). This should be done qualitatively (i.e. no numbers needed on these impacts)
4. Under which states of the world is the proposed mitigation scenario a possibility, and under what circumstances is it unrealistic? Is there a carbon price, level of economic development, amount of foreign funding, etc. which would make the scenario feasible/unfeasible?

[3] As a reminder, the following types of scenarios were mentioned as examples during the workshop: Maximum penetration of wind, maximum penetration of rooftop solar (either PV or solar hot water or both!), an extreme electric vehicle or biofuels transport scenario, maximum penetration of public transport, a very aggressive scenario for passive building construction or for maximal retrofitting of existing buildings. However, you are free to choose your own scenario.

[4] Tip: if you wish, you can use your national colours at the graphs to make them stand out.

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium

The submission e-mail address of the outputs of Module 3 homework is jozsef.feiler@ecranetwork.org, with a copy to imre.csikos@ecranetwork.org

You may also wish to join the LEAP Facebook group or the COMMAND website and ask there your questions.
The Facebook group is here: https://www.facebook.com/groups/LEAPSoftware
The COMMEND web site: http://www.energycommunity.org/

Resources:

National Statistical Services
Energy Community Secretariat (http://www.energycommunity.org)
IEA Energy Statistics Manual (http://www.iea.org/publications/freepublications/publication/energy-statistics-manual.html)
IEA Energy Technology Perspectives (http://www.iea.org/etp/etp2015/)
IEA Projected Costs of Generating Electricity (http://www.oecd-nea.org/ndd/egc/2015/)
IEA World Energy Outlook (http://www.worldenergyoutlook.org/ - older publications are available for free)
GHG Projection Guidelines – European Commission (
http://ec.europa.eu/clima/policies/g-gas/monitoring/docs/ghg_projection_guidelines_en.pdf
http://ec.europa.eu/clima/policies/g-gas/monitoring/docs/ghg_projection_guidelines_a_en.pdf
http://ec.europa.eu/clima/policies/g-gas/monitoring/docs/ghg_projection_guidelines_b_en.pdf)
JRC Technology Roadmaps (https://setis.ec.europa.eu/archive/technology-roadmaps)
JRC Photovoltaic Geographical Information System (http://re.jrc.ec.europa.eu/pvgis/)
US EIA (http://www.eia.gov/analysis/)

This Project is funded by the European Union

A project implemented by Human Dynamics Consortium