UNECE Convention on Long-Range Transboundary Air Pollution

GAINS and other techno-economic tools for post-processing of Gothenburg scenarios in EECCA countries

Modelling analysis performed by the GAINS_Europe Model

Presented by Tiziano Pignatelli

Co-Chairman of EGTEI

tiziano.pignatelli@enea.it

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Presentation Outline

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Introduction

The analysis here reported concerns the application of a methodology, developed a couple of years ago', to investigate the possible effects of the ELVs elaborated by EGTEI, on the Emission Scenarios developed by IIASA, in the frame of the process of revision of the Gothenburg Protocol.

The methodology is applied to the official scenarios for Gothenburg, developed for ***Belarus, Republic of Moldova, Russian Federation and Ukraine.*** The **GAINS_Europe Model** (old version) has been used taking the ELVs as in the document "Amendment of the text of and annexes II to IX to the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone and the addition of new annexes X and XI" ***ECE/EB.AIR/111/Add.1,*** as result of the revised and adopted Gothenburg Protocol.

Objective of the analysis

1. Establish a link between the ELVs, as in the Annexes to the Gothenburg Protocol and the Gothenburg Baseline Emission Scenarios developed by CIAM/IIASA.
2. Estimate the "technological gap" between the Baseline Emission Scenario and the ELVs consistent Upgraded Scenario. Estimate the (additional) Emission Reductions and Costs, in the new Upgraded Scenario.
3. Ultimately, provide the Experts from EECCA Countries with (useful) information on the potential technological improvement in the productive system of their country.

Methodology

The methodology has been already described in other meeting of EGTEI (Lyon 2010) and is here summarized as:

1. Analysis of the Baseline Gothenburg Scenario to compare the average EF (mg/m3), for each plant category in the Power Plant Sector (output of GAINS) with the ELVs in the Annexes.
2. Identify which plant categories are NOT consistent with the corresponding ELVs.
3. Looking for higher implementation rates, where possible, or alternatively, more efficient abatement technologies, available for that plant categories, such as the average EF is line with the corresponding ELV. Introduce such rates/technologies into the new Upgraded Scenario.
4. Re-calculate, by the GAINS_Europe Model, the emissions of the Upgraded Scenario, for the concerned sector, focusing on emission reductions (and additional costs from GAINS), at the target year (2020).

A proper routine, in form of Excel Macro, has been developed to accomplish the above tasks (1-3).

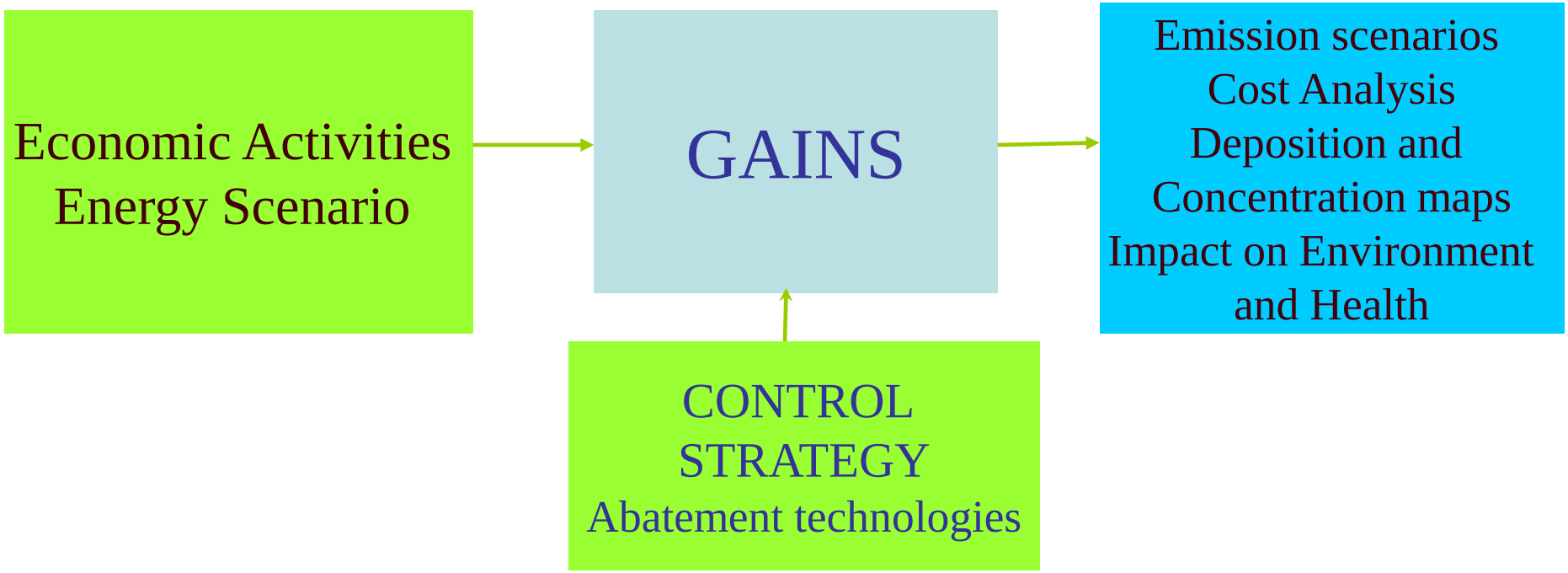
Assumptions and caviats

The EF (mg/m3) calculated by GAINS, refers to annual emissions and is an average value for that specific plant category and abatement technology. The ELVs are referred to a single plant in standard operating conditions.

Main Assumption: As first approximation it is assumed that EF is ***comparable*** with ELV

When more technologies are implemented in a given plan category the *average* EF (mg/m3) is calculated, from GAINS EF data, as weighted average, where the technology implementation rates are taken as weight factors.

Semplified schema of GAINS



Example of results

Provisional data

Emissions (PM_TSP) and technology costs for UKRAINE

	Gothenburg Scenario	Upgraded Scenario
Exist PP (kt_ PM)	31.53	0.92
New PP (kt_PM)	74.48	2.56
Total PP emissions (kt_PP)	106.01	3.48
Difference in emissions vs Base (kt_PM)	0	-102.53
Additional tech costs vs Baseline (M_Euro)	0	10.08
Total PM Emissions in Country @ 2020 (kt)	927.68	825.14

Example of results

Preliminary data

Emissions (PM_TSP) and technology costs for Russian Federation (European Part)

	Gothenburg Scenario	Upgraded Scenario
Exist PP (kt_ PM)	36.50	2.00
New PP (kt_PM)	213.32	82.51
Total PP emissions (kt_PP)	249.82	84.51
Difference in emissions vs Base (kt_PM)	0	-165.31
Additional tech costs vs Baseline (M_Euro)	0	16.5
Total PM Emissions in Country @ 2020 (kt)	1860.43	1695.13

Example of results

Detailed analysis

Gothenburg Scenario

Power Plants Existing coal fired (coal grade 1, HC1)

Electrostatic Precipitator 1 stage (ESP1)

EF = 368.4 t_PM /PJ

Upgraded Scenario

Power Plants Existing coal fired

High Efficiency Deduster (HED)

EF = 3.72 t_PM /PJ

Other possible applications

The same methodology is applicable to other sectors for which GAINS calculates EF in mg/m3, namely Industrial Boilers and Residential Sector

The applicaton of the methodology EGTEI/GAINS for EECCAs is scheduled in the LRTAP workplan 2014-2015

The methodology, with proper adjustments can be applied to the GAINS_Europe Model New Version for the scenarios developed in the next future.

Conclusions

The methodology presented is suitable for investigating the potential technology upgrade in the EECCA countries, at least for some sectors and pollutants.

From the calculations performed till now it comes out that significant emission reductions may result from the implementation of technologies consistent with the ELVs in the Annexes of the revised Gothenburg Protocol.

The analysis may continue and extend to other sectors and the new GAINS structure.

IIASA is working on inclusion of other EECCA countries in GAINS in ad hoc versions. EECCA experts are invited to contribute to this initiative.