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Development of emission reduction commitments for six Western Balkan economies

Presentation | Date: 05.11.2025

Quelle: Umweltbundesamt, M. Deweis

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Agenda

- Project overview
- Summary of the *Consultation* process
- Updates to the GAINS baseline
- Background on the development of the Emission Reduction Commitments (ERCs)
- ERCs per economy and pollutant
- Questions and discussion

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Project overview

- Providing support for the development of best data sets representing past air emissions from 2005 and future projections until 2050 for SO2, NOx, NH3, NMVOC and PM2.5
- Development of emission reduction commitments (ERCs) for the before mentioned air pollutants for 2020-2029, 2030 and beyond
    - Based on similar assumptions as NECD: reduction of 50% of premature deaths attributable to air pollution by 2030 (compared to 2005)

- Additional consultations to clarify issues and open questions
- Provide a detailed documentation on the development of the dataset and ERCs

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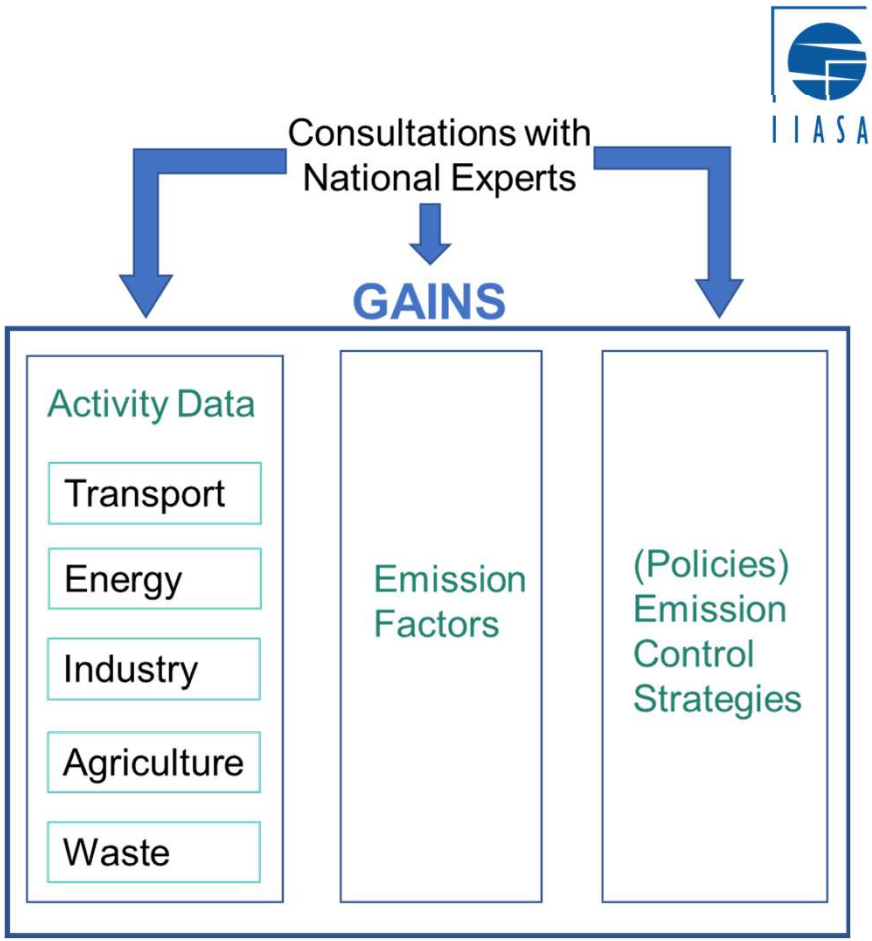
Consultation Process

- 4 consultations with good attendance
- Information & data exchange after meetings
  - Minutes & presentation
  - Details and background of GAINS and national calculations
  - National policy papers etc
- Information used to update the GAINS baseline



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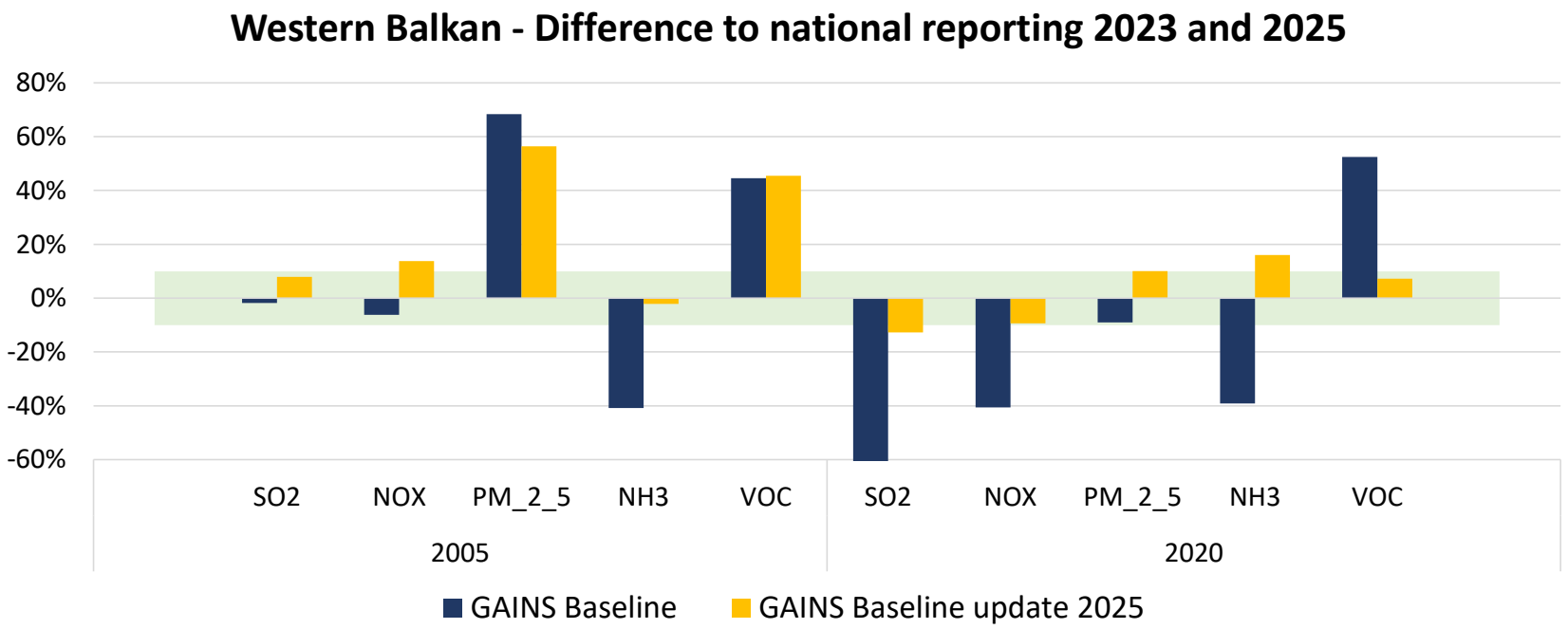
Updates to the GAINS baseline



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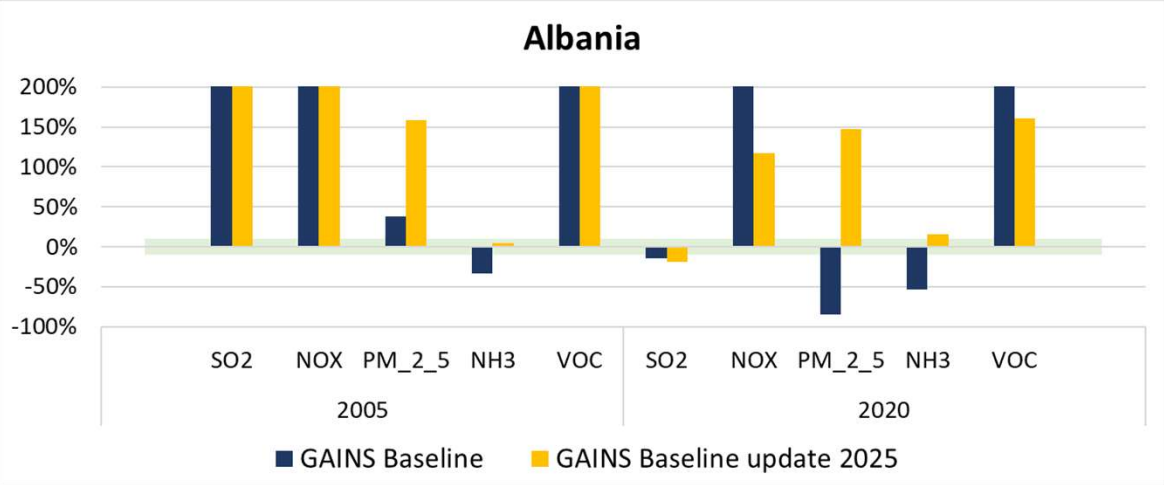
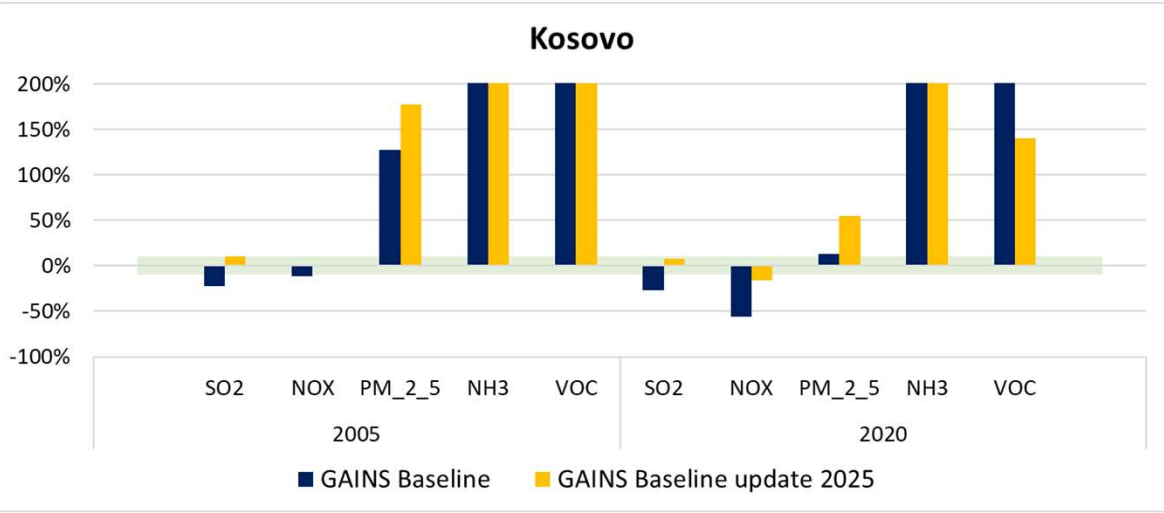


- Non-reporting of some key sectors (e.g cement, transport, ferrochrome smelters, fugitive)
- Differences in NFR submissions
- Difference in emission factors
- PM control technologies from cement production



- Non-reporting of some key sectors (e.g agriculture, fugitives and solvents)
- Difference in structure of installations
- Revision of de-dusting technologies

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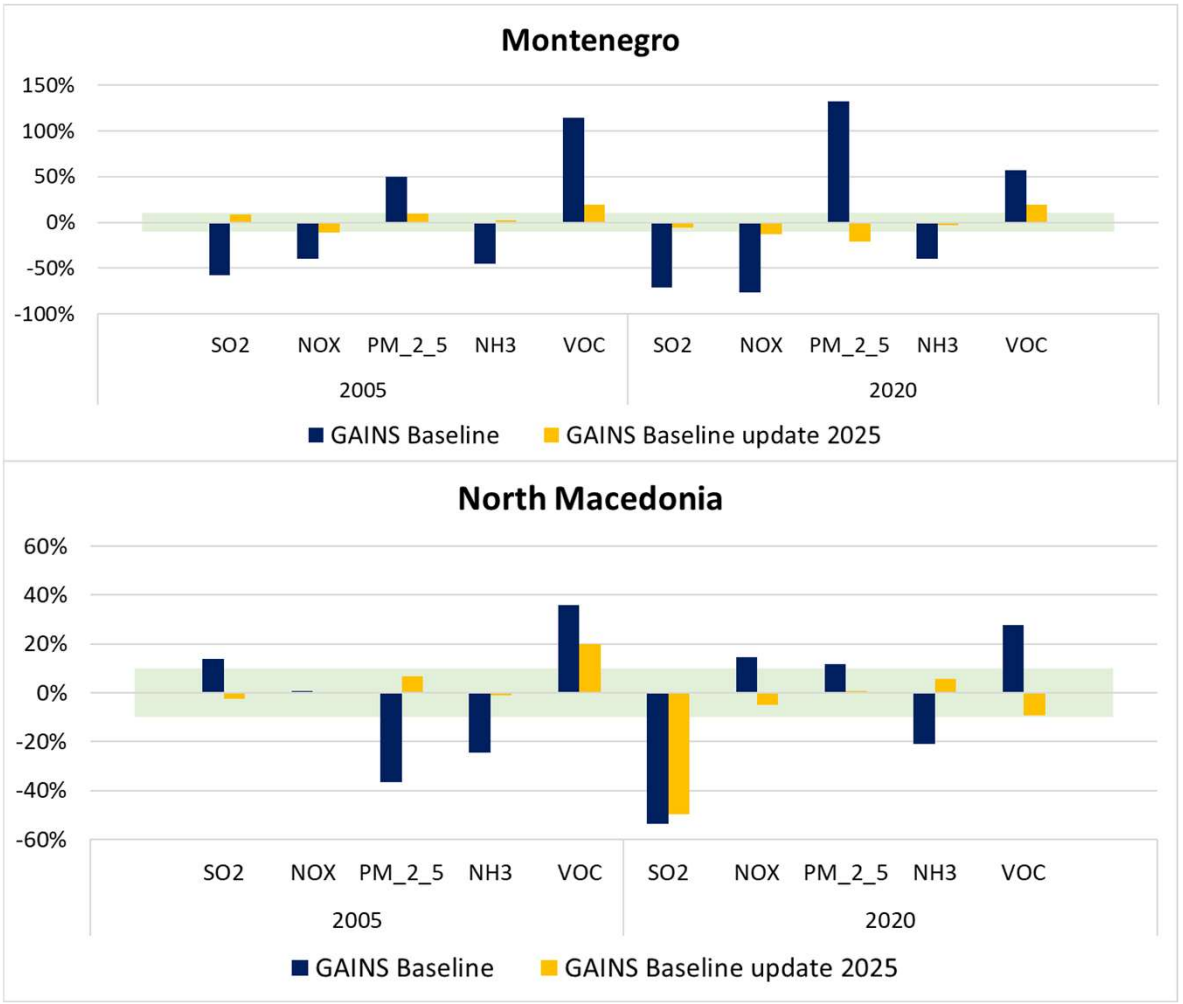

- Changes in NFR submissions 2023-2025
- Differences in emission vectors due to installations

- Differences due to national emissions coming from measurements
- Different assumptions on installation structure & oil products

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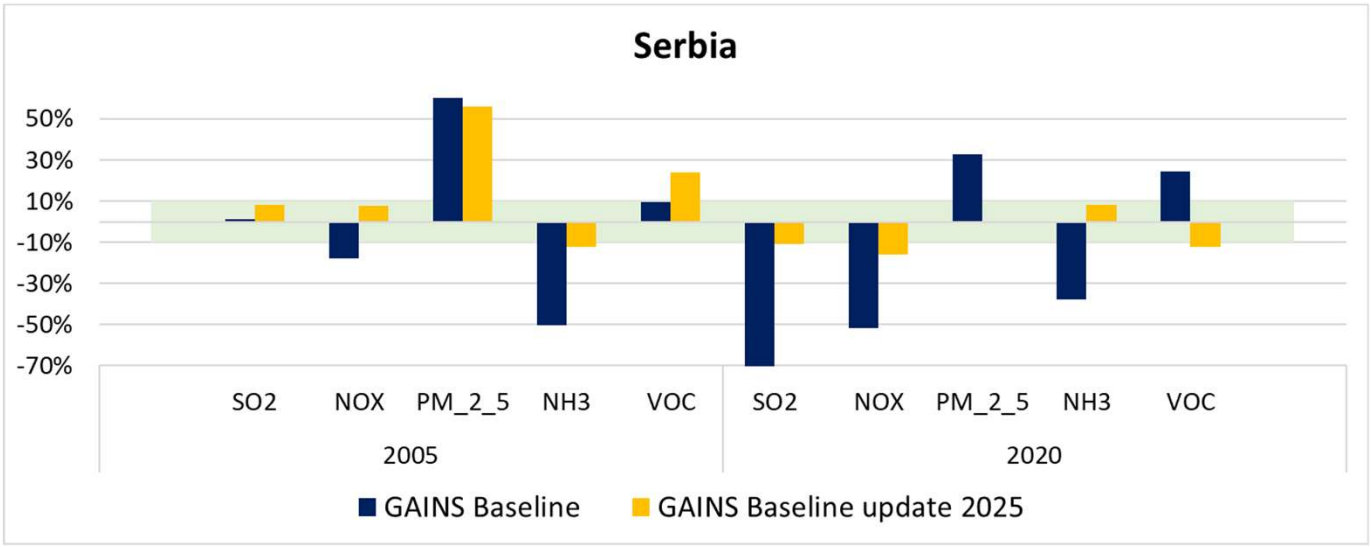

- Different distribution of types of stoves and different emission factors

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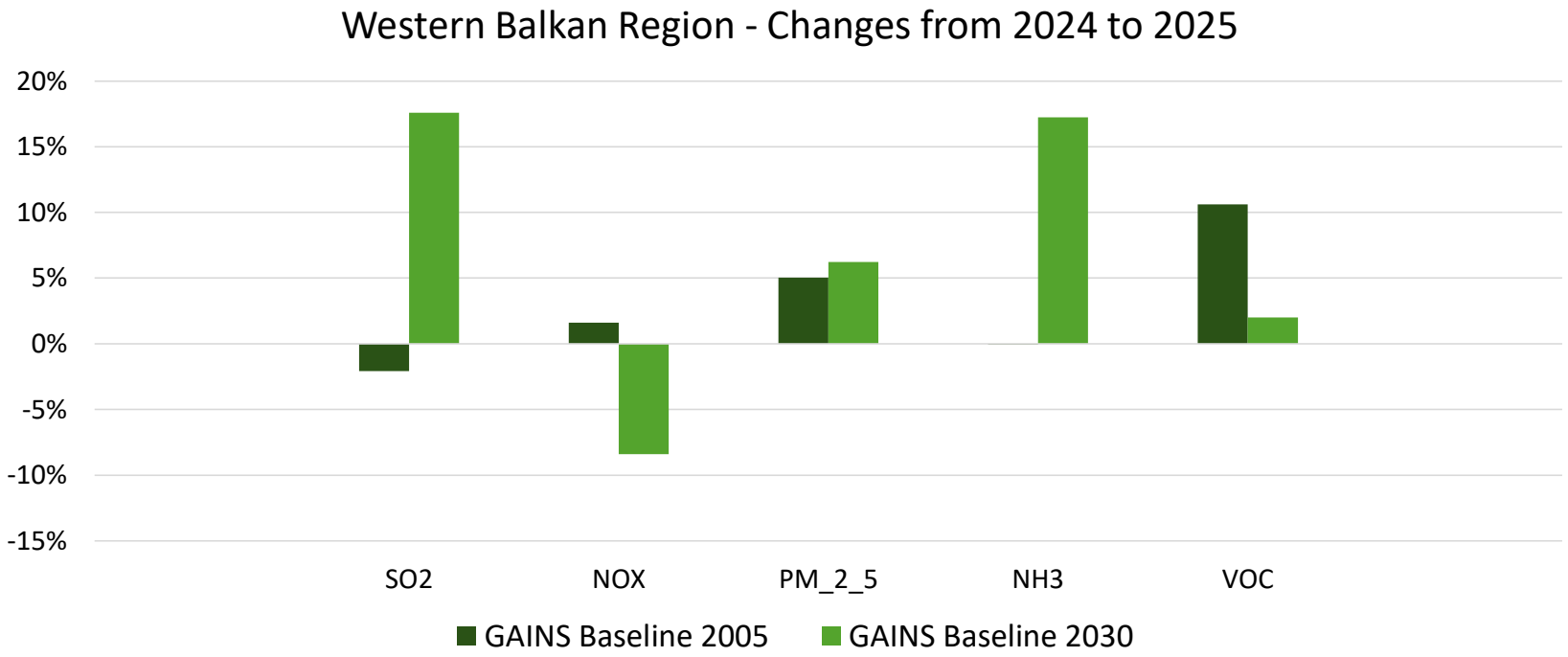

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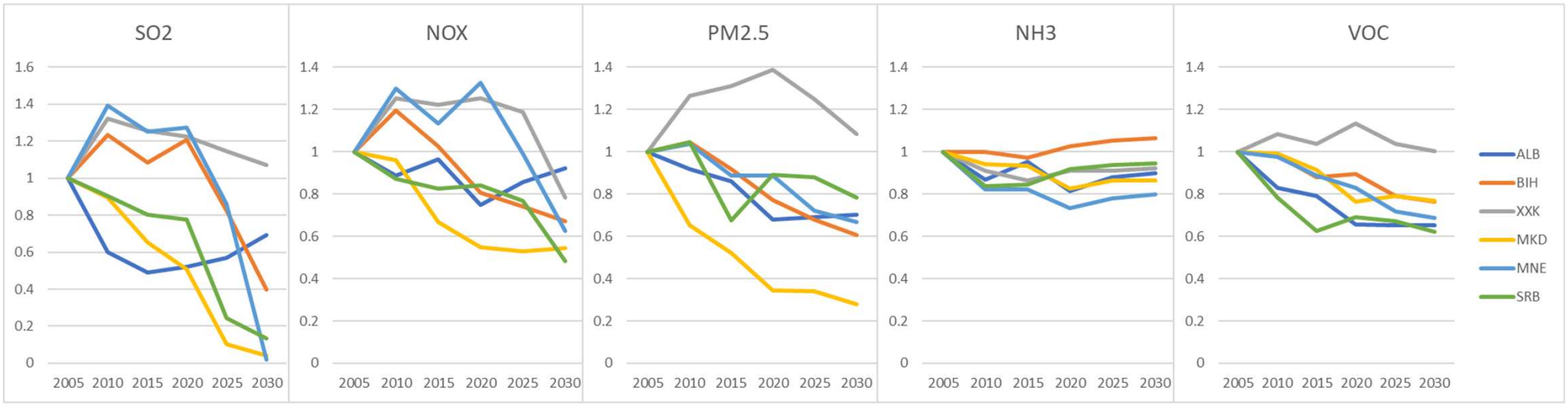
Emission trends



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Conclusion Consultations

- Improved understanding on both sides of emission calculation
- Development of inventories
- Developments in policy and availability of information
- Overall improvements to GAINS Baseline and within 10% difference to national reporting for most pollutants

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Background on the development of the Emission Reduction Commitments (ERCs)

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Agenda for this section

- Conceptual: The 'whole domain approach': How to get from a regional target to a national target
- Conceptual: The 'human health' approach: How to get from an impact target to national ERCs
- Conceptual: Finding the cost-effective solution using optimization & what it takes
- The real world:
  - Is a 50% reduction feasible for the West Balkan region? -> Yes
  - What is the most cost-effective set of ERCs, for each country and pollutant?
  - What are the implications for costs?

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Conceptual: How to get from a regional target to a national target

- For a moment, just think emissions, e.g. SO2 emissions.
- Suppose we wanted to achieve a -50% reduction in SO2 emissions for the whole of the West Balkan.
  - **How much would each country have to reduce? How would you distribute the target to each country?**

Option A
Each country reduces SO2 by 50%

Note:
- This may not be feasible in each country
- This may be very expensive in some countries -> economically not efficient

Option B
Find the cost-effective solution

Note:
- Sort all available mitigation measures in all countries by marginal cost
- Start from the cheapest and include more and more until you reach the target at the regional level

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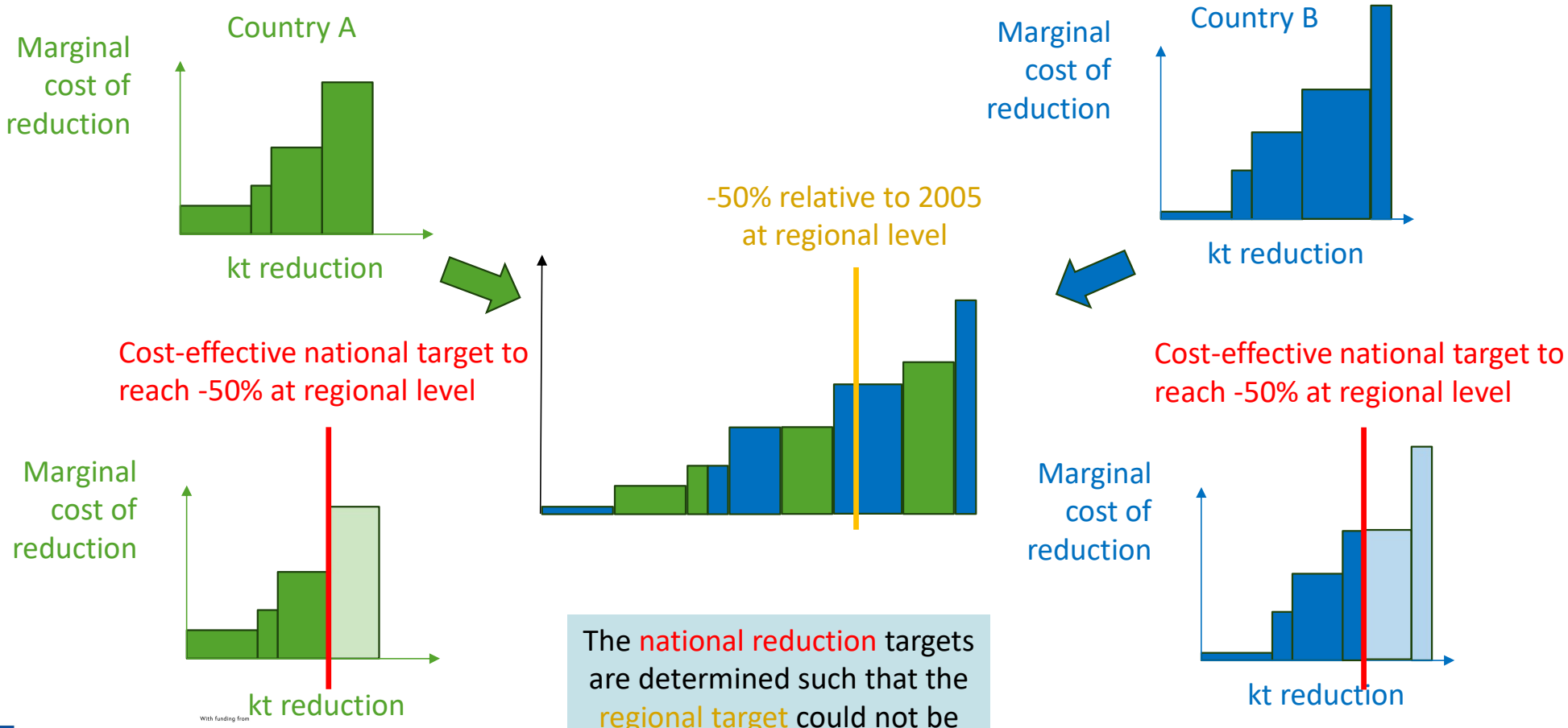
Conceptual: How to get from a regional target to a national target



The national reduction targets are determined such that the regional target could not be achieved at lower costs.

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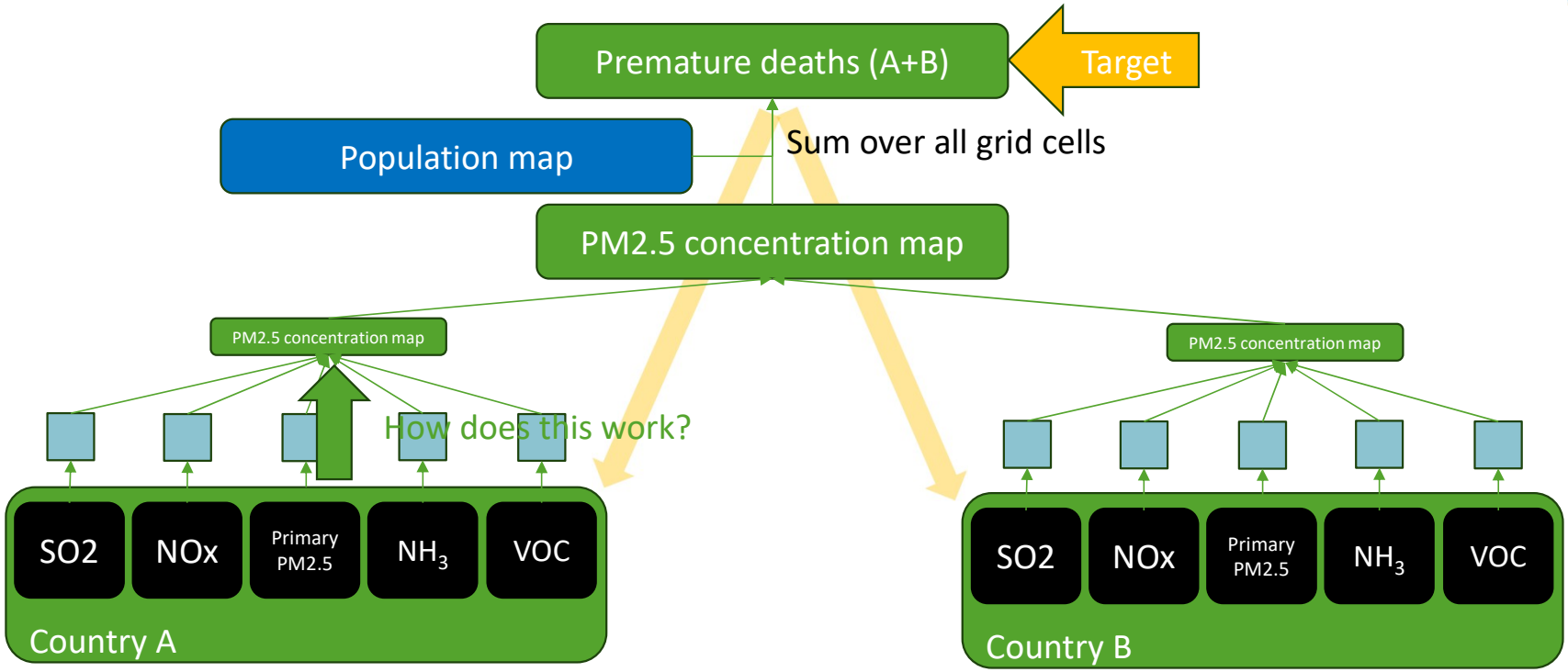
Conceptual: How to get from an impact target to national ERCs



atmospheric dispersion and chemistry

In the GAINS model: weights reflect these (Source-Receptor Matrix; EMEP model)

Find the most cost-effective measures to reach the target
Check the cost of each measure for each pollutant in each country
Take into account the weights which represent the atmospheric chemistry

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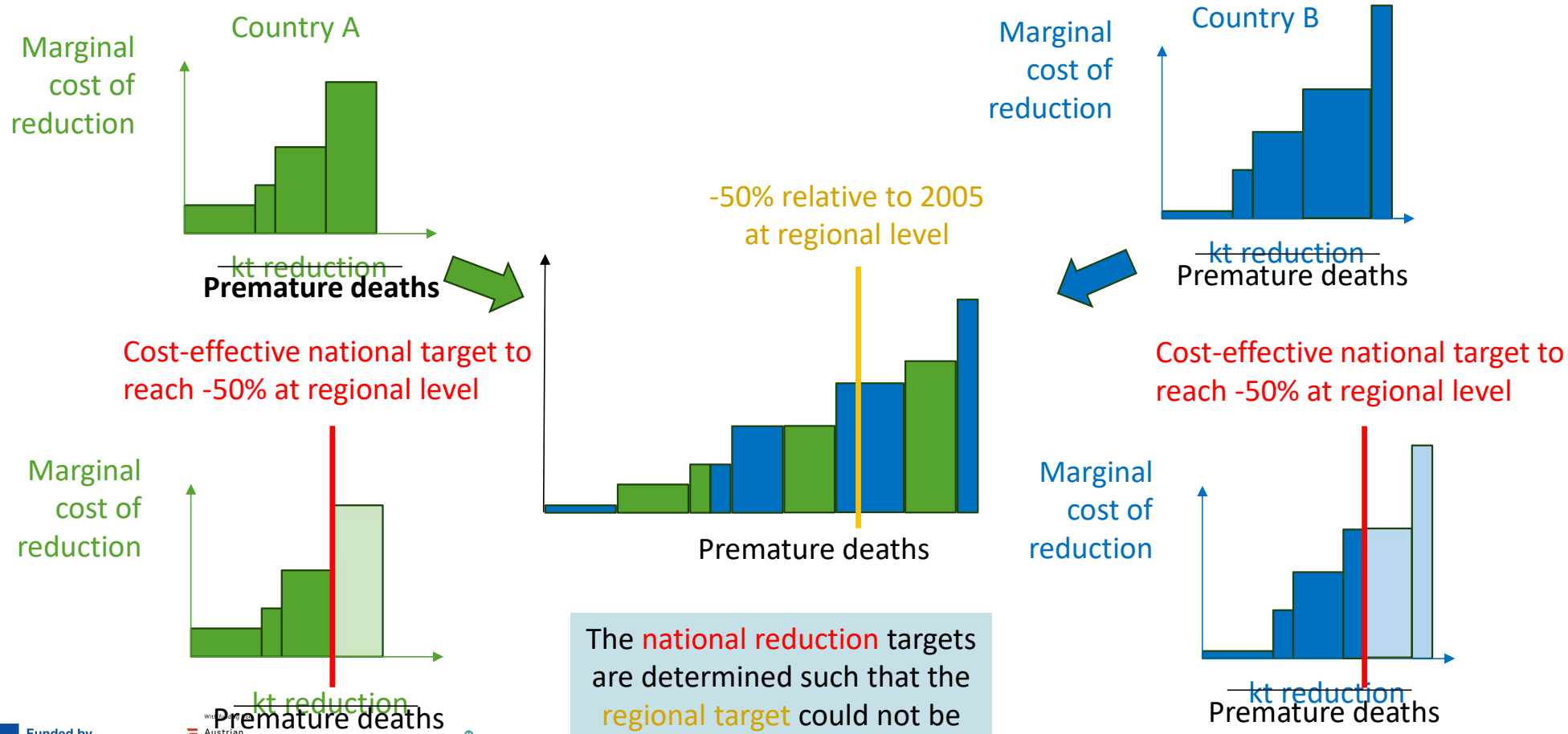
Conceptual: How to get from a regional target to a national target



The national reduction targets are determined such that the regional target could not be achieved at lower costs.

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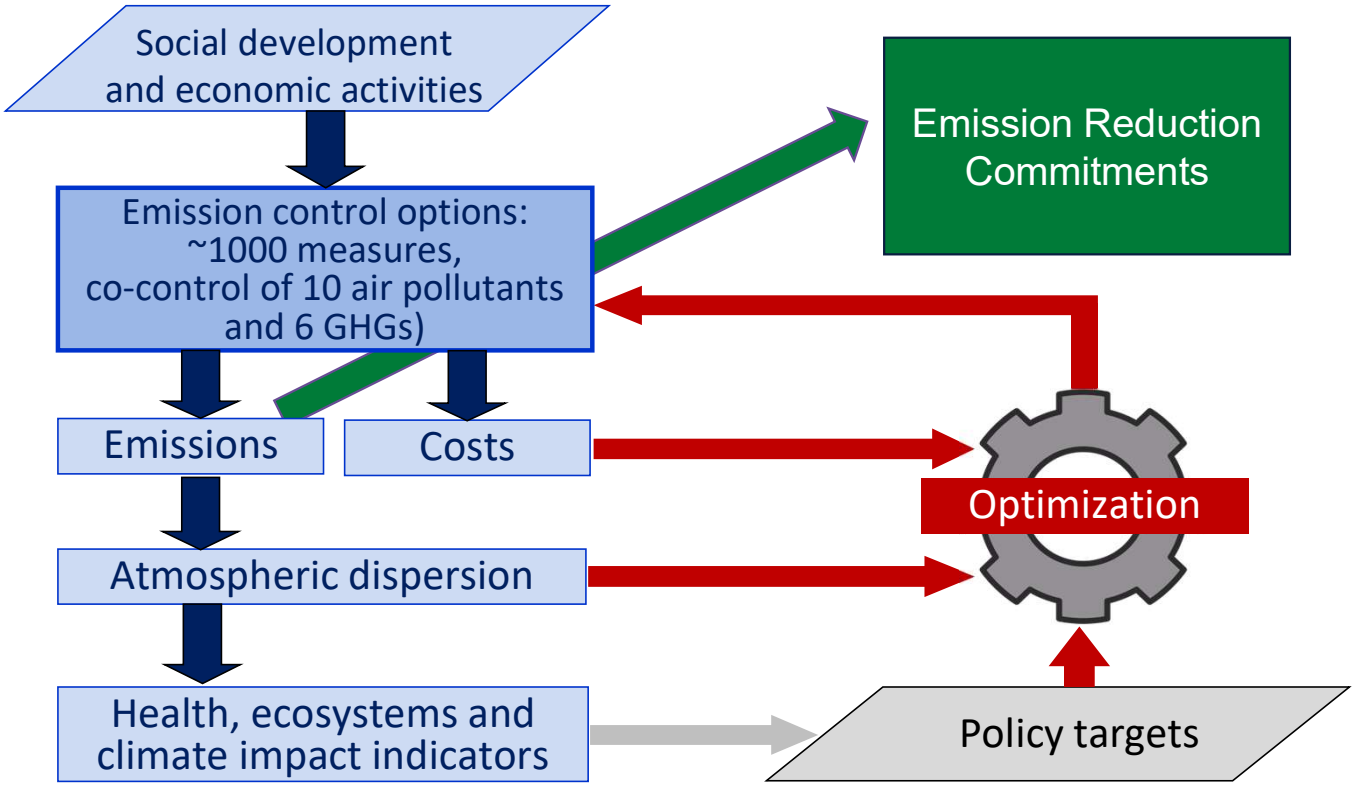
Method: the GAINS tool
[Greenhouse gas–Air pollution Interactions and Synergies]



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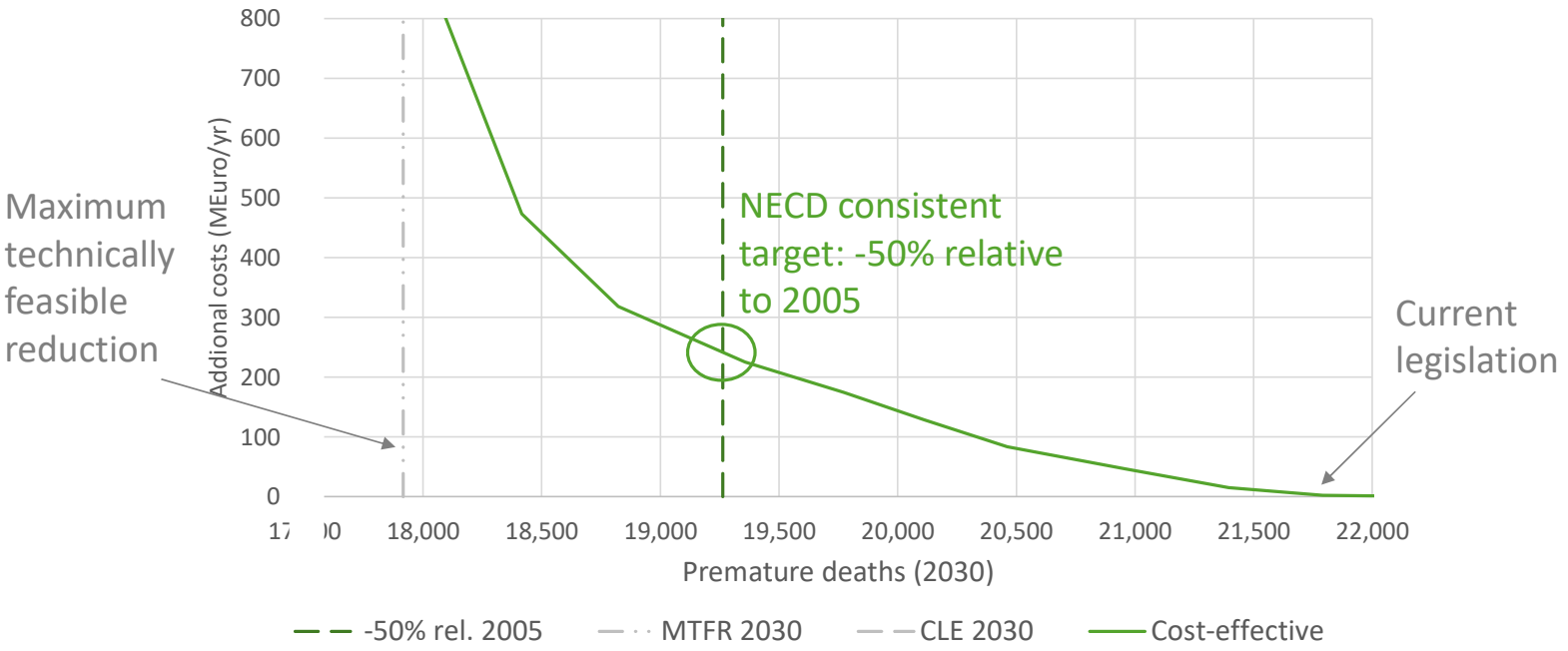
Reducing premature deaths cost-effectively in West Balkan



CLE… current legislation emission
MTFR… maximum technically feasible reduction

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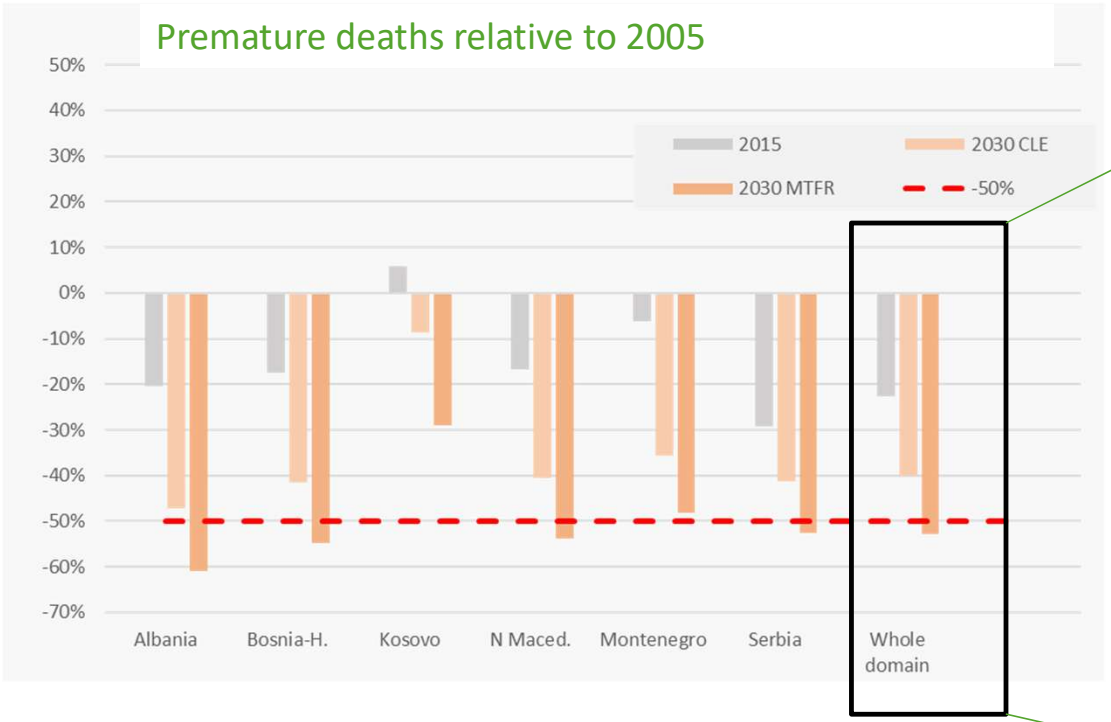
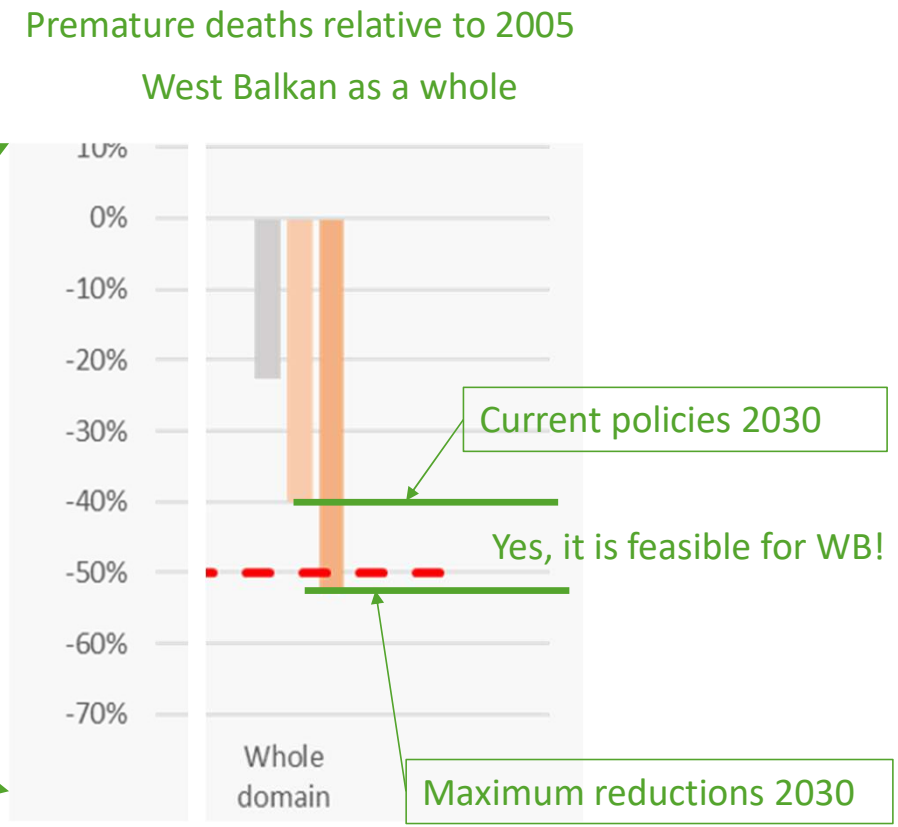
Is a 50% reduction in premature deaths relative to 2005 feasible?





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Conclusion cost-effectiveness

- A 50% reduction, relative to 2005, in premature deaths due to PM2.5 exposure by the year 2030 for the total domain of the six West Balkan economies is technically feasible at a cost of approximately 230 million €/yr
  (equivalent to approx. 0.2% of regional GDP).

- The modeling analysis underpins the proposed cost-effective solution for each of the economies
  - -> proposal for modeled cost-effective measures and preliminary ERCs

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Country specific information

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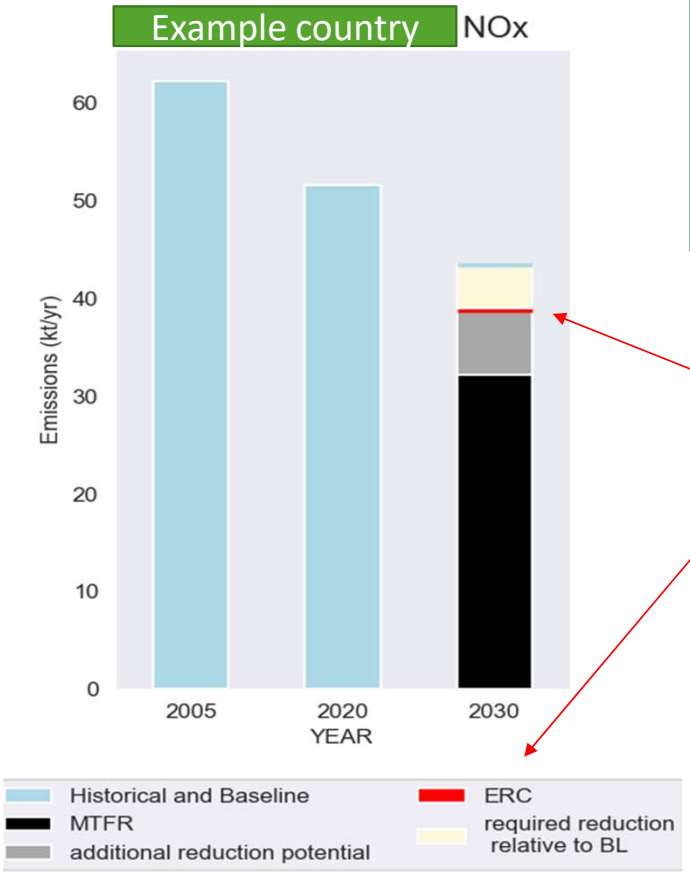
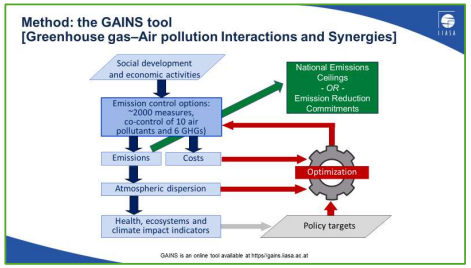
Example:



Example country

Item	unit	NOx
Absolute target	kt	39.00
Reduction rel. 2005	kt	-23.30
	%	-37%
Reduction rel. 2020	kt	-12.60
	%	-24%
Reduction rel. 2030 (CLE)	kt	-4.50
	%	-10%

Cost-effective ERC resulting from modeling exercise



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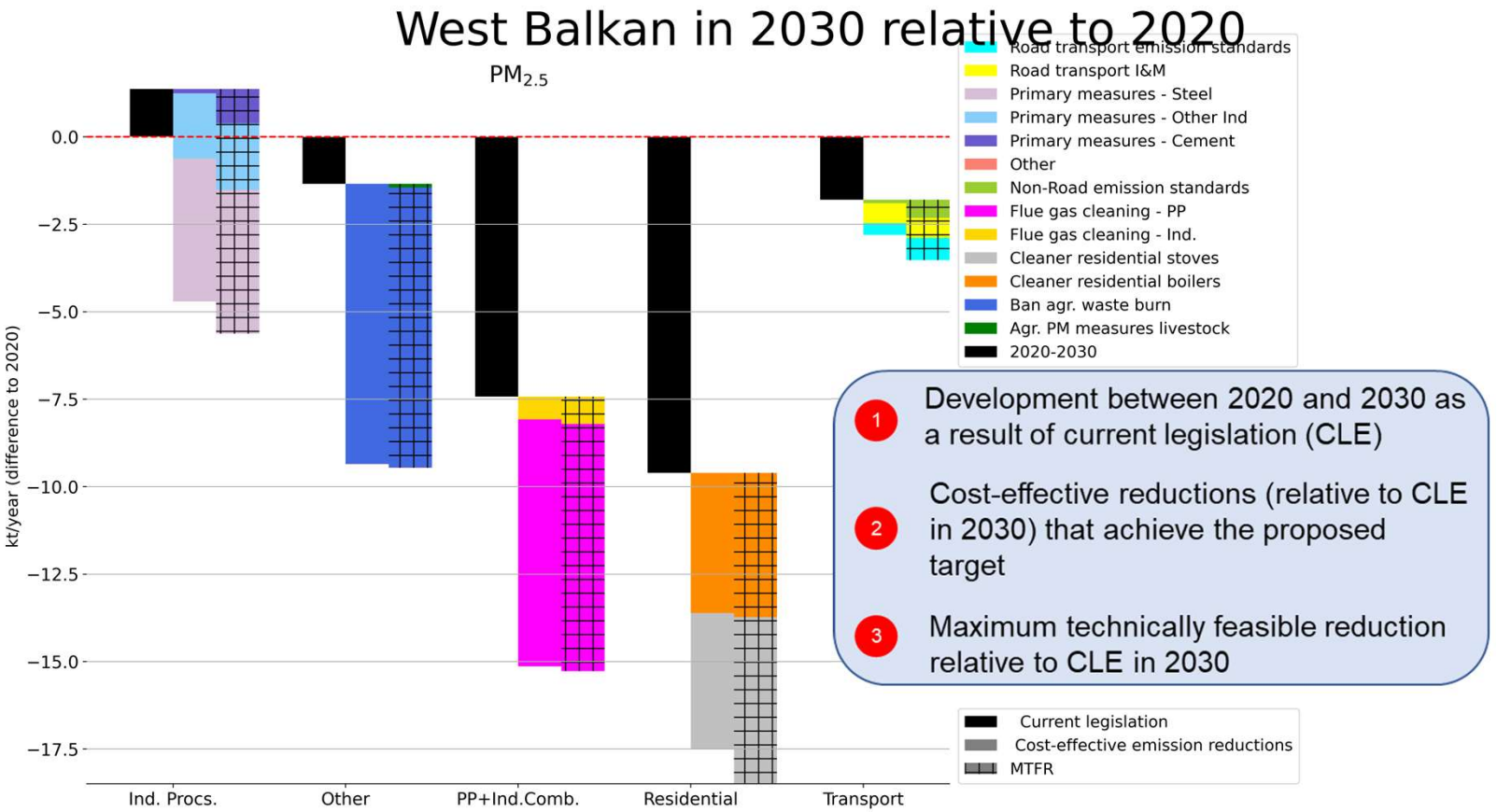
Measures by sectors in the cost-effective solution



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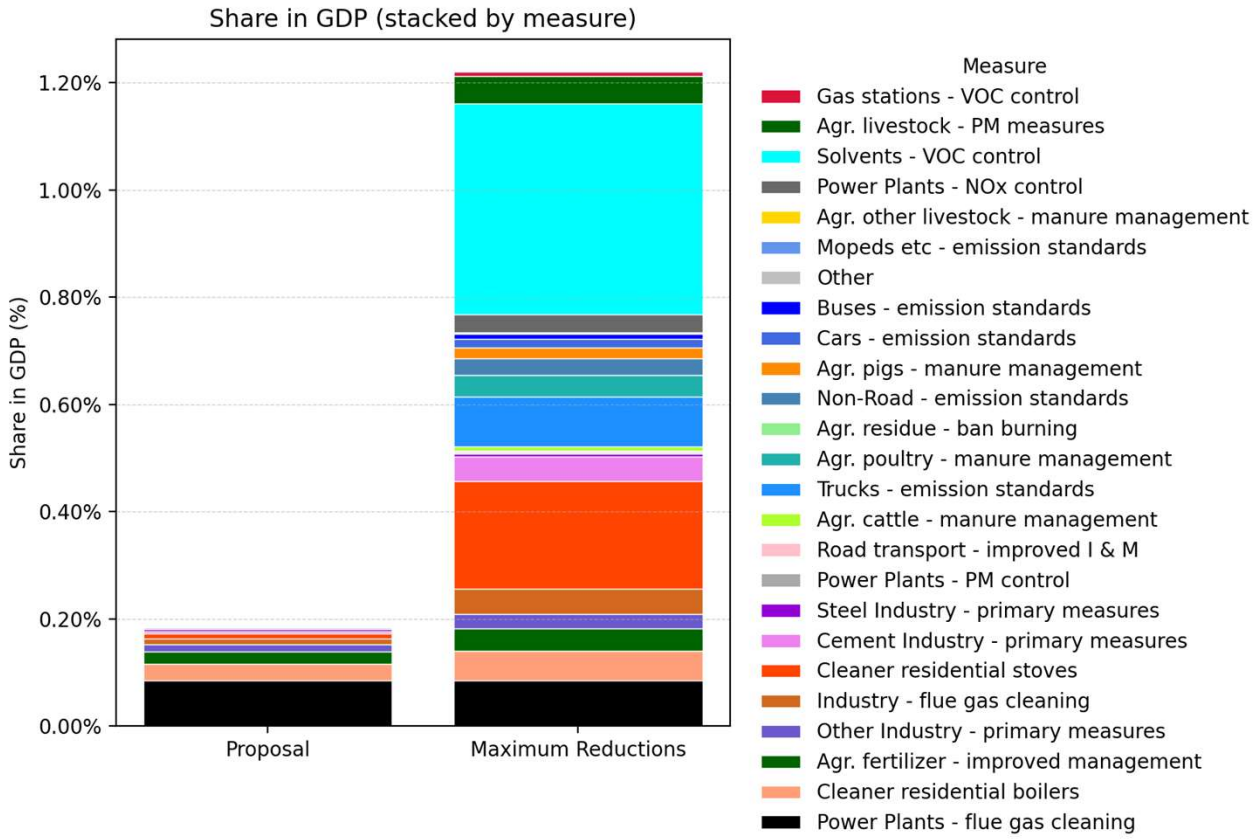
Additional Costs relative to 2030 Current Legislation (CLE) – An example



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Albania

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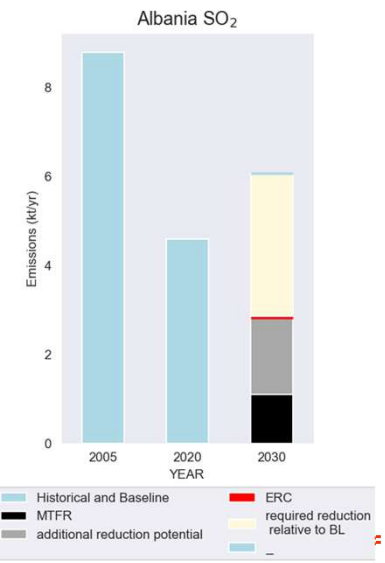
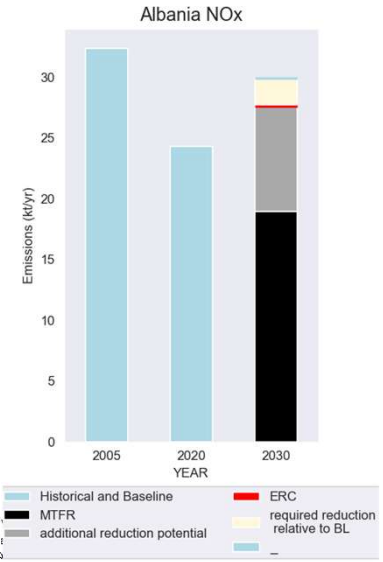
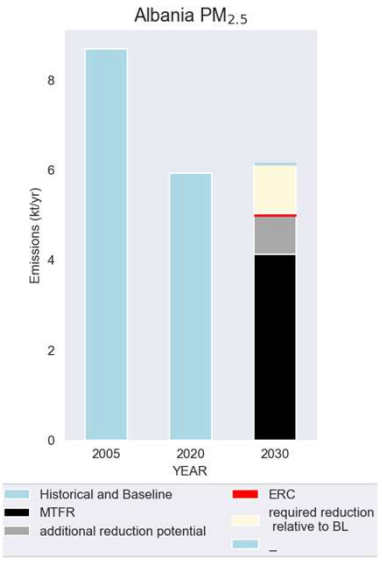
Cost-effective ERCs resulting from the modeling exercise

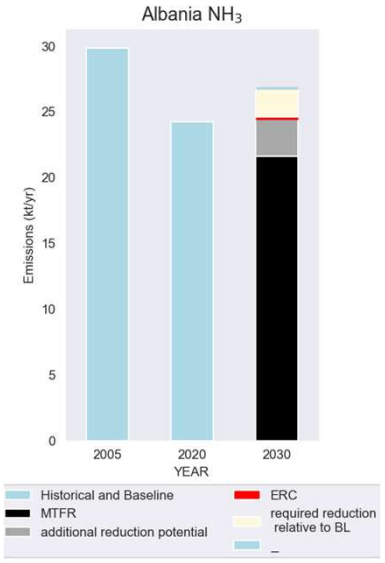
Albania

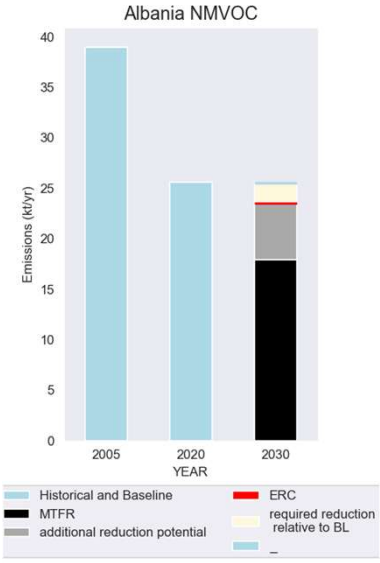
Item	unit	SO2	NOx	PM2.5	NH3	VOCs
Absolute target	kt	2.86	27.75	5.04	24.61	23.64
Reduction rel. 2005	kt	-5.94	-4.65	-3.66	-5.19	-15.36
	%	-68%	-14%	-42%	-17%	-39%
Reduction rel. 2020	kt	-1.74	3.45	-0.86	0.31	-1.96
	%	-38%	14%	-15%	1%	-8%
Reduction rel. 2030 (CLE)	kt	-3.24	-2.15	-1.06	-2.19	-1.86
	%	-53%	-7%	-17%	-8%	-7%











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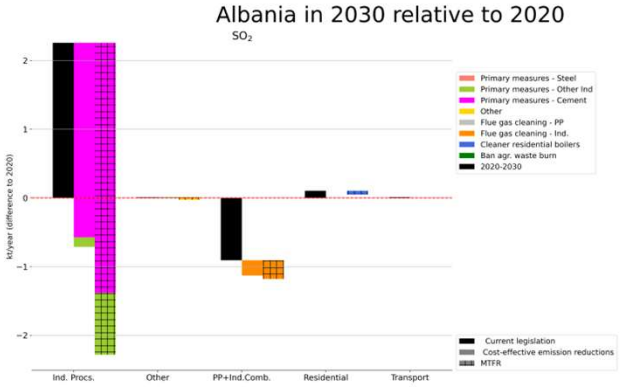
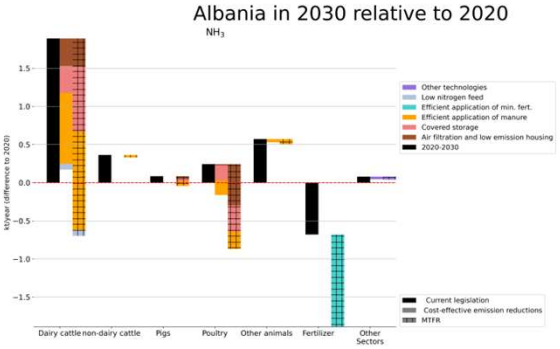
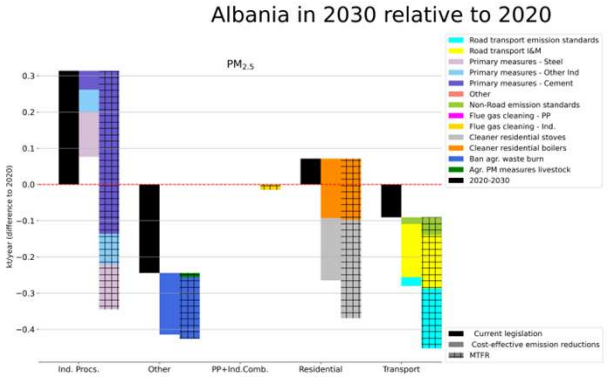
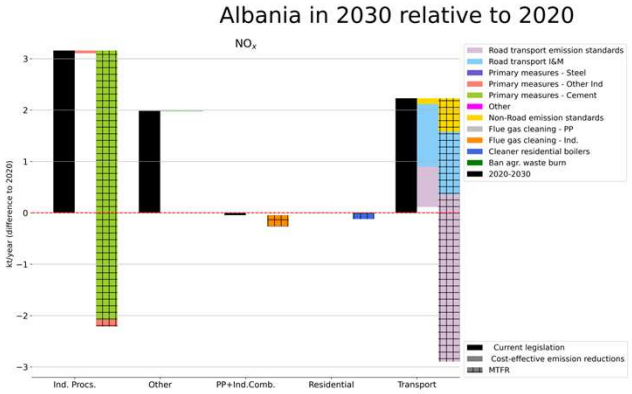
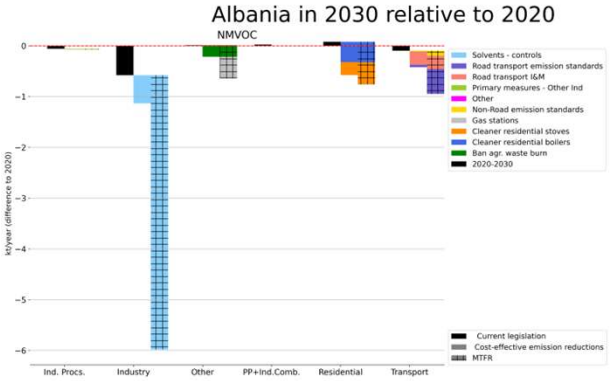
Cost-effective ERCs and costs resulting from the modeling exercise











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Bosnia and Herzegowina

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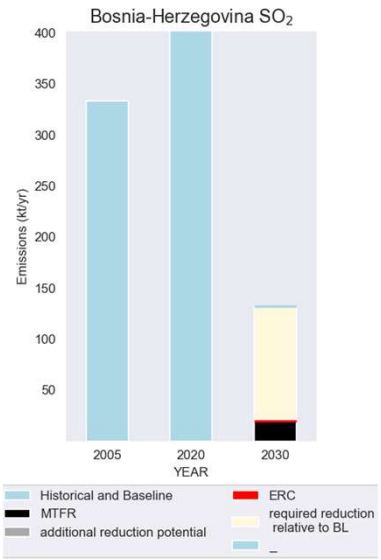
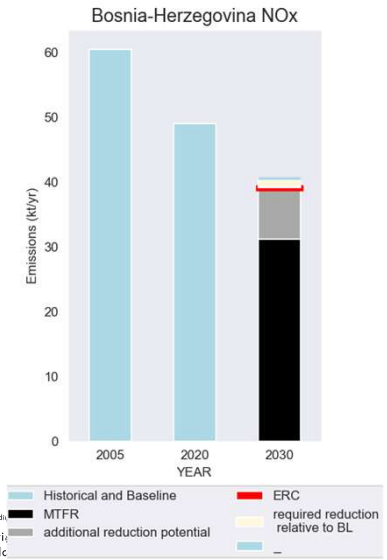
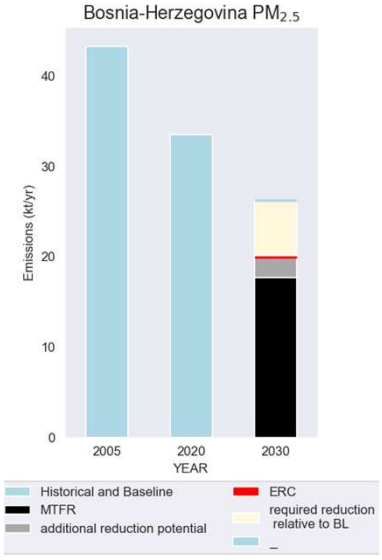
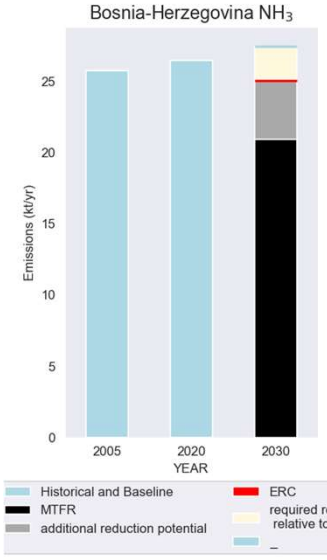
Cost-effective ERCs resulting from the modeling exercise

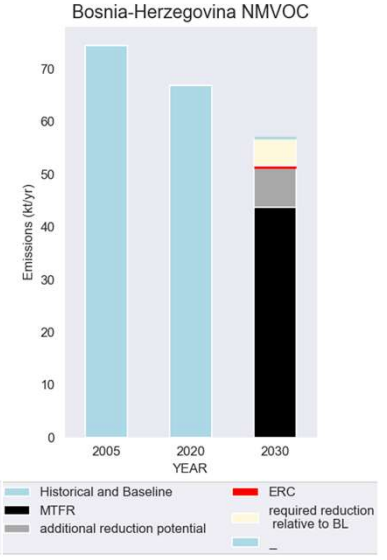
Bosnia and Herzegovina						
Item	**unit**	**SO2**	**NOx**	**PM2.5**	**NH3**	**VOCs**
Absolute target	kt	21.35	39.12	20.08	25.17	51.54
Reduction rel. 2005	kt	-311.95	-21.48	-23.22	-0.63	-22.96
	%	-94%	-35%	-54%	-2%	-31%
Reduction rel. 2020	kt	-380.65	-9.88	-13.42	-1.33	-15.26
	%	-95%	-20%	-40%	-5%	-23%
Reduction rel. 2030 (CLE)	kt	-110.95	-1.48	-6.22	-2.33	-5.46
	%	-84%	-4%	-24%	-8%	-10%











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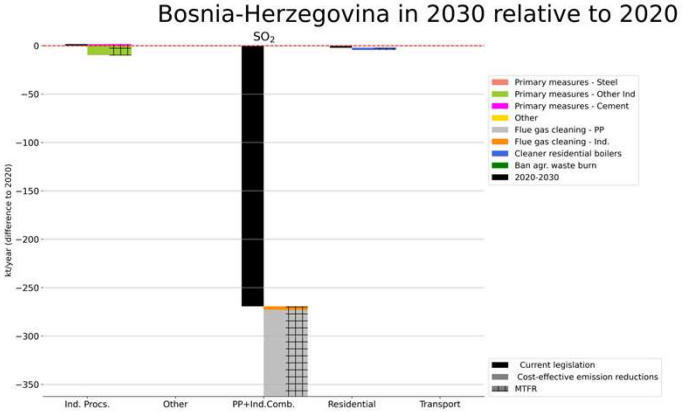
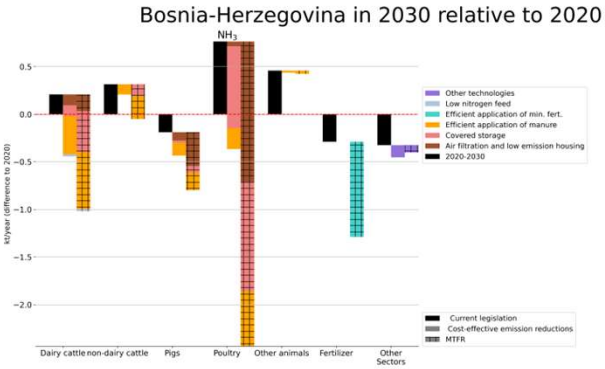
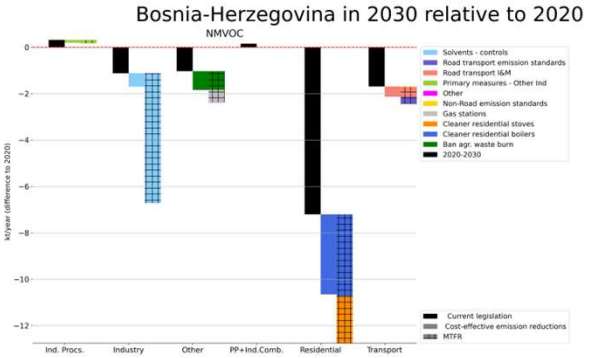
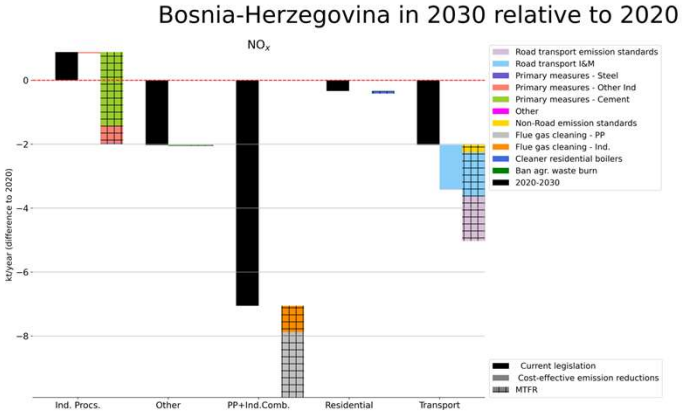
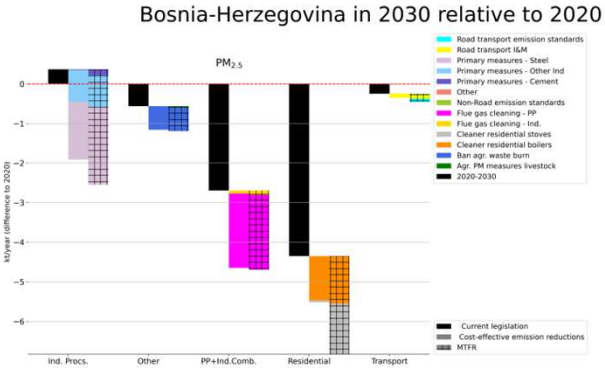
Cost-effective ERCs and costs resulting from the modeling exercise











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Kosovo

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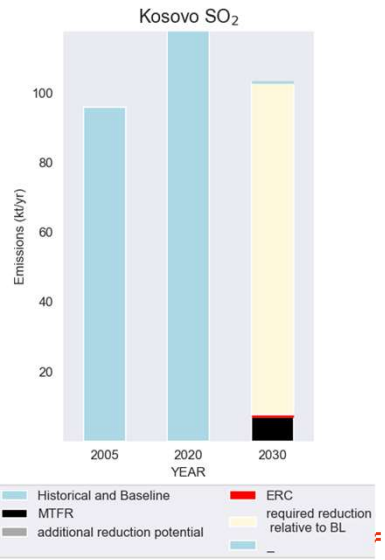
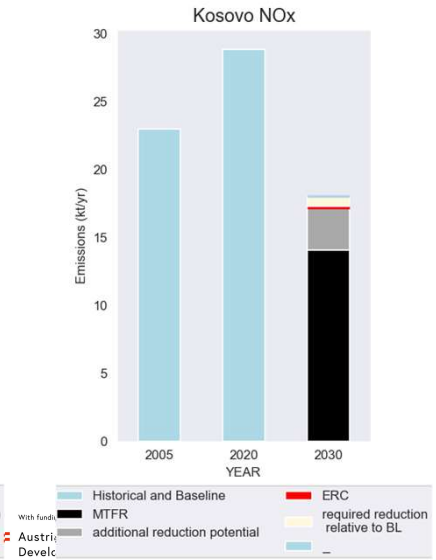
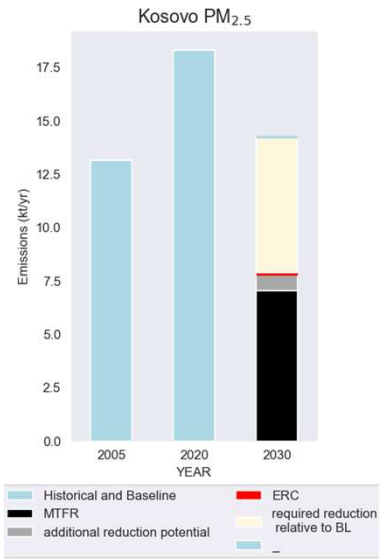
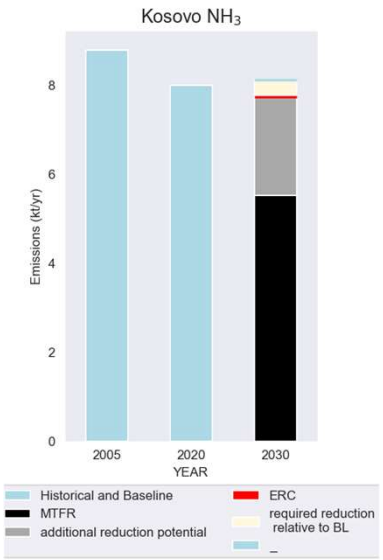
Cost-effective ERCs resulting from the modeling exercise

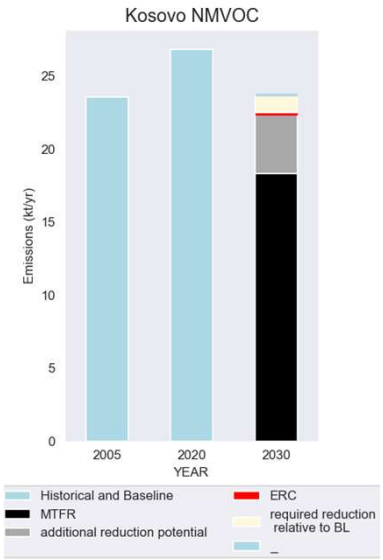
Kosovo						
Item	**unit**	**SO2**	**NOx**	**PM2.5**	**NH3**	**VOCs**
Absolute target	kt	7.67	17.27	7.90	7.78	22.50
Reduction rel. 2005	kt	-88.43	-5.73	-5.30	-1.02	-1.10
	%	-92%	-25%	-40%	-12%	-5%
Reduction rel. 2020	kt	-110.23	-11.53	-10.40	-0.22	-4.30
	%	-93%	-40%	-57%	-3%	-16%
Reduction rel. 2030 (CLE)	kt	-95.43	-0.73	-6.40	-0.32	-1.20
	%	-93%	-4%	-45%	-4%	-5%











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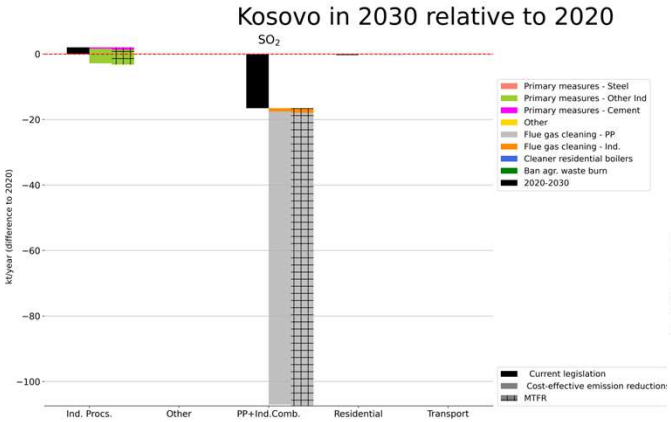
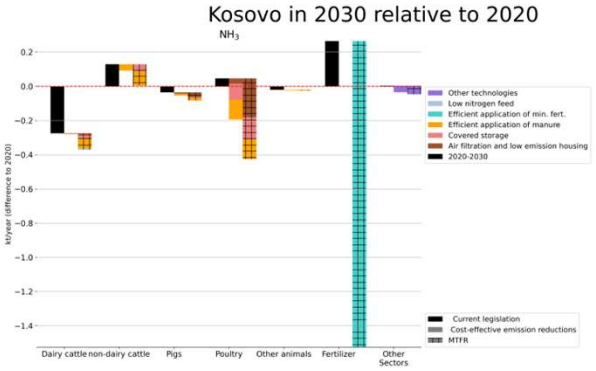
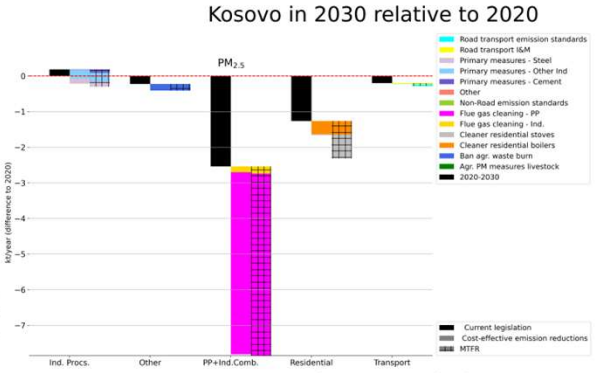
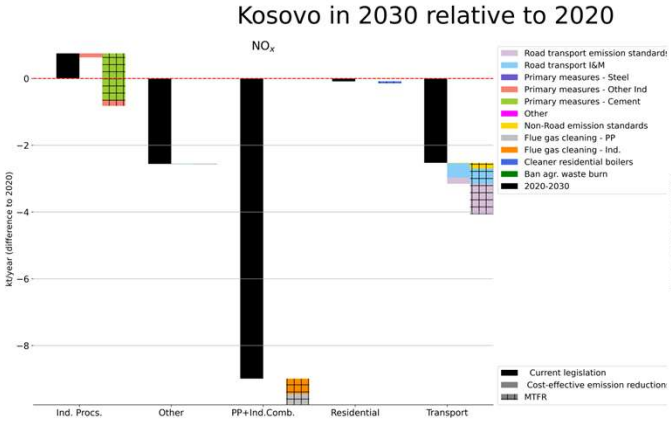
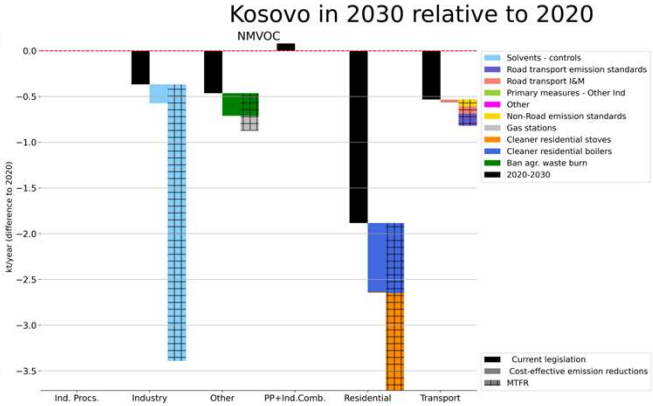
Cost-effective ERCs and costs resulting from the modeling exercise











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Montenegro

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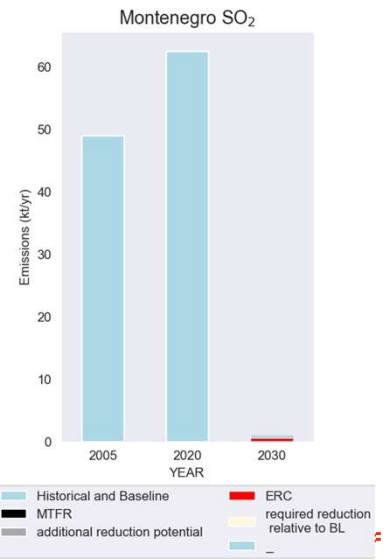
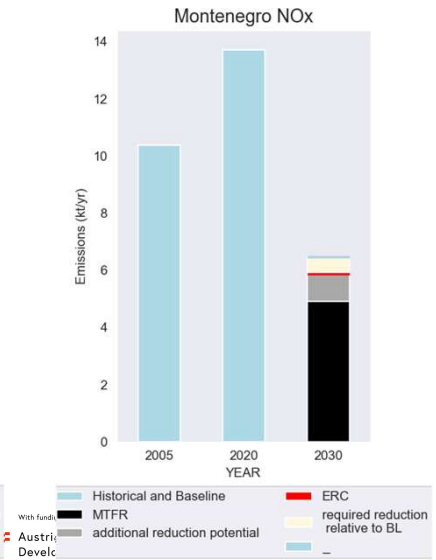
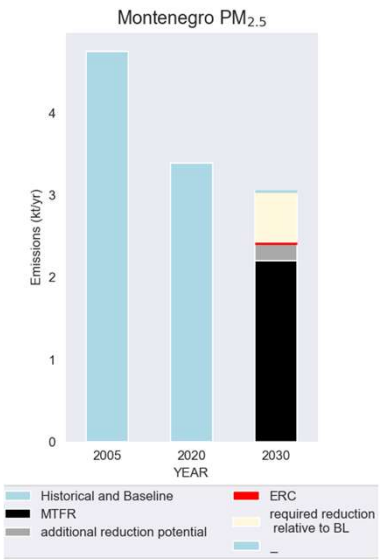
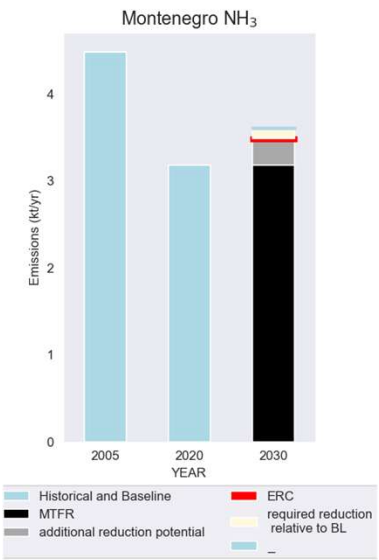
Cost-effective ERCs resulting from the modeling exercise

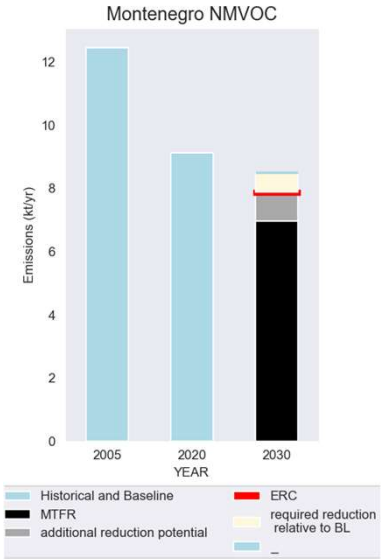
Montenegro						
Item	**unit**	**SO2**	**NOx**	**PM2.5**	**NH3**	**VOCs**
Absolute target	kt	0.58	5.91	2.43	3.48	7.87
Reduction rel. 2005	kt	-48.42	-4.49	-2.37	-1.02	-4.63
	%	-99%	-43%	-49%	-23%	-37%
Reduction rel. 2020	kt	-61.92	-7.79	-0.97	0.28	-1.23
	%	-99%	-57%	-29%	9%	-14%
Reduction rel. 2030 (CLE)	kt	-0.32	-0.59	-0.67	-0.12	-0.63
	%	-36%	-9%	-22%	-3%	-7%











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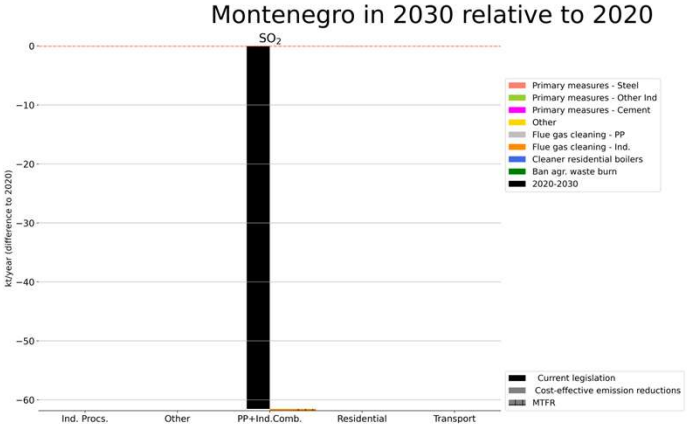
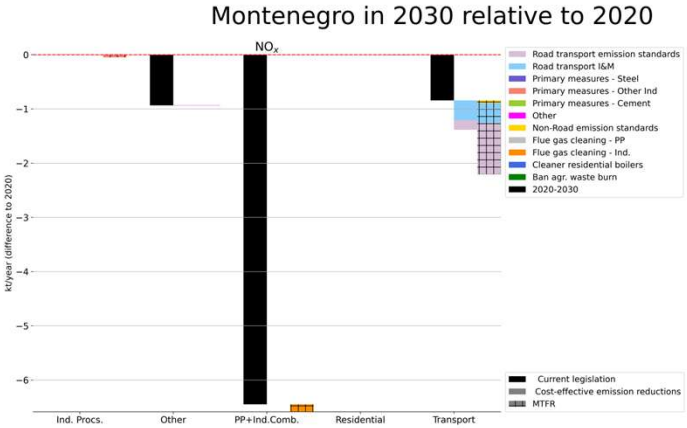
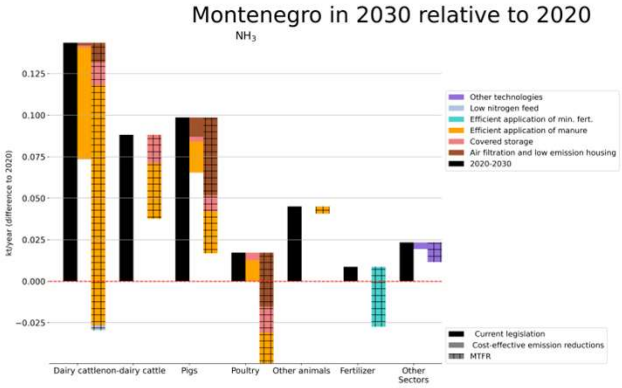
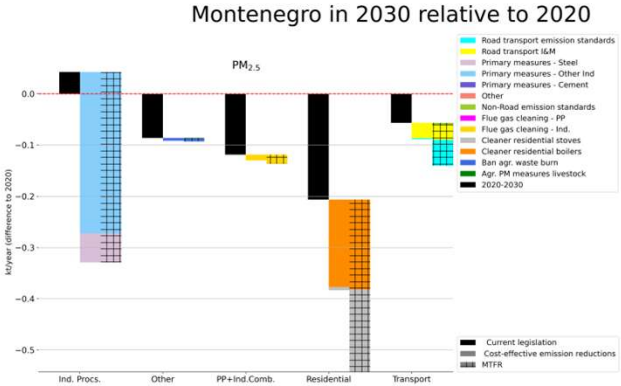
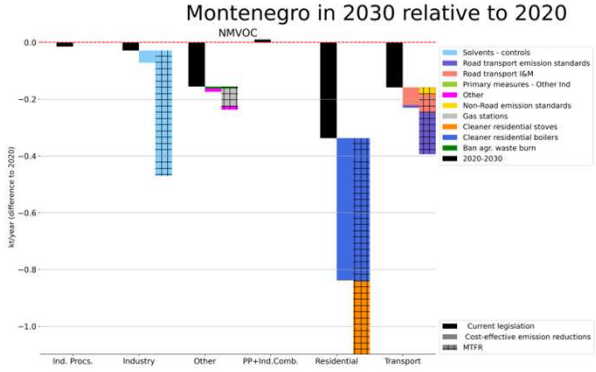
Cost-effective ERCs and costs resulting from the modeling exercise











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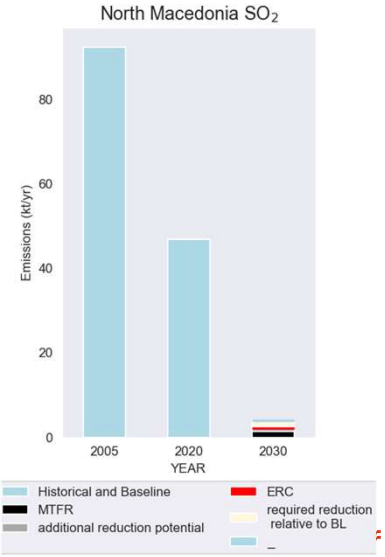
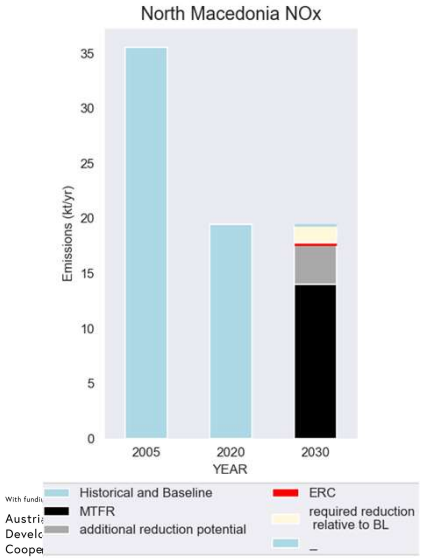
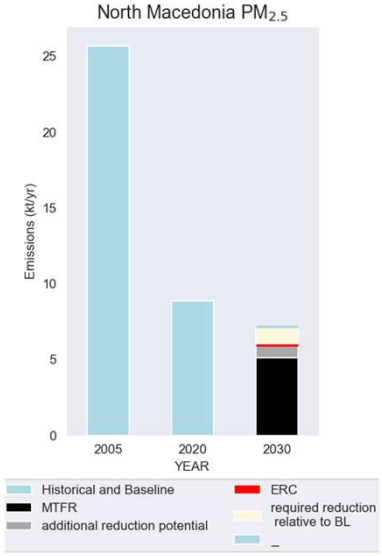
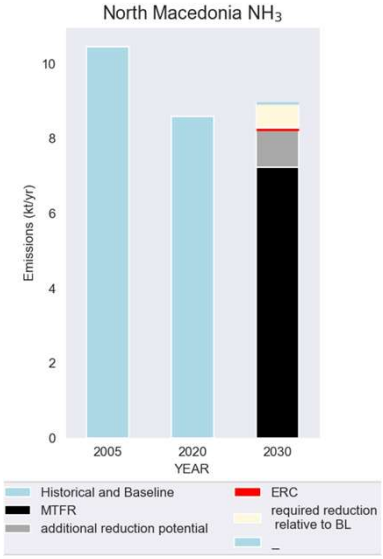
Cost-effective ERCs resulting from the modeling exercise

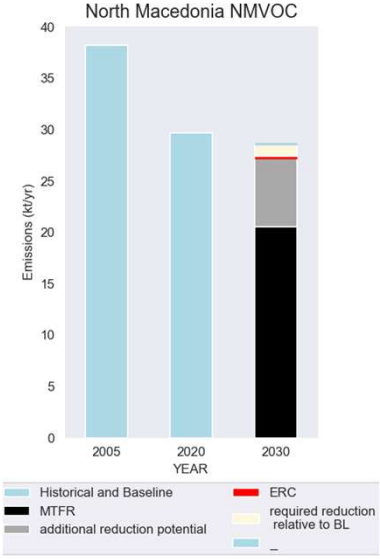
North Macedonia						
Item	**unit**	**SO2**	**NOx**	**PM2.5**	**NH3**	**VOCs**
Absolute target	kt	2.47	17.75	6.05	8.28	27.44
Reduction rel. 2005	kt	-89.83	-21.55	-20.35	-2.52	-12.86
	%	-97%	-55%	-77%	-23%	-32%
Reduction rel. 2020	kt	-44.43	-9.05	-4.25	-0.72	-5.86
	%	-95%	-34%	-41%	-8%	-18%
Reduction rel. 2030 (CLE)	kt	-1.63	-5.55	-2.85	-1.12	-5.96
	%	-40%	-24%	-32%	-12%	-18%











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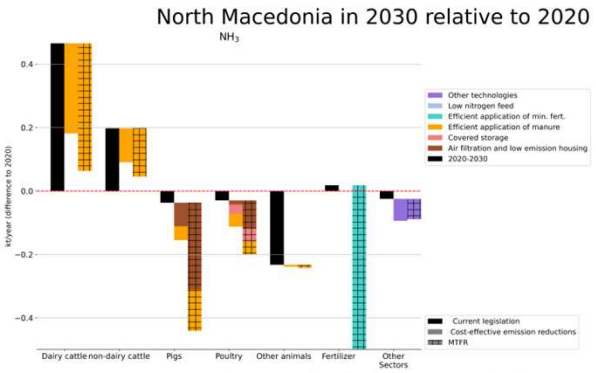
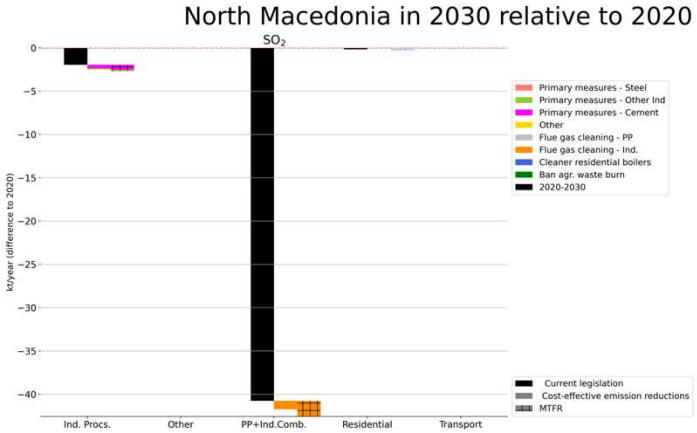
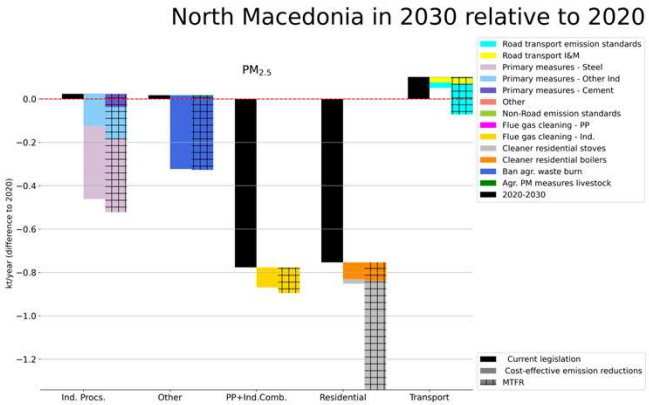
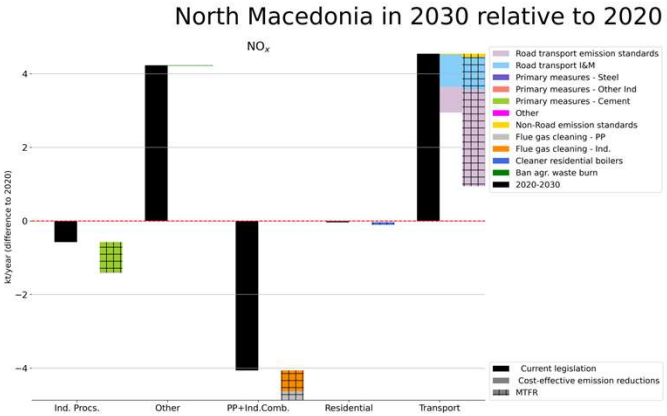
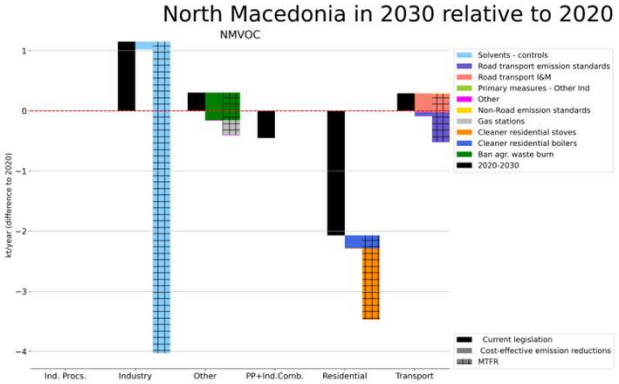
Cost-effective ERCs and costs resulting from the modeling exercise











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Serbia

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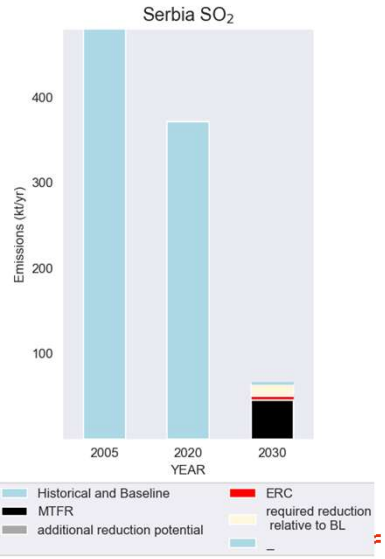
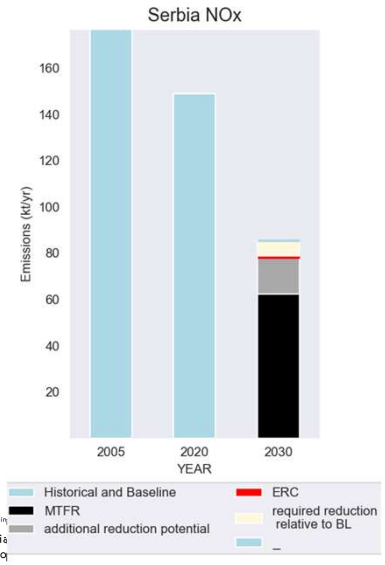
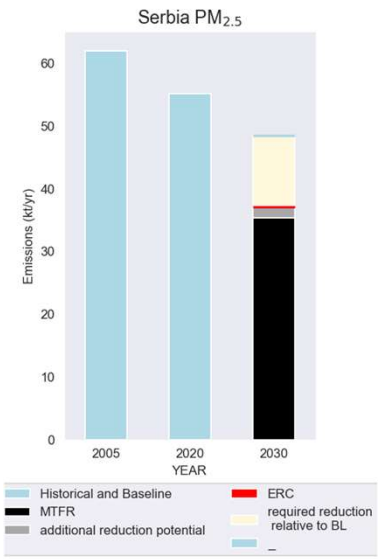
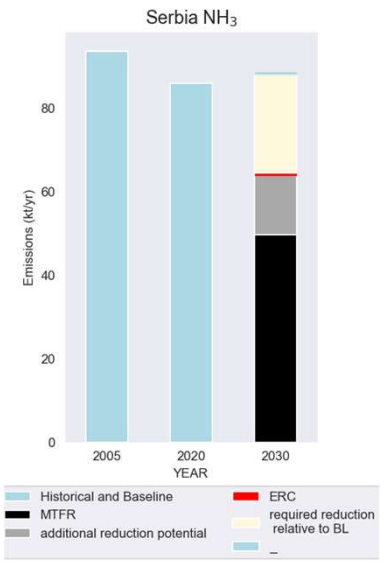
Cost-effective ERCs resulting from the modeling exercise

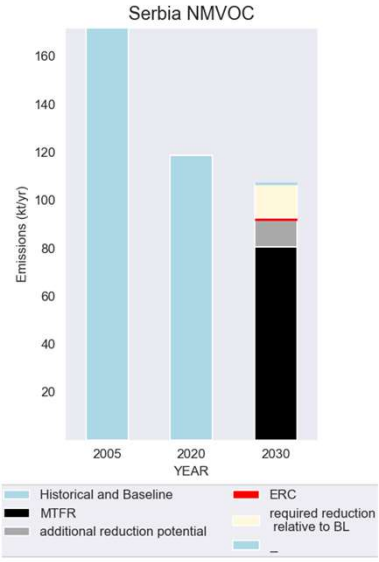
Serbia						
Item	**unit**	**SO2**	**NOx**	**PM2.5**	**NH3**	**VOCs**
Absolute target	kt	50.32	78.74	37.36	64.44	92.67
Reduction rel. 2005	kt	-429.58	-98.26	-24.54	-29.16	-79.33
	%	-90%	-56%	-40%	-31%	-46%
Reduction rel. 2020	kt	-322.98	-70.36	-17.14	-21.66	-24.93
	%	-87%	-47%	-31%	-25%	-21%
Reduction rel. 2030 (CLE)	kt	-16.28	-6.76	-12.54	-29.96	-16.23
	%	-24%	-8%	-25%	-32%	-15%











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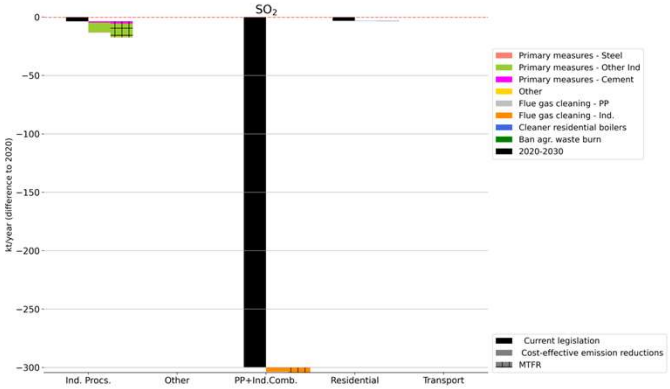
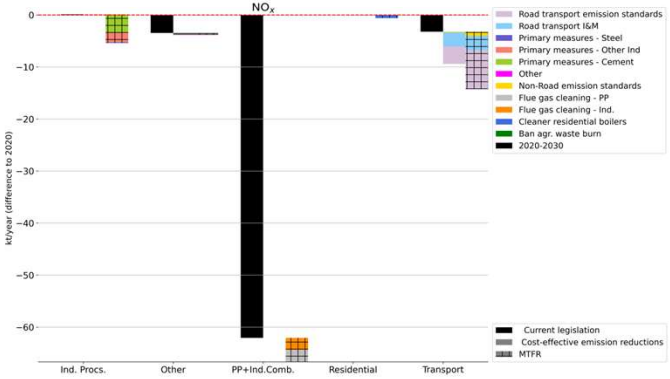
Cost-effective ERCs and costs resulting from the modeling exercise

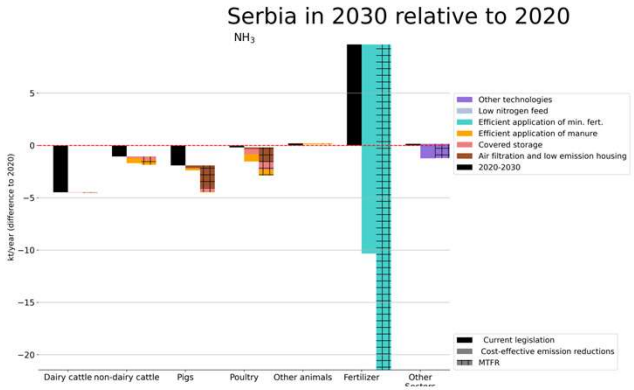
Serbia in 2030 relative to 2020



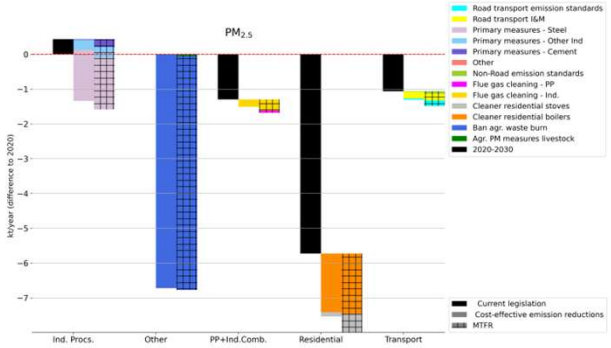
Serbia in 2030 relative to 2020



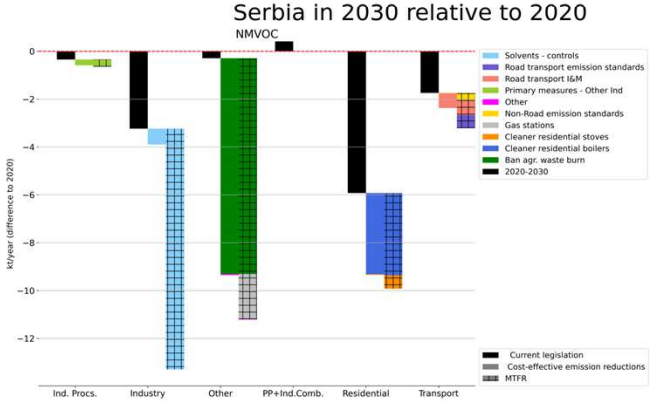
Serbia in 2030 relative to 2020



Serbia in 2030 relative to 2020



Serbia in 2030 relative to 2020



Conclusion

- Following the approach of the NECD that was applied to EU27, in this modeling exercise a target was set on the number of premature deaths (-50% relative to 2005, across the whole WB domain)
- The optimization module of GAINS was used to identify the cost-effective control strategy for each of the economies
- This optimization takes into account the characteristics of emission control technologies, the potentials for emission reduction technology in each sector and country, the atmospheric transport and chemical reactions of the pollution; the baseline developments in each economy; the demographic vulnerabilities in each economy;
- The calculated optimal ERCs differ by pollutant and country.
- The optimal solution comes at a cost of around 230 MEuros per year, or approx. 0.2% of GDP of the whole WB domain
- Deviations from the optimal solution may be associated with higher costs

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