The status of the latest guidance documents on NTM & the cost-of-inaction document

Informal Meeting of the CLRTAP WGSR, 21-24 October 2024

Stefan Åström, co-chair TFIAM, 2024-10-20

Guidance document on Non-technical Measures

Guidance Document on Non-Technical Measures

- Draft submitted on the 18th of October 2024,
- Outline
  - Introduction,
  - Why do we need non-technical measures,
  - Policy instruments to implement non-technical measures,
  - Inventory of effective measures,
  - Modelling potentials, costs, and benefits of structural and non-technical measures,
  - Political and social challenges of non-technical measures,
  - Conclusion
- NTM defined as emission reduction measures not described in the Technical annexes to the Gothenburg Protocol,

NTM - Key take-aways (1 of 2)

- Many NTM-cases documented, no policy ’golden rule’.
  ⇨ Successful NTM require adaptation to local/regional conditions,
- Successful implementation often requires combination of instruments
  ⇨ ”*One problem, one policy instrument*” = FALSE
- NTMs have large remaining potential
  - NH_3 has highest identified potential (See GAINS Low scenario).
- NTMs are often co-beneficial with greenhouse gas emission control.

NTM - Key take-aways (2 of 2)

- NTMs that imply’individual behavioural change’, are most difficult,
- NTM proposals risk being discouraged if:
  - NTM influence individuals’ own behavior,
  - NTM restrict personal freedom.
- Individual behavioural change more acceptable if individuals:
  - are aware and concerned about the problem and its consequences,
  - feel a moral obligation,
  - perceive the change as fair and environmentally effective,
  - trust the institution proposing policy.

NTM next steps

- Draft delivered on the 18th of October 2024,
- Presented to EB in December 2024,
- Adaptation of draft to comments received,
- Next version presented to WGSR in 2025,
- Final version sent to EB for ‘note’ / ‘approval’ by December 2025

The costs of inaction on air pollution

Report for policymakers on the **Costs of inaction** on air pollution

https://unece.org/sites/default/files/2022-10/ECE_EB.AIR_2022_7-2215043E_0.pdf

Question #1:
Can we confidently estimate welfare effects of poor air quality?

Answer #1:
Yes!
We are confident in the data and method used to calculate welfare effects. We are confident that published values are underestimations.

Question #2:
How high are the damage costs when we don't take action on air pollution?

Answer #2:
Costs of Inaction are so high that they correspond to several percents of GDP for most countries

Report for policymakers on the **Costs of inaction** on air pollution

https://unece.org/sites/default/files/2022-10/ECE_EB.AIR_2022_7-2215043E_0.pdf

Question #3:
Are these damage costs expected to go up or down in the future?

Answer #3:
Costs expected down for: EECCA and South and Western Europe,
Costs expected up for West Balkan,
Scenario unknown for North America,

Question #4:
How can we further reduce the costs of inaction?

Answer #4:
By implementing known technical solutions as well as non-technical measures.

Question #5:
Will human welfare improve if we do more?

Answer #5:
Yes, MTFR scenario analysis of EU countries, as well as case study calculations of Apatity coal power plant shows benefits larger than costs

Thank you for your attention

COI Report available in English, French, and Russian at:

https://unece.org/sites/default/files/2022-10/ECE_EB.AIR_2022_7-2215043E_0.pdf

For more questions, please contact:

stefan.astrom@anthesisgroup.com

Extra slides

Examples of policy instruments to encourage behavioral and structural measures

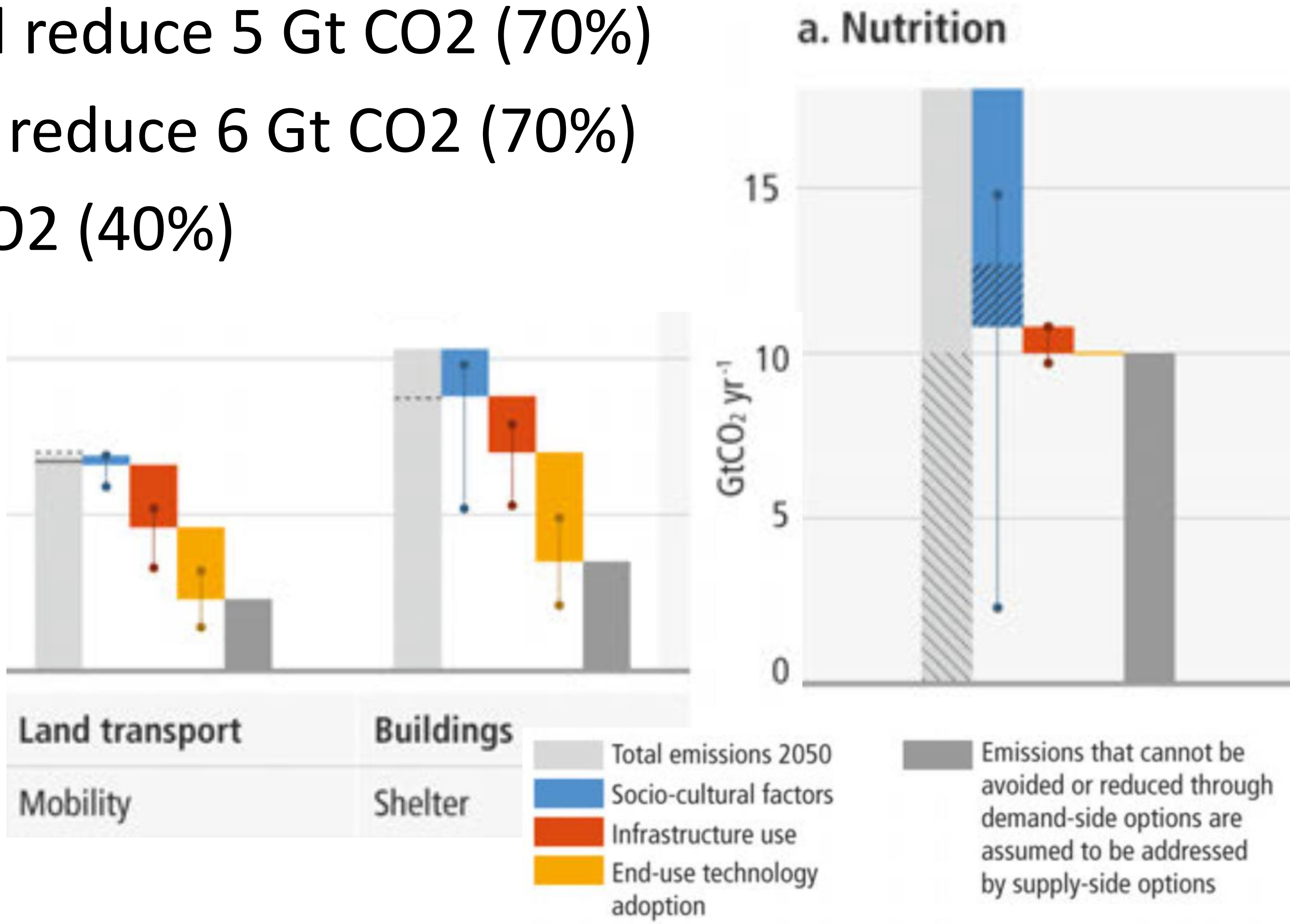
1. Regulatory instruments: low-emission zones; permits for new roads or traffic intensive services
2. Economic instruments: subsidies for clean alternatives (food, vehicles, wood stoves); charges for polluting vehicles, fuels (and meat), compensation for the early scrapping of cars or stoves; increased parking fees in cities
3. Social instruments: raising awareness, public involvement in monitoring and city transport planning, communication strategies to gain societal support for the use of one of the other policy instruments and adapt social norms that in turn influence individual behavior
4. Public investments: investments in public transport, removal of parking spaces and the replacement of car lanes by bus or cycle lanes aimed at modal change and reduction of car traffic intensity. Investments in electric vehicle (EV) infrastructure and green electricity; replacement of government motor vehicle fleets with EVs

+ remove subsidies that stimulate fossil fuel use, car traffic, intensive farming

Great expectations

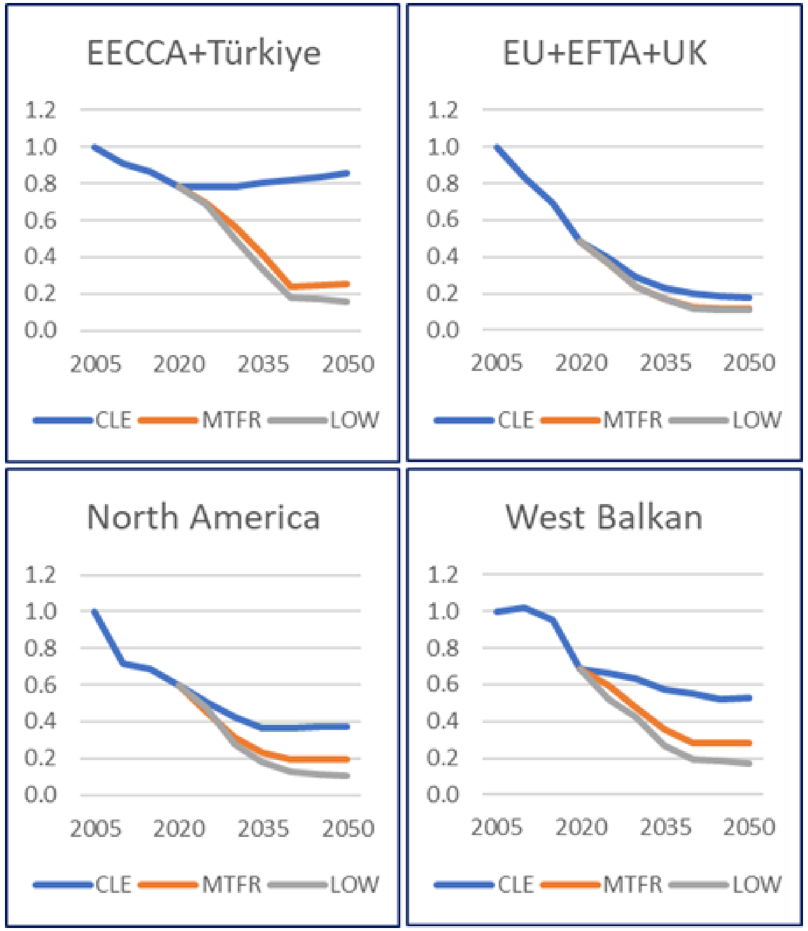
- Modal shifts, active mobility could reduce 5 Gt CO2 (70%)
- Domestic heating measures could reduce 6 Gt CO2 (70%)
- Dietary shifts could reduce 8 Gt CO2 (40%)

Source IPCC –WGIII (2022)

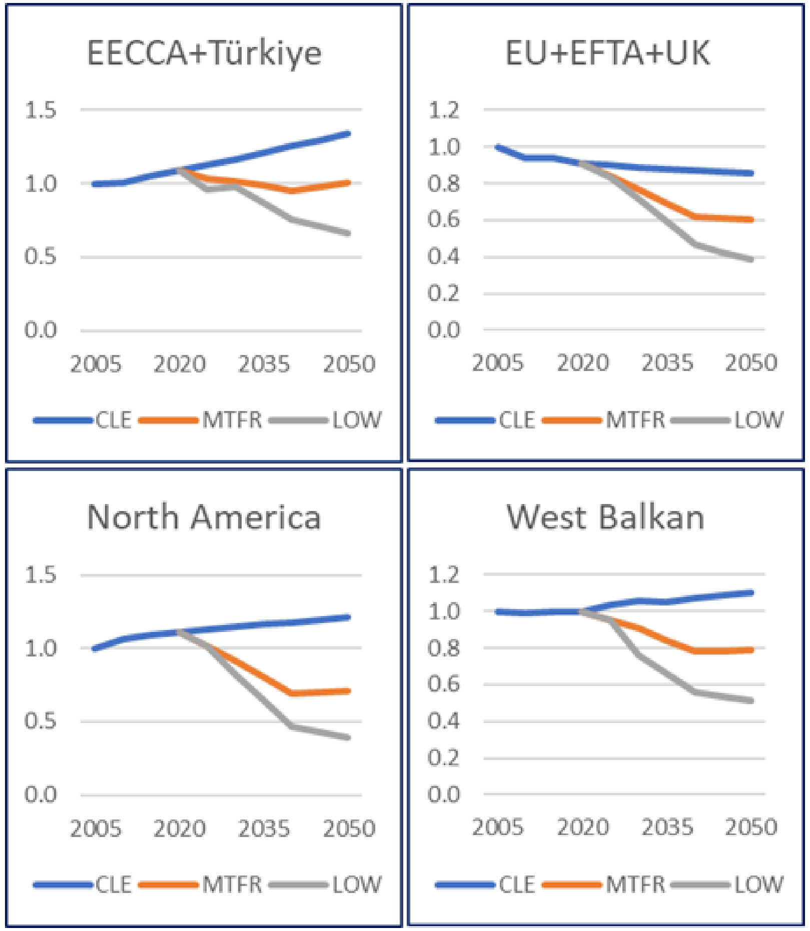


What can we learn from GAINS-scenarios?

Nitrogen oxides



Ammonia



Hot issues

- Is wood-burning a human right? How to enforce "burning the right way"
- Who has the power to change the food system?
- Can we live with less flying?
- How to avoid yellow jackets?
- Who is being compensated for the costs of the energy transition?

Transport policies – there no silver bullet

	Public support	Health benefits
logistical programs for goods transport	.	+
national speed limits	-	+
increase of fuel duties	--	++
(local or national) road pricing	--/---	+++
Higher parking fees / fewer parking places	-	+
investments in public transport	+	+
agreements with cities on low-emission zones	-	(++)
enhanced inspection and maintenance schemes	+	+
scrapping schemes	+	++
EV infrastructure and incentives for EV sales	++	+++
public awareness health benefits walking and cycling	+	+
Traffic circulation schemes	-	0/-

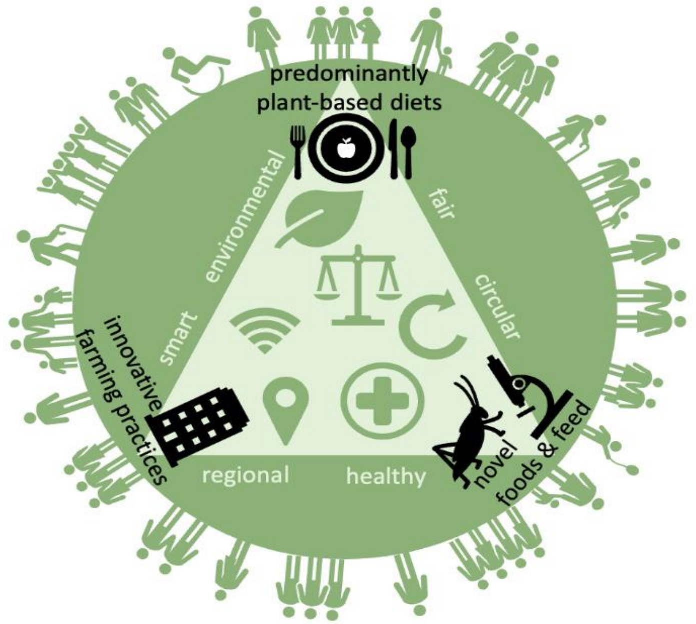
Public support differs among countries. Health benefits are linked to emission reductions. Success depends on the spatial scale and 'strength' of the measure.

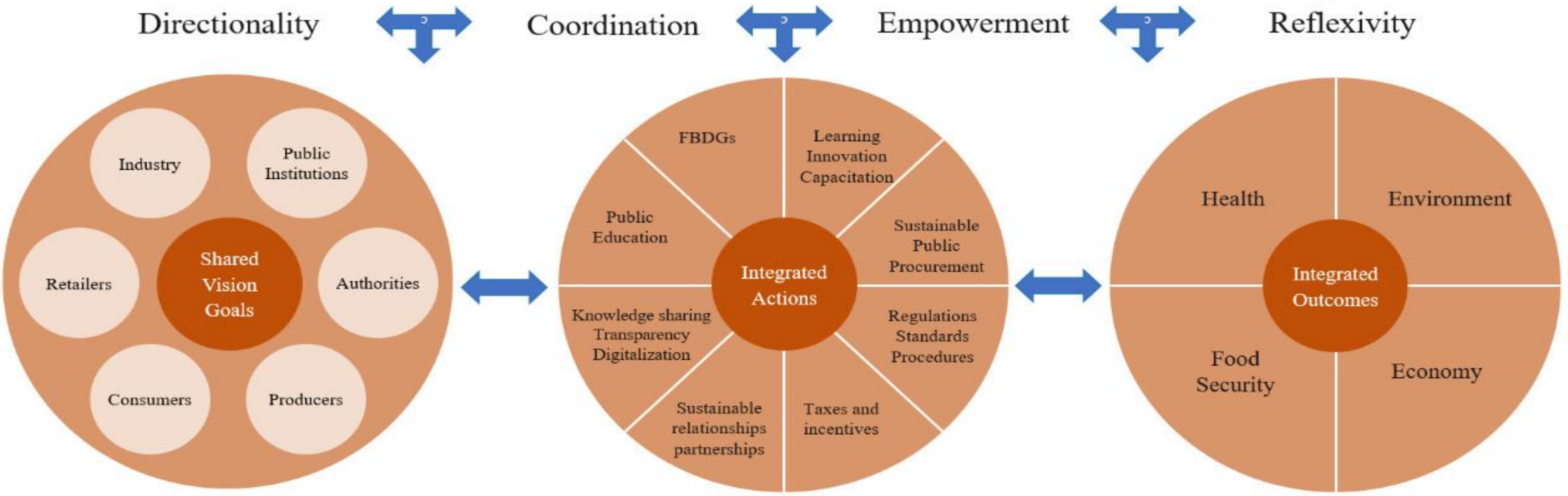
Dietary change

It is more complex than you think!

Appetite for change

- **Combining policy instruments to support more plant-based diets**
- **Strengthen governments' coordination and operational capacities**
- **Anticipatory capacity is essential for imagining a future food system**





What are benefits and costs of behavioral and structural measures?

Benefits:

a) Higher emission reduction potential than with technical measures alone
b) Lower costs of technical measures

Political limitations:

a) They cannot easily be implemented via permitting of specific activities. They often require *more coordination* with other ministries, government layers, stakeholders and public.
b) They often require a combination of *actions by various players* in the production chain, as well as by consumers.
c) *Non-monetary costs*: longer traveling time, less comfortable indoor temperatures, loss of freedom to choose, loss of personal control, ..
d) *Less predictable*: much depends on the actual preferences and power of stakeholders.
e) In specific situations, pragmatic policy choices must be made acknowledging that *public acceptance* of policy instruments has limitations, that long-term goals cannot be realized at once, and that one should be satisfied with small steps in the right direction.

Scientific challenges to deal with “NTM’s”

1. Translation of (variable) local experiences to UNECE domain
2. Monetization of costs and benefits and inclusion in optimization of “welfare” effects
    a) Costs of enforcement
    b) Some measures improve air quality and have additional direct health benefits (active mobility, healthy diets)
    c) Costs of integrated transport-city planning is difficult to attribute
    d) Taxing fuels and food will have cross-border impacts
3. Impacts on air quality and health are mainly based on ex ante model calculations; ex post evaluations are sparce

Conclusions

1. There is no silver bullet
2. Effective measures seem to encounter most political resistance
3. What works in one country doesn’t have to work in other countries
4. However, it is important to exchange experiences and learn from each other

- Next version Guidance Document (Sept 2024)
- Final version to be approved by EB in December 2025

Urban policy interventions to reduce traffic-related emissions and air pollution: A systematic evidence map (376 measures, based on over 9000 references)

Haneen Khreis et al, Env Int Feb2023

Policy Category	Policy Intervention	Frequency Studied
Pricing: 11.8 % (n = 216)	1. Air pollution charging fees	24
	2. Congestion charging	28
	3. Fuel taxes or price increase	26
	4. Mileage-based user fees	4
	5. Parking charges	55
	6. Road pricing	51
	7. Pricing incentives	27
	8. Vehicle ownership taxes	1
Land-Use: 4.2 % (n = 77)	1. Development density and mixed developments	42
	2. Parking expansion	2
	3. Superblock development	2
	4. Transit-oriented development	18
	5. Urban sprawl	8
	6. Urban transport planning	5

Infrastructure: 11.5 % (n = 210)	1. Active transportation infrastructure	26
	2. Bus rapid transit or mass rapid transit	43
	3. Greenspace or blue space	2
	4. Park and ride	9
	5. Public transportation infrastructure	33
	6. Roadway development	23
	7. Solid roadside barrier	8
	8. Speed bump development	18
	9. Street ventilation	3
	10. Unconventional intersection or intersection alteration	22
	11. Vegetative roadside barrier, surface, or roof	23

https://doi.org/10.1016/j.envint.2023.107805

Urban policy interventions to reduce traffic-related emissions and air pollution: A systematic evidence map – ctd

Category	Intervention	n
Behavioral: 6.3 % (n = 116)	**1. Active or non-motorized transport (i.e., bike or walk) promotion or shift**	**31**
	2. Flexible work arrangements	26
	3. Public transit promotion or shift	47
	4. Ride sharing promotion or shift	12
Technology: 22.2 % (n = 406)	1. Alternative fuel technology	271
	2. Alternative vehicle technology	12
	3. Electronic toll technology	3
	4. Material coating	6
	5. Real-time passenger information	2
	6. Speed control technology	5
	7. Stop/Start technology	2
	8. Vehicle retrofitting	105

Category	Intervention	n
Management, Standards, and Services: 44.1 % (n = 807)	**1. Fleet management**	**59**
	2. Fuel regulation or restriction	35
	3. High occupancy vehicle lane	13
	4. Inspection and maintenance program	18
	5. Intelligent transport system	47
	6. Low emission zone	56
	7. Loading, unloading, and/or idling regulation	18
	8. Parking standards, reduction, or regulation	16
	9. Public transportation expansion	47
	10. Public transportation regulation	31
	11. Speed limit regulation or reduction	42
	12. Street cleaning	4
	13. Studded tire regulation	1
	14. Traffic signal optimization	29
	15. Vehicle or manufacturing alteration	4
	16. Vehicle emission regulation	134
	17. Vehicle purchase restriction	7
	18. Vehicle rerouting or route optimization	18
	19. Vehicle retirement or replacement	112
	20. Vehicle shift	2
	21. Vehicle use restriction	114

NTM overview Italy (Ilaria D' Elia & Antonio Piersanti)

	Succesful examples	summary	Effective zone (country/area)	Air pollution reduction	Health effects	Costs	reference
Transport	Speed limit highway	reduction of speed limit from 130 km/h to 100 km/h	Italy	Year 2030: reduction of 11.5% of Nox emissions respect to the 2030 baseline. Smaller reduction for PM10 (<2%)	available but not per single measure	not estimated	D'Elia et al., 2018, https://www.sciencedirect.com/science/article/abs/pii/S1309104217306529
Transport	Low emission zones		several Italian regions	5% of NOx emission reductions	available but not per single measure	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Transport	road traffic restriction	Limitation to vehicle circultation of older Euro vehicles	several Italian regions	10% of NOx emission reductions and 5% of PM10 emissions	available but not per single measure	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Transport	New heavy duty vehicles	Incentives for the substitutions of heavy duty vehicles	several Italian regions	31.4% of NOx emissions	available but not per single measure	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Transport	Renew fleet for freight vehicles	Promote the use of methane/liquefied natural gas (LNG)–powered heavy duty trucks. Promote the use of LNG in maritime transport	Italy	NOX emission reduction of 49% at the year 2030 respect to the baseline	available but not per single measure	available but not per single measure as benefits obtained applying a set of measures	Piersanti et al., 2021, https://www.mdpi.com/2073-4433/12/2/196
Transport	Public transport renewal	Incentives for bus substitution, frequency increase, etc	several Italian regions	10% of NOx emission reductions and 2% of PM10 emissions	available but not per single measure	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Energy	Promotion of photovoltaic integrated in domestic buildings	incentives to install photovoltaic systems in houses	Italy	negligible emission reductions	not estimated	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Energy	Regulation of residential biomass, oil and coal use	ban of these type of fuel	Italy	Reduction of SO2 emissions (36.4%), of 15% of PM10 emissions and 5% of Nox emissions	available but not per single measure	not estimated	D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Energy	Efficiency improvements in fireplaces and stoves	Renewal of old biomass heating systems with efficient and low–emission technologies	Italy	PM10 and NMVOC emission reduction of 12% and 20% at the year 2030 respect to the baseline	available but not per single measure	available but not per single measure as benefits obtained applying a set of measures	Piersanti et al., 2021, https://www.mdpi.com/2073-4433/12/2/196; D'Elia et al., 2009, https://www.sciencedirect.com/science/article/pii/S1352231009007675
Agriculture	Lower nitrogen feeding diet for bovines	10% of lower nitroge feeding diet for bovins (not regulated by EU Directive)	Italy	the two measures were applied together with an overall NH3 emission reductions of 7%	available but not per single measure	not estimated	D'Elia et al., 2018, https://www.sciencedirect.com/science/article/abs/pii/S1309104217306529
Agriculture	More efficient use of nitrogen fertilizers	Reduction of 50% of nitrogen application in fertilization with an efficiency of 50%	Italy		available but not per single measure	not estimated	D'Elia et al., 2018, https://www.sciencedirect.com/science/article/abs/pii/S1309104217306529
Agriculture	Incorportate fertilizers	Incorporate urea-based fertilizers	Italy	NH3 emission reduction of 27% at the year 2030 respect to the baseline scenario	available but not per single measure	available but not per single measure as benefits obtained applying a set of measures	Piersanti et al., 2021, https://www.mdpi.com/2073-4433/12/2/196

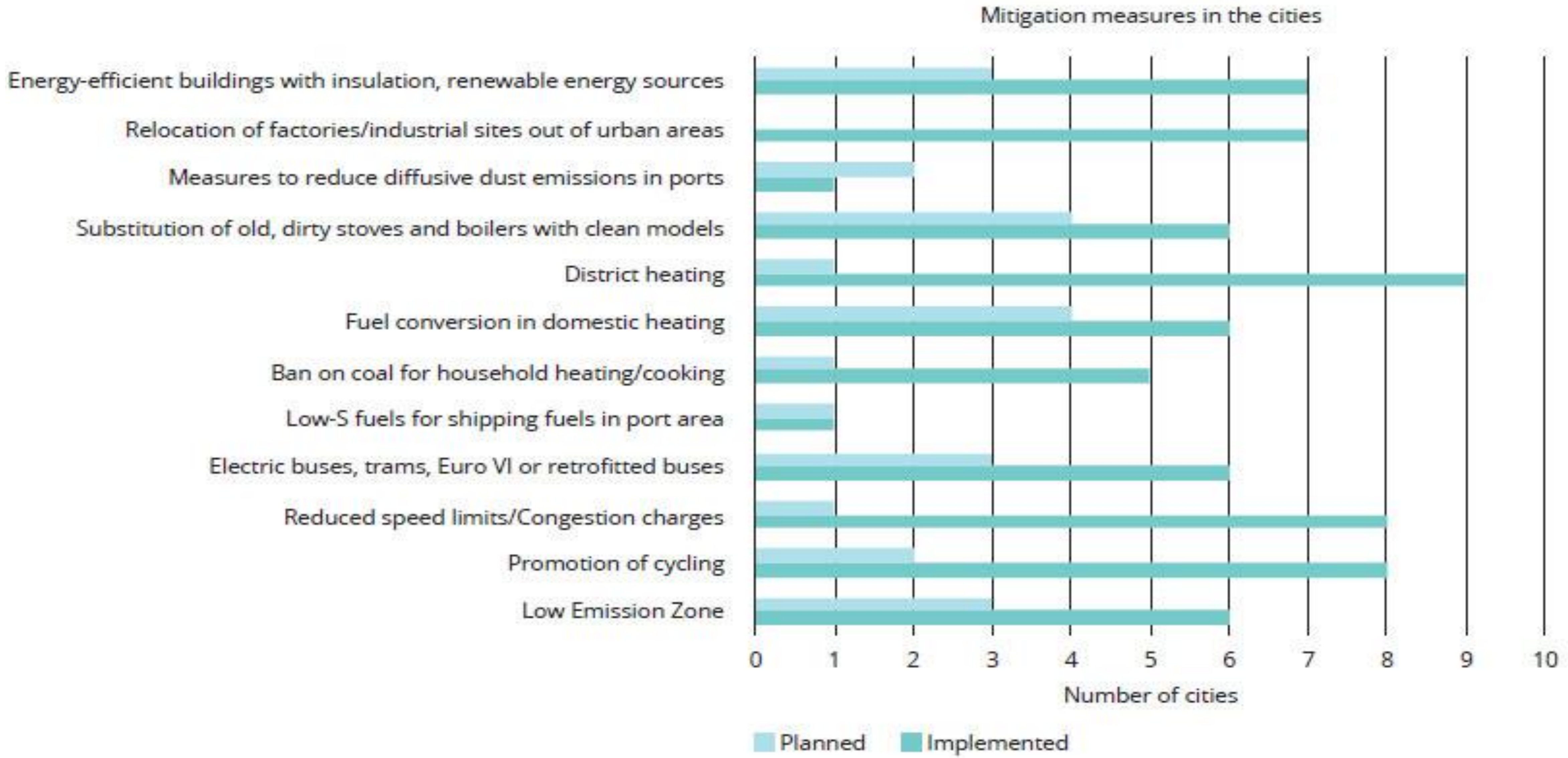
More Examples (available on Sharepoint)

NTM example	Summary	Effective Zone	Air pollution reduction	Health effects	Costs	Reference
Fat tax	Tax on saturated fat from milk products and meat as part of the Danisch "spring package"(=lower taxes on work and increase taxes on goods with detrimental effect on environment, climate and health) Okt 2011-Jan 2013.	Denmark	*Not mentioned. Should be visible when looking at PM and NO2 concentrations over the years.*	4% less saturated fatt intake. Modelled health effect: 123 averted deaths per year.	estimated 6 milion for bussines sector and 14 milion extra for cross-border trade. (reason for abolition.)	The effects of the Danish saturated fat tax on food and nutrient intake and modelled health outcomes: an econometric and comparative risk assessment evaluation | European Journal of Clinical Nutrition (nature.com) 2021-5063 Final.
speed limit polluted roads trail->went to permanent	"the speed limit on five polluted roads, along a total length of 8.5km, was lowered from 50km per hour to 30km per hour."	Berlin, Germany	"reduction of 2-4µg/m³ in annual average concentrations of both NO2 and coarse particulate matter (PM10)" (and noise reduction by 2 decibel)		pilot cost 850000 euro.+ 620000 for the more busses needed to maintain service level.	Traffic management in Berlin, Germany — European Environment Agency (europa.eu)
London congestion tax	tax of 5 pound (july 2005 8 pound) introduced from Feb 2003. These are results after 4 years But more reason findings say 15 pounds	London city introduction in 2003	NOx redcution of 13%, PM10 15% for 2005. But in 2019 CO 60%, NO2 24%, SO2 61% reductions.		net revenues of 112M pound	Has the London Congestion Charge Zone Improved Air Quality? (selectcarleasing.co.uk) London congestion tax FourthAnnualReportFinal.pdf
Superblock model	modelling of superblock in the city of Barcelona (and potential upscaling)	Barcelona	*"The greatest number of preventable deaths could be attributed to reductions in NO2 (291, 95% PI: 0–838), followed by noise (163, 95% CI: 83–246), heat (117, 95% CI: 101–137), and green space development (60, 95% CI: 0–119). Increased PA for an estimated 65,000 persons shifting car/motorcycle trips to public and active transport resulted in 36 preventable deaths (95% CI: 26–50). "*	*We estimated that 667 premature deaths (95% CI: 235–1,098) could be prevented annually through implementing the 503 Superblocks.The Superblocks were estimated to result in an average increase in life expectancy for the Barcelona adult population of almost 200 days (95% CI: 99–297), and result in an annual economic impact of 1.7 billion EUR (95% CI: 0.6–2.8).*		Changing the urban design of cities for health: The superblock model - ScienceDirect

Ranking (Joaquin study 2016)

NAME	JOAQUIN SCORE
Low Emmision Zone (LEZ)	Good
Traffic Restriction	Good
Traffic Signal Coordination	Good
Public Transport	Good
Electric Vehicles (EV)	Good
Congestion Charge Scheme (CCS)	Good
Carpooling	Good
Car Sharing	Good
Active Transport	Good
Speed Limit Reduction	Good
Fuel Taxation	Good
Noise Barriers	Good
Fleet Renewal	Moderate
Parking Management	Moderate
Urban Planning	Moderate
Urban Parks	Moderate
Traffic Reallocation	Moderate
Green Barriers	Moderate
Engine Idling Reduction	Moderate
Street Cleaning	Moderate
Street Vegetation	Low
Air Purifing Building Materials	Low

EEA inventory _Dogan Ozturk_Urban Air quality in Europe, 2019



Cost of Inaction - Approach

- Summary of existing literature published before May 2021
- Complementary calculations with the GAINS model and ARP model for the countries not covered in the literature but included in the GAINS v.3 Europe. Cost calculations also done with TFTEI.
- Two cost sets are calculated for the countries and regions:
  - Within country-comparison:
    Income-adjusted cost used for comparing costs of inaction to GDP,
  - Between country-comparison:
    Absolute costs are based on average values for UNECE-Europe

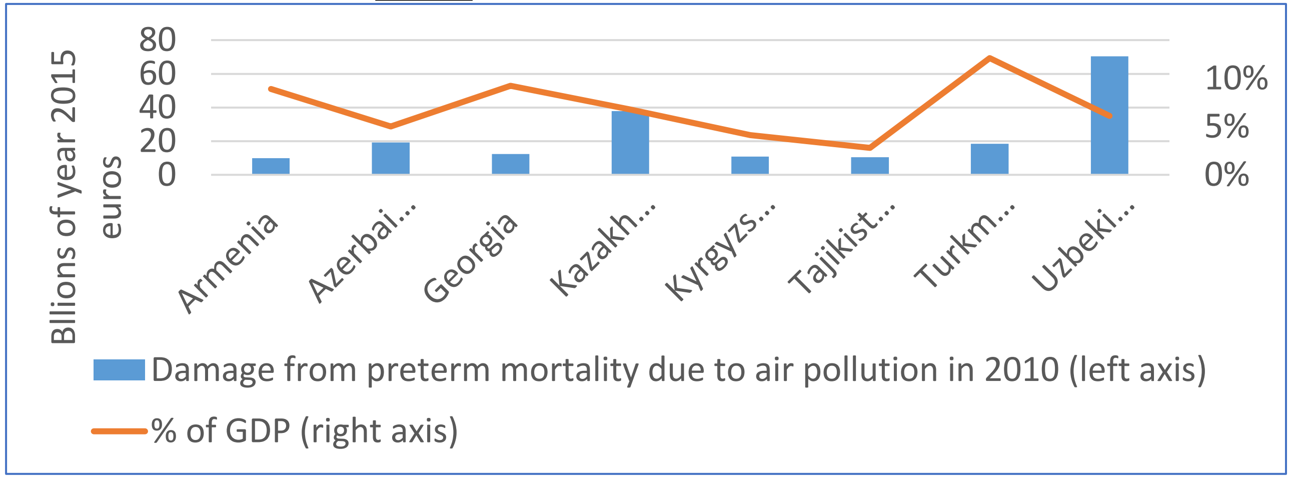
Can we confidently estimate welfare effects of poor air quality?

Yes!
We are confident in the data and method used to calculate welfare effects.
We are confident that published values are underestimations.

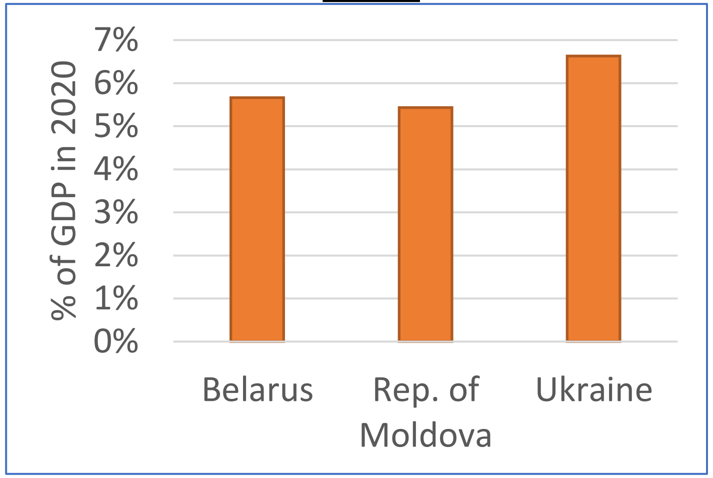
- Numerous studies on costs of inaction have been published in peer-reviewed journals.
- The impact pathway approach is well developed for Goth. protocol air pollutants,
  - Emission dispersion is well known,
  - Many health effects and environmental effects are well quantified,
  - Economic effects are calculated for a significant subset of the known health effects and some of the environmental effects,
- More economic research is needed to reach completeness.

How high are the damage costs when we don't take action on air pollution?

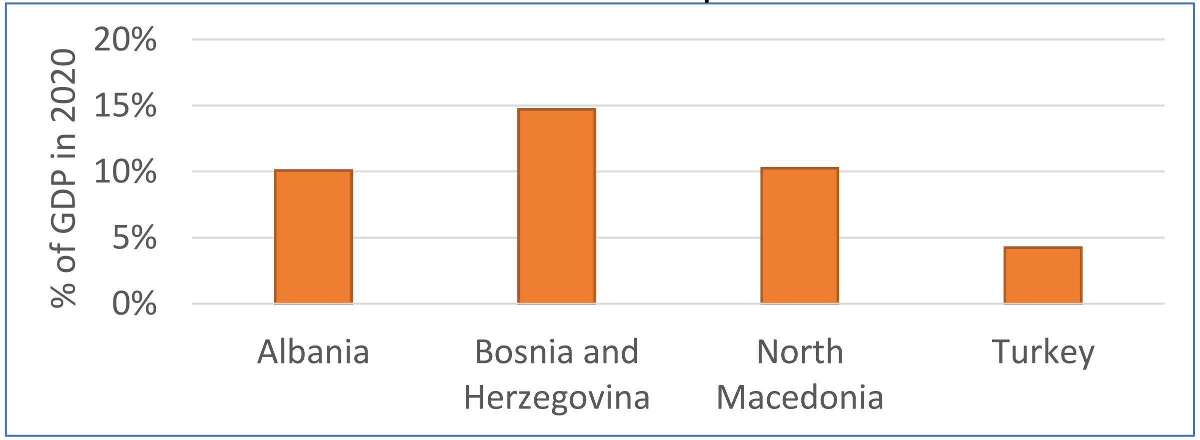
EECCA 2010



2020

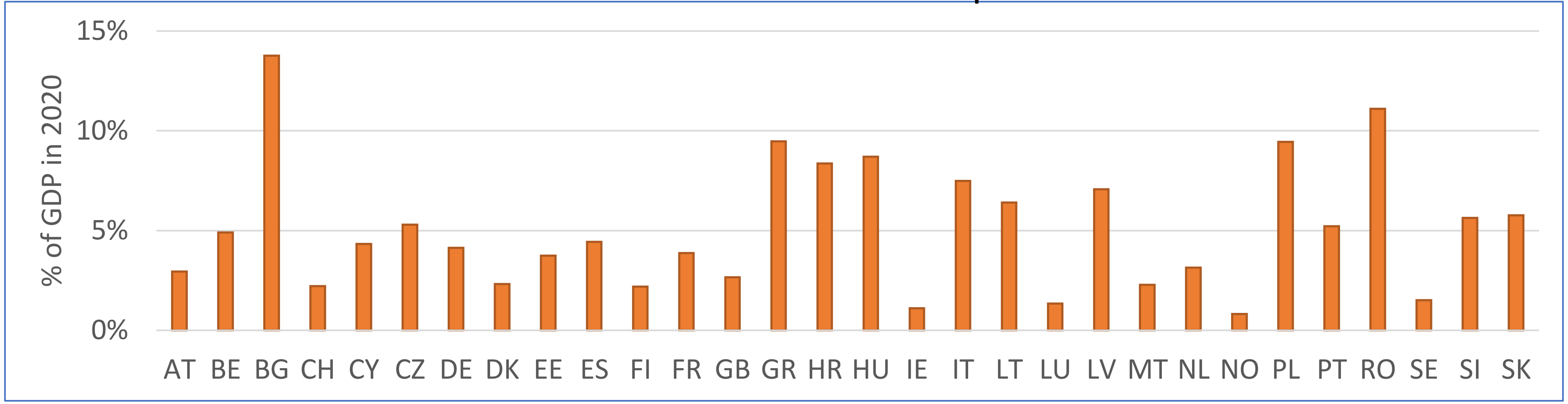


South Eastern Europe 2020



How high are the damage costs when we don't take action on air pollution?

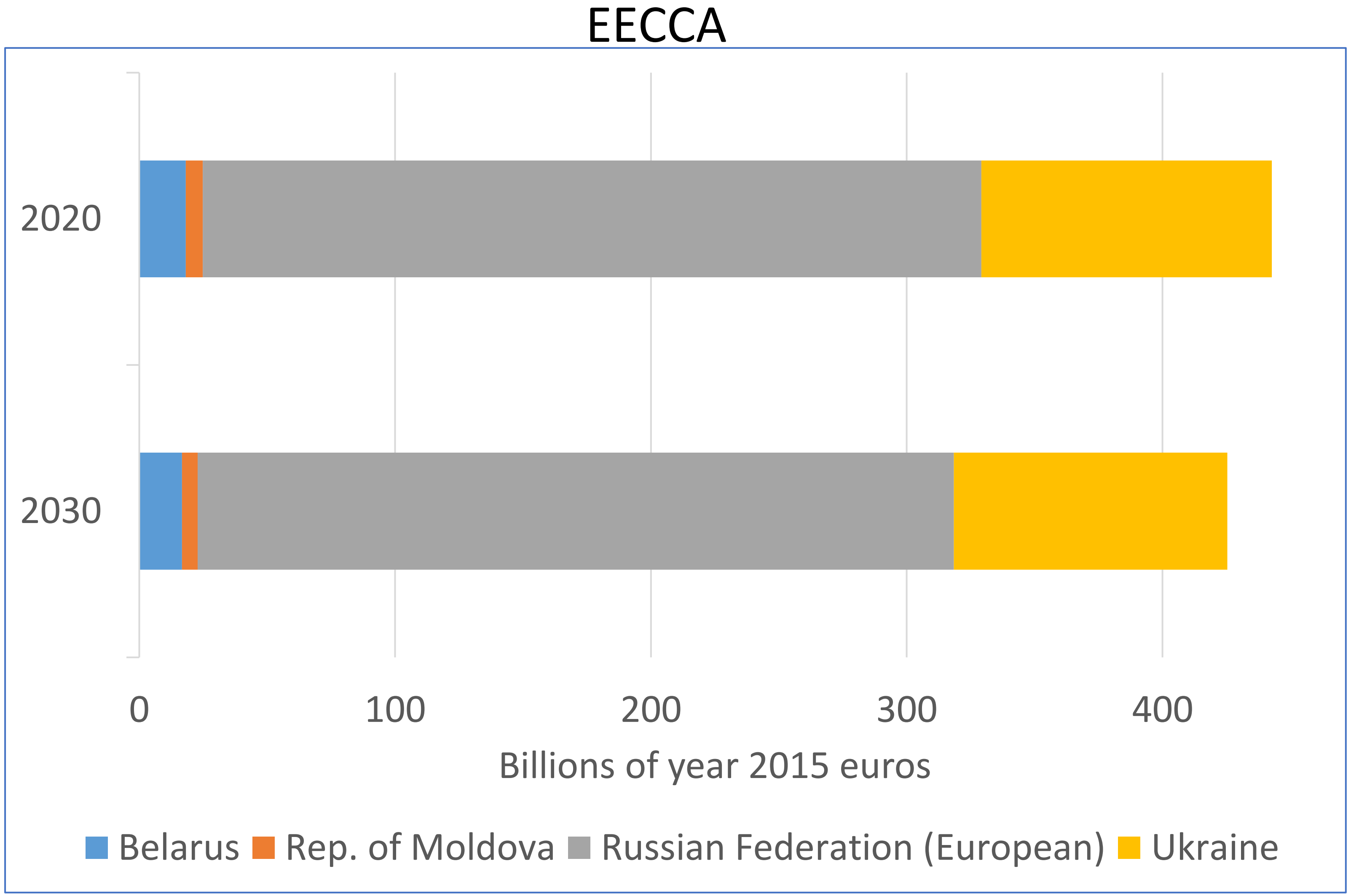
Western and Central Europe



North America

Country	Year	Damage	% of GDP	Included effects; chosen metric for valuation (if available)	Source
US	2010	150	**1%**	Mortality, morbidity; VOLY	Im et al., 2018
US	2011	510	**3%**	Mortality; VSL	Goodkind et al., 2019
US	2014	340	**2%**	AP3 IAM model	Tschofen et al., 2019
US	2005	>980	**>7%**	Mortality, morbidity	Fann et al., 2012
Canada	2008	6.7	**0.5%**	Mortality, morbidity	Canadian Medial Association, 2008
Canada	2015	27	**2%**	Mortality and morbidity; VSL	Smith&McDougal, 2017

Are these damage costs expected to go up or down in the future?



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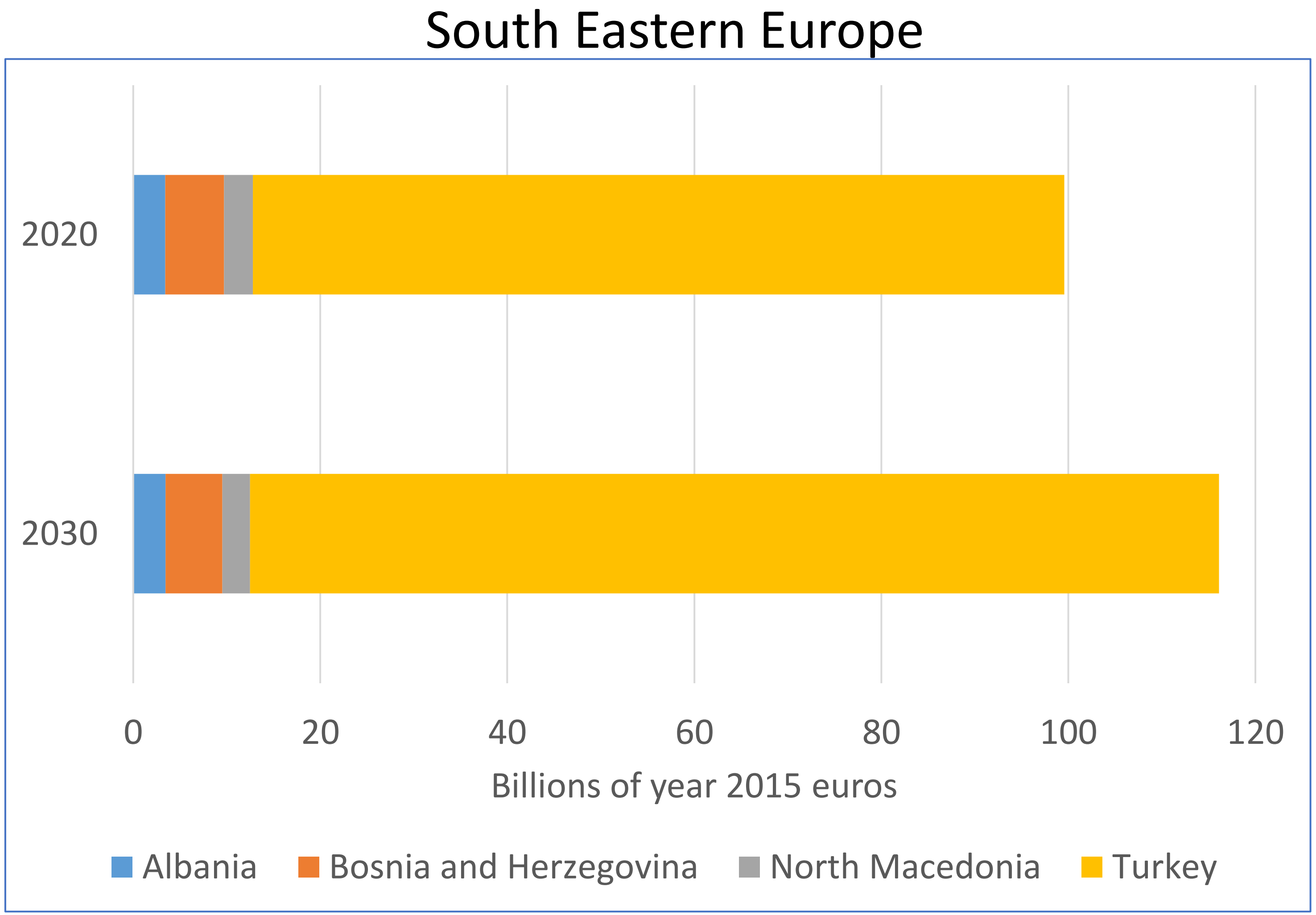

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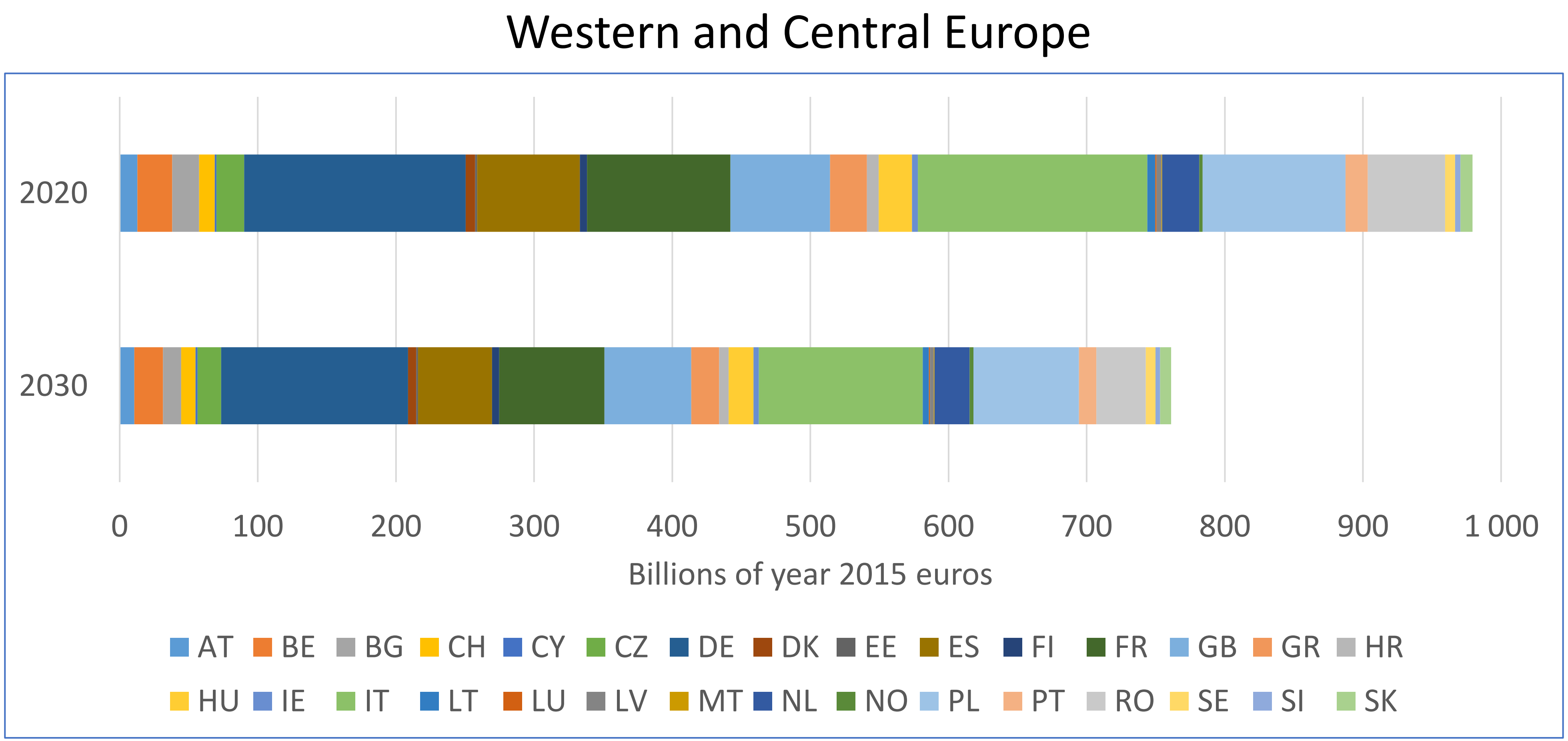
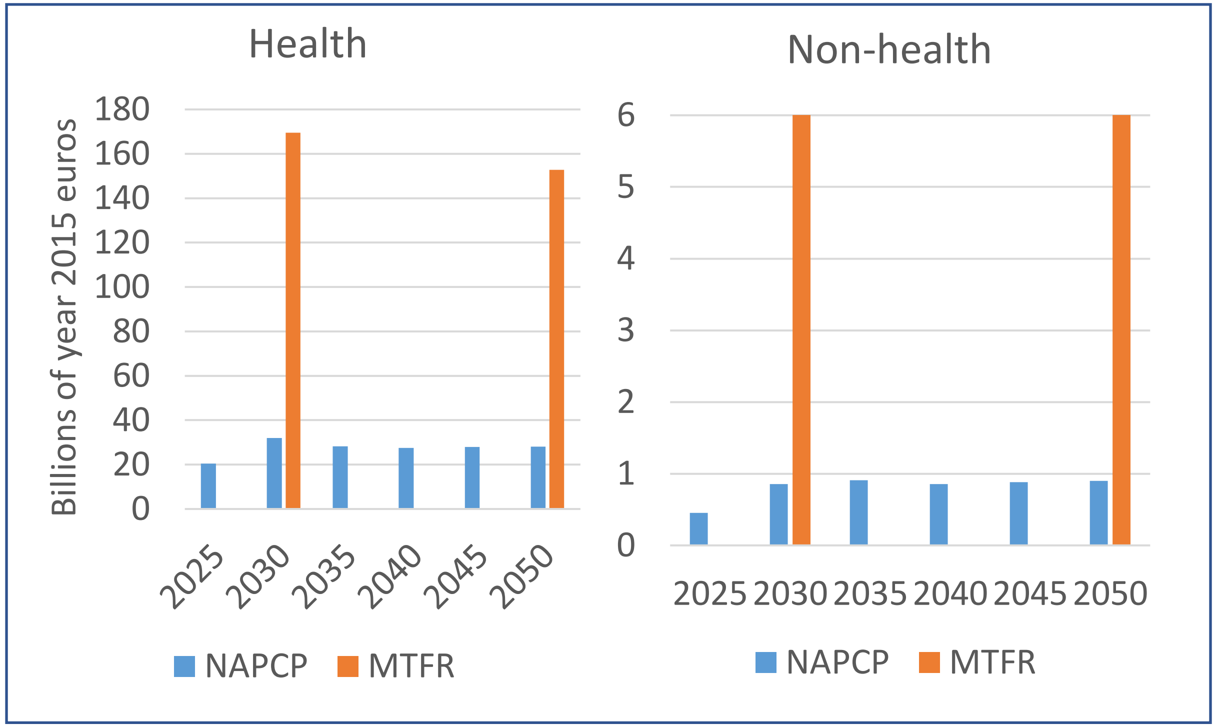


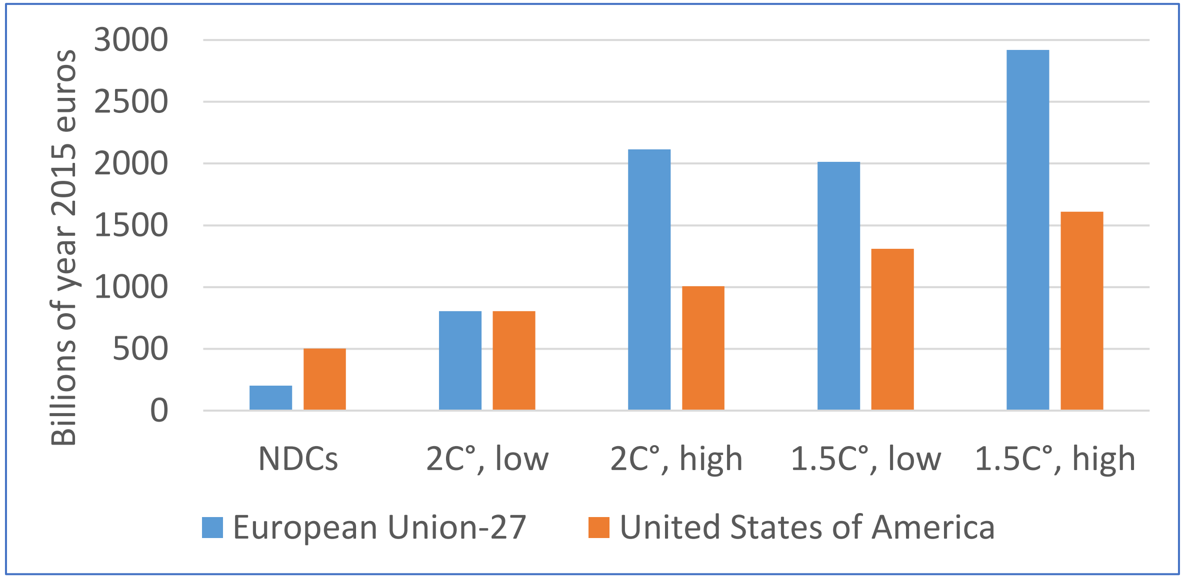
No consistent information found for North America

How can we further reduce the costs of inaction?

Dedicated air pollution control, example from EU

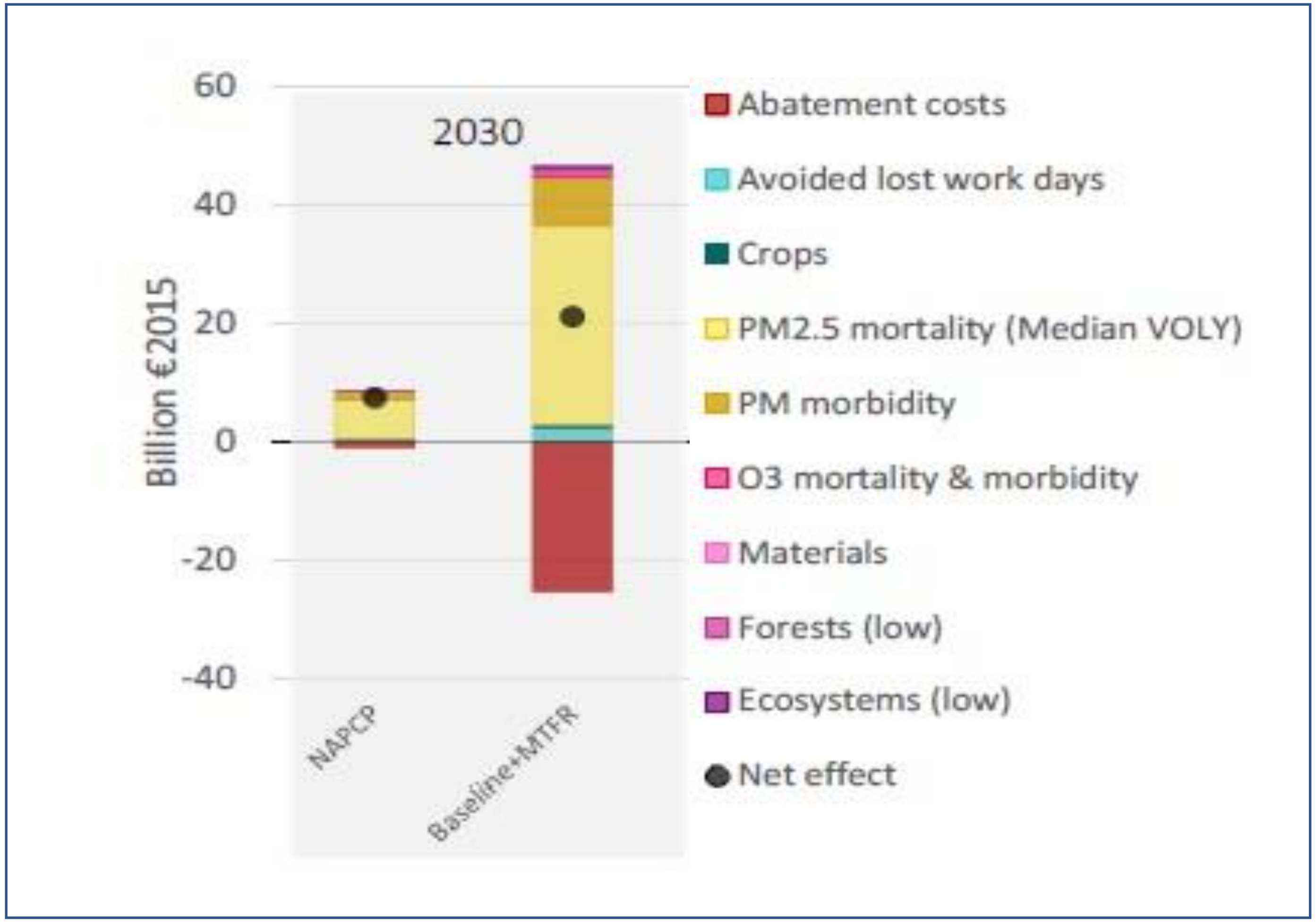


Climate control co-benefits (example from EU and United States



Will human welfare improve if we do more?

Cost-benefit assessment for the EU-27 relative to the baseline



Will human welfare improve if we do more? - The case of Apatity Coal plant

EGTEI (2011) estimated annual abatement costs of installing equipment to reduce emissions of SO2, NOx and total suspended particles (TSP):

1. wet flue gas desulfurisator,
2. selective catalytic reduction, and
3. electrostatic precipitator.

Parameters used for calculating costs and benefits of installation of cleaning technologies at Apatity coal plant, based on EGTEI, 2011, Schucht et al., 2021,[16] and GAINS model scenarios as in Amann et al., 2020[5].

Pollutant	*Emissions in 2008/2010, kt*	*Removal efficiency of equipment, per cent*	*Removed emissions, kt*	*Abatement costs, millions of year 2015 euros*
TSP	6.23	99.9	6.18	5.3
$PM_{2.5}$	0.37	96	0.36	
NO_x	2.4	75.4	1.8	10.5
SO_2	12.6	95.4	12.0	11.6
Total	-	-	-	**27.4**

Will human welfare improve if we do more?

Avoided damages to health due to these abatement techniques are valued by applying country-specific unit damage costs from Schucht et al., 2021,16 the range is €158 million–€469 million.

Costs and benefits of installation of cleaning technologies at Apatity coal plant: Benefits would be 6-17 times larger than costs