

# AN ASSESSMENT OF CLIMATE CHANGE DAMAGE COSTS OF SHORT-LIVED CLIMATE POLLUTANTS

Stefan Åström

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## BACKGROUND

- The climate change impact of short-lived climate pollution have received much attention since 2011,
- Demands for an integrated approach to air pollution and climate change policy have been raised,
- Climate change damage costs of short-lived climate pollutants hasn't been presented yet.

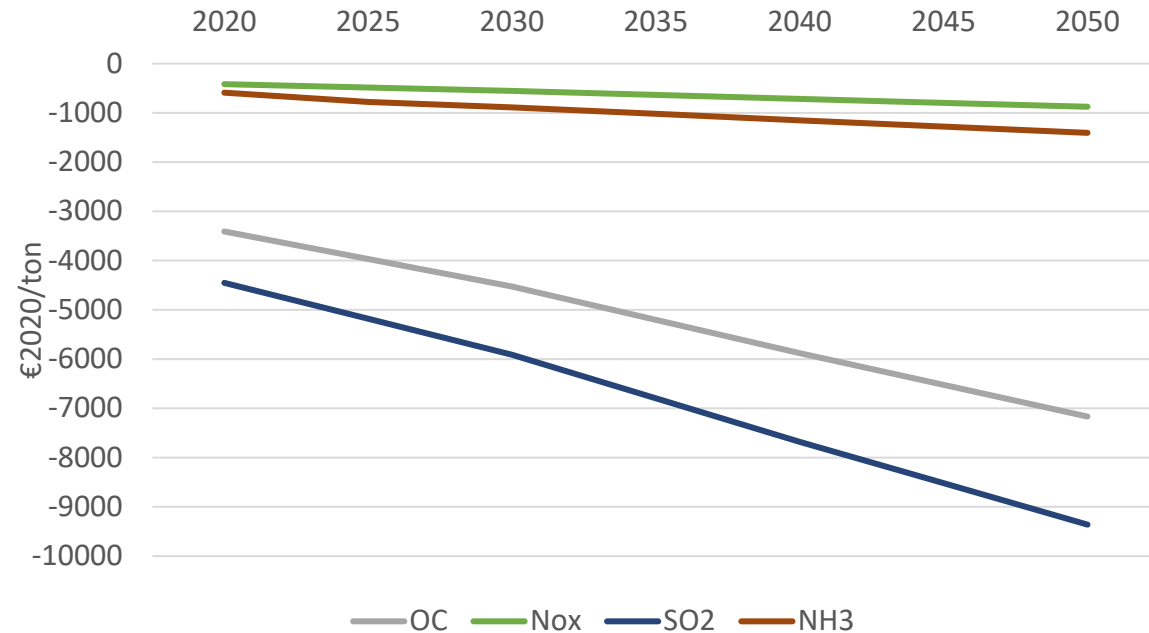
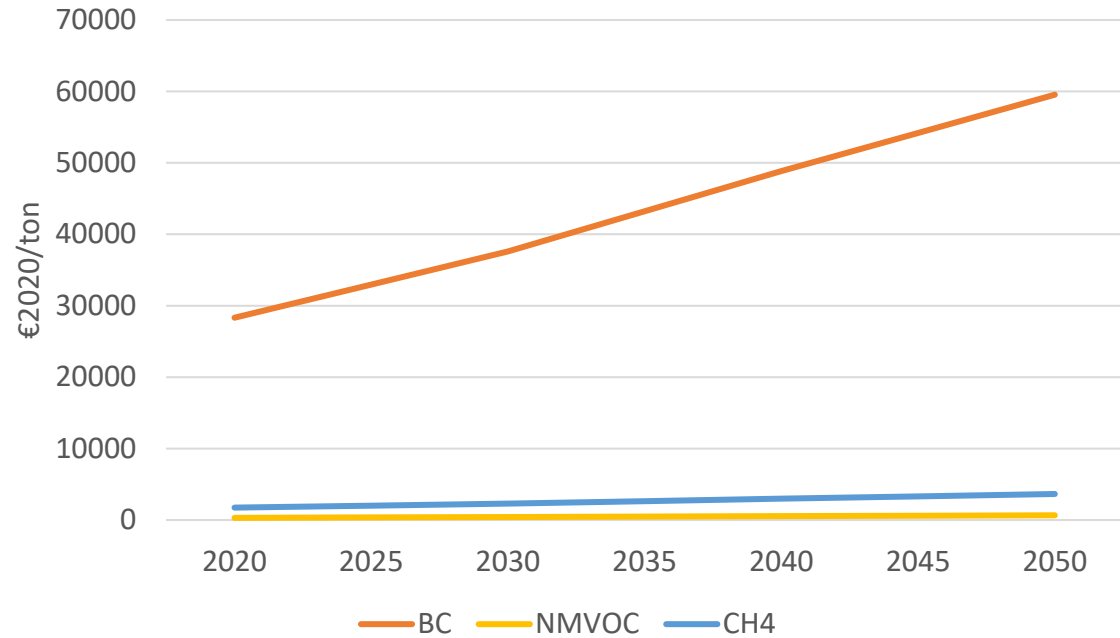
# METHOD

- Climate perturbation metric values taken for European emissions from IPCC 2013 and 2021,
- Literature review of 'social cost of carbon' and 'social cost of methane' revealed that the IWG 2021 study provides most comprehensive economic cost estimates,
- SLCP climate damage cost = value  $\text{CH}_{4\text{eq}}$  \* social cost of methane

## Other considerations

- 1 std deviation for metric values and social cost values used, calculations made for three different discount rates
- SLCP climate damage costs adjusted for changes in climate perturbation time profile between CH4 and shortlived pollutants,
- Social cost of methane values taken for 'no climate policy scenarios' to avoid mixing of climate abatement cost and climate damage costs

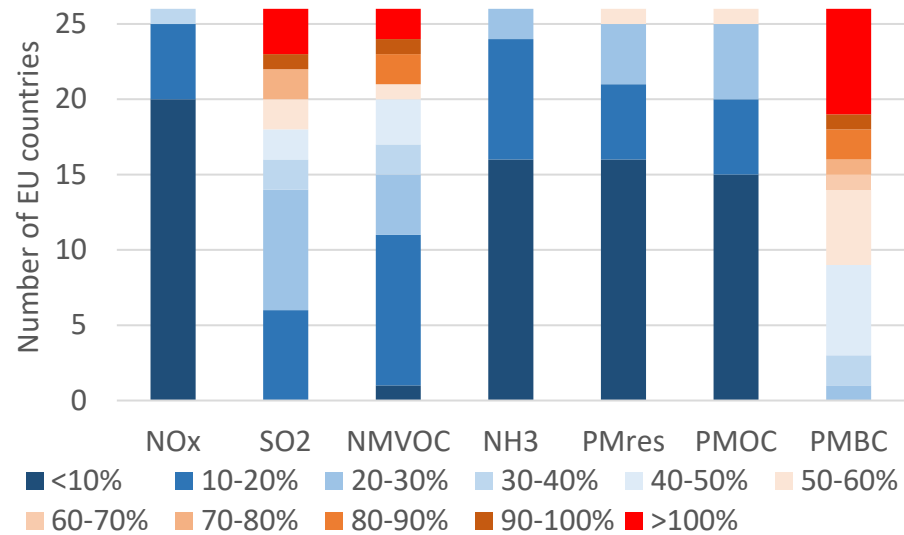
# RESULTS - AVERAGE CLIMATE DAMAGE COSTS (GWP100 & 3% DISCOUNT RATE)



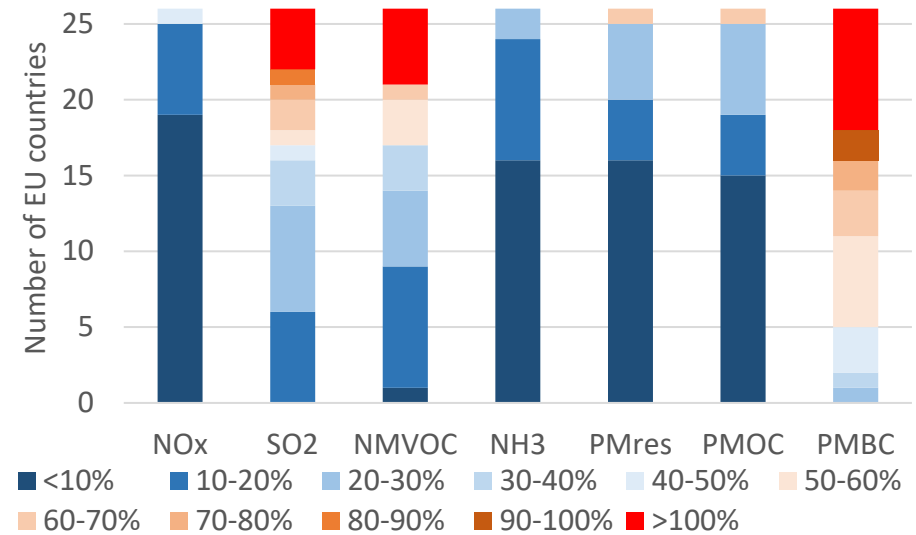
**How do these values compare with established human health damage costs of pollution?**

# RESULTS – COMPARISON WITH SCHUCHT ET AL 2021 FOR INDUSTRY

Average climate damage costs as shares of health damage costs for EU countries  
(Climate: GWP100CH4eq, 3.0% discount rate. Health: VOLY for mortality).



2030

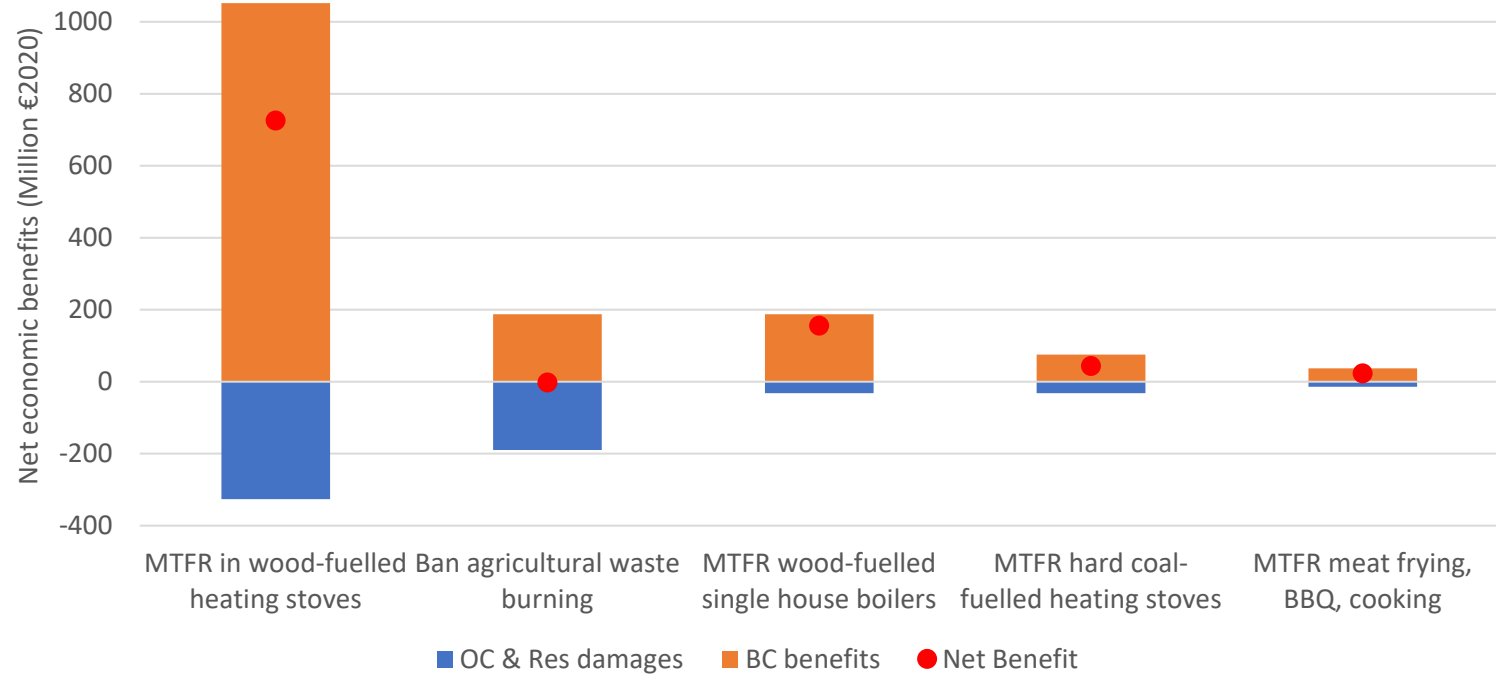


2050

# How do these values help prioritize SLCP abatement?

# RESULTS – COMPARISON WITH SCHUCHT ET AL 2021 FOR INDUSTRY

Monetized total annual climate benefits and damages of European 2030 PM emission reductions in BC-intensive sectors (GWP100CH<sub>4eq</sub>, 3.0% discount rate)





# DISCUSSION AND FURTHER WORK

- This was a mere first assessment to explore if more in-depth earth system model is needed, which we argue it is.
- The metric values used were for European emissions, but the study can easily be remade for other regions.
- The social cost-of methane estimates are incomplete with respect to number of climate effects considered (as for social cost of carbon)
- Soon to be published in Journal of Benefit-Cost Analysis

## Further work

- More metric calculations needed for all SLCPs, not only high-impact (BC & CH<sub>4</sub>),
- High-latitude and seasonal metric calculations would be useful,
- More work needed to monetize climate effects into the social cost of carbon/methane

# FUTURE PERSPECTIVES ON CBA FOR AIR POLLUTION POLICY

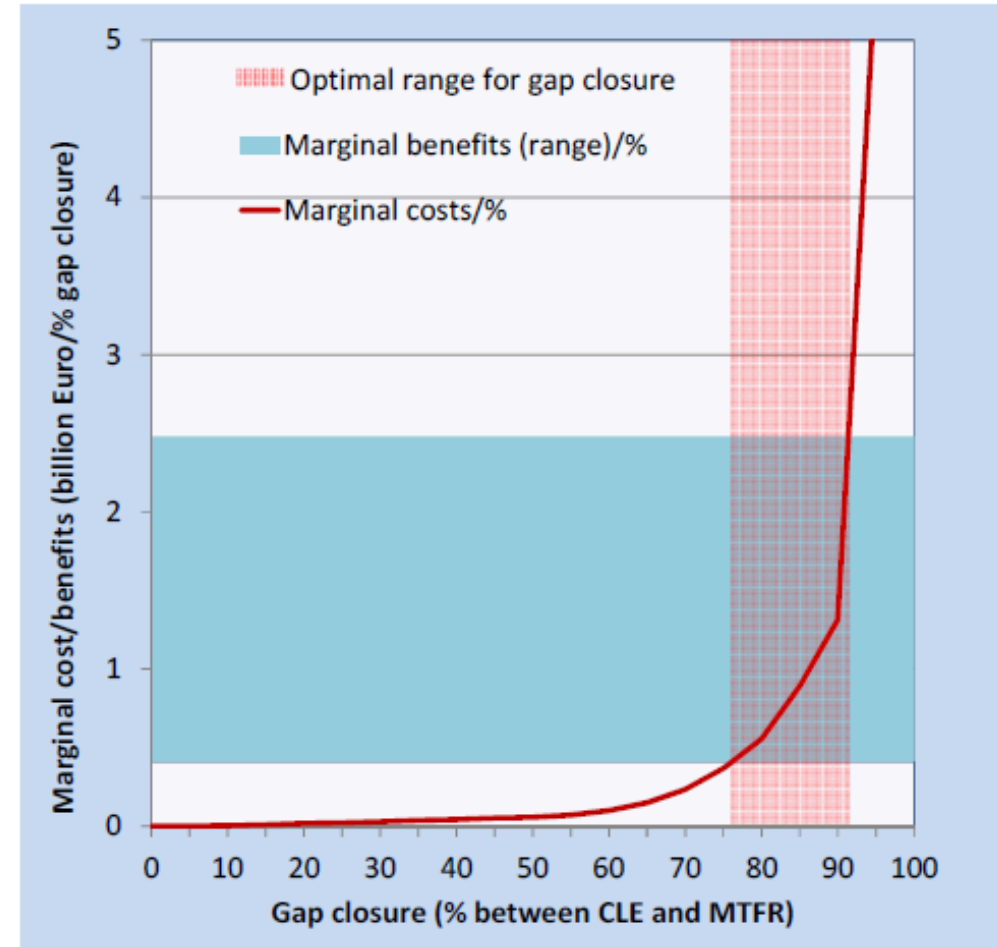
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# BACKGROUND

- In December 2013, the European Commission proposes a new NEC Directive
- The proposed targets were very much informed by modelled 'socio-economic efficient solutions'
- But economics as a discipline, and CBA as a practice, is subject to severe criticism



## IS THE USE OF CBA FOR TARGET-SETTING A PROBLEM?

- Questioned ethics
- Data gaps in CBA
- Uncertain future
- Questioned methodology

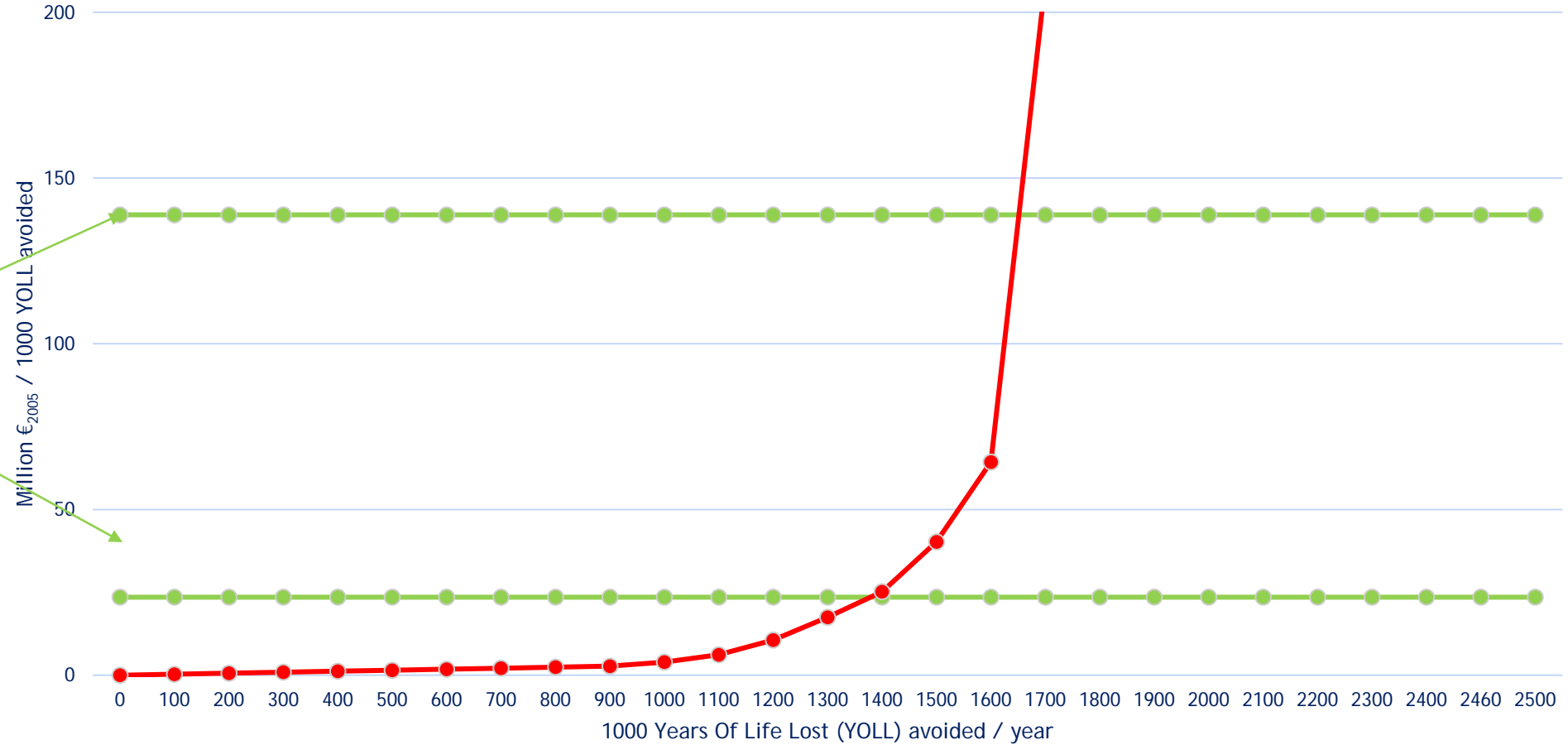
Questioned ethics

The original input

Do you like old people?

Yes

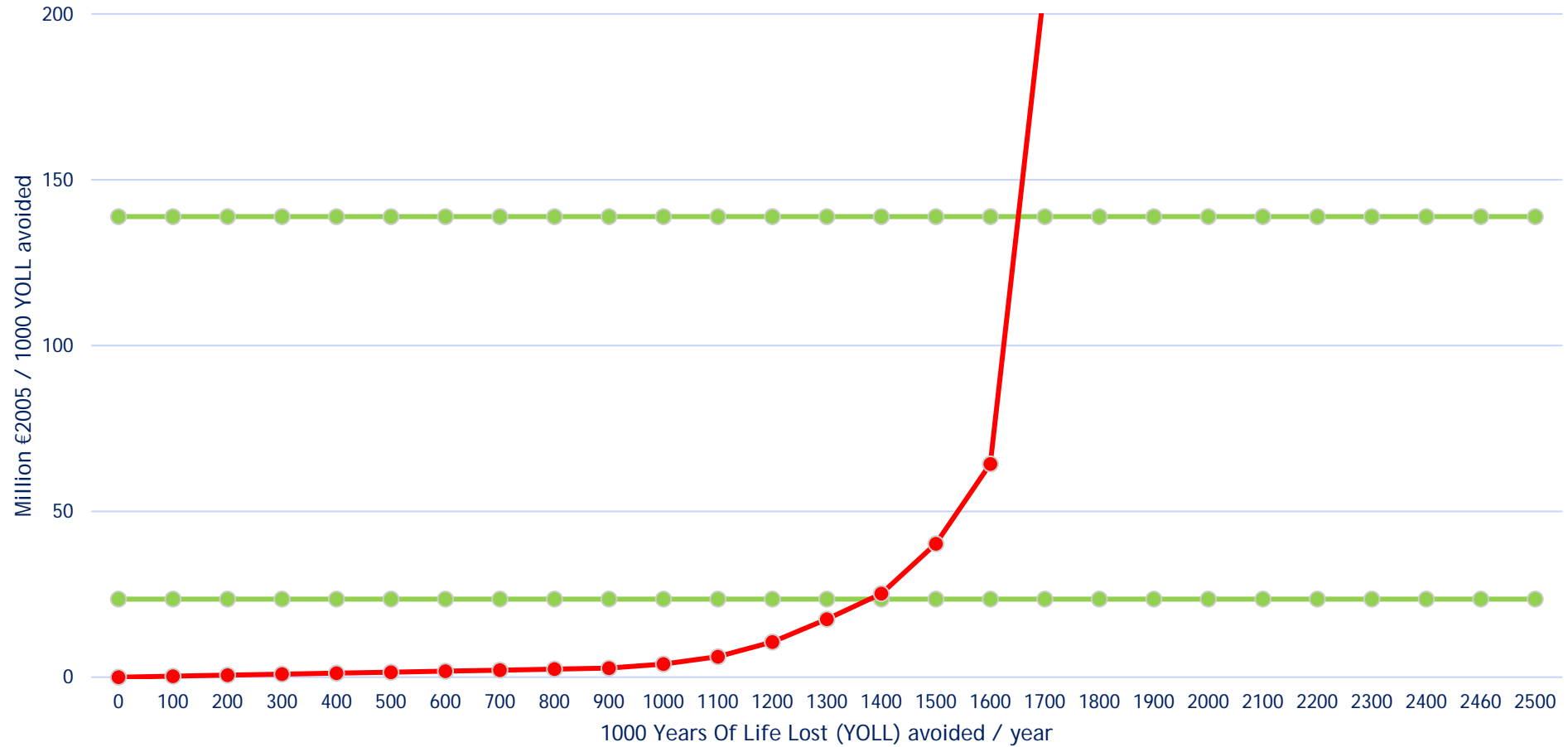
No



Cost-efficient emission reduction:



## Data gaps and uncertain future (illustrative examples)

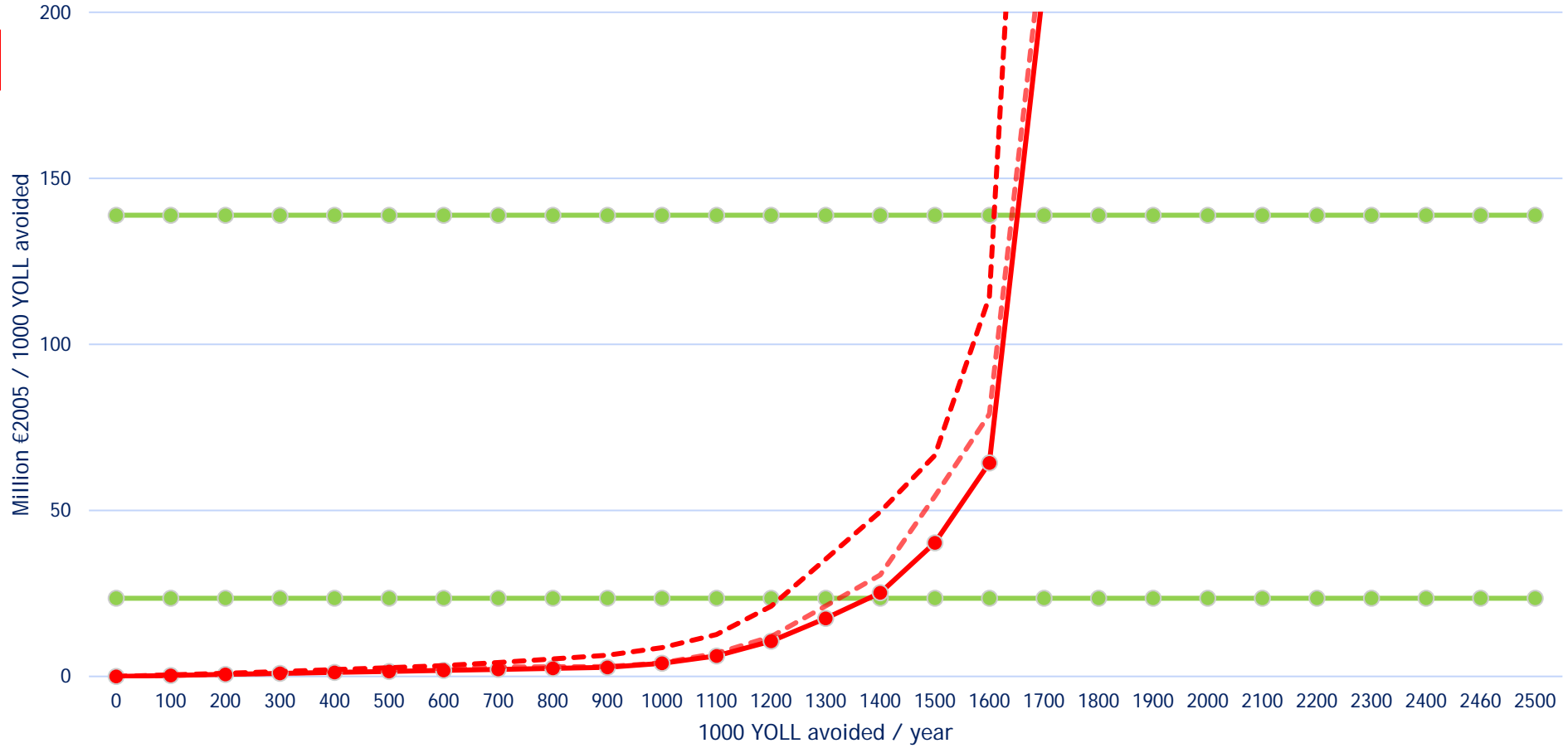


Cost-efficient emission reduction:

## Data gaps and uncertain future (illustrative examples)

Effect of inv. perspectives?

(Extension of earlier results on interest rates)

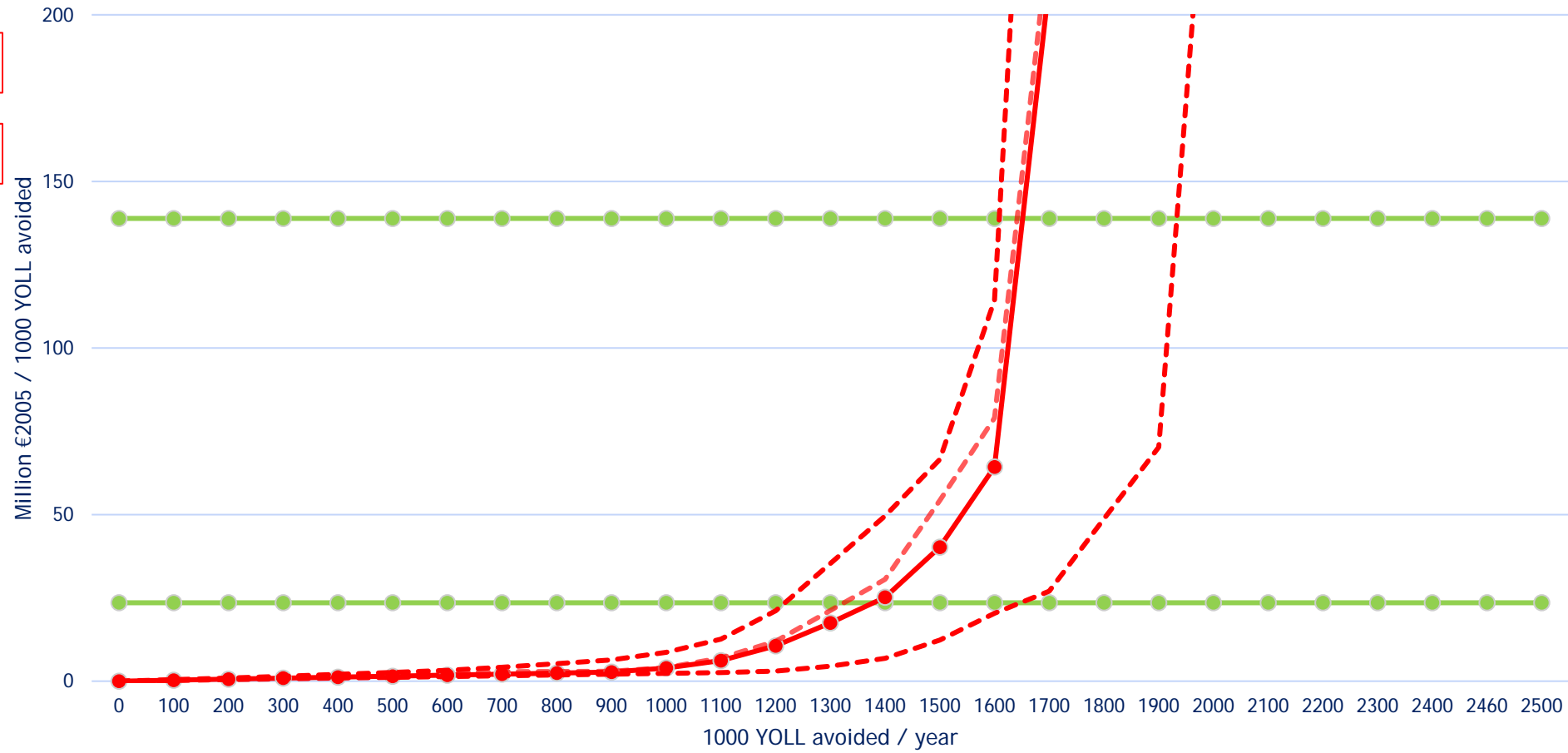


Cost-efficient emission reduction:

## Data gaps and uncertain future (illustrative examples)

Effect of inv. perspectives?

Effect of EU GHG policy?  
(EU parliament study (2014))



Cost-efficient emission reduction:



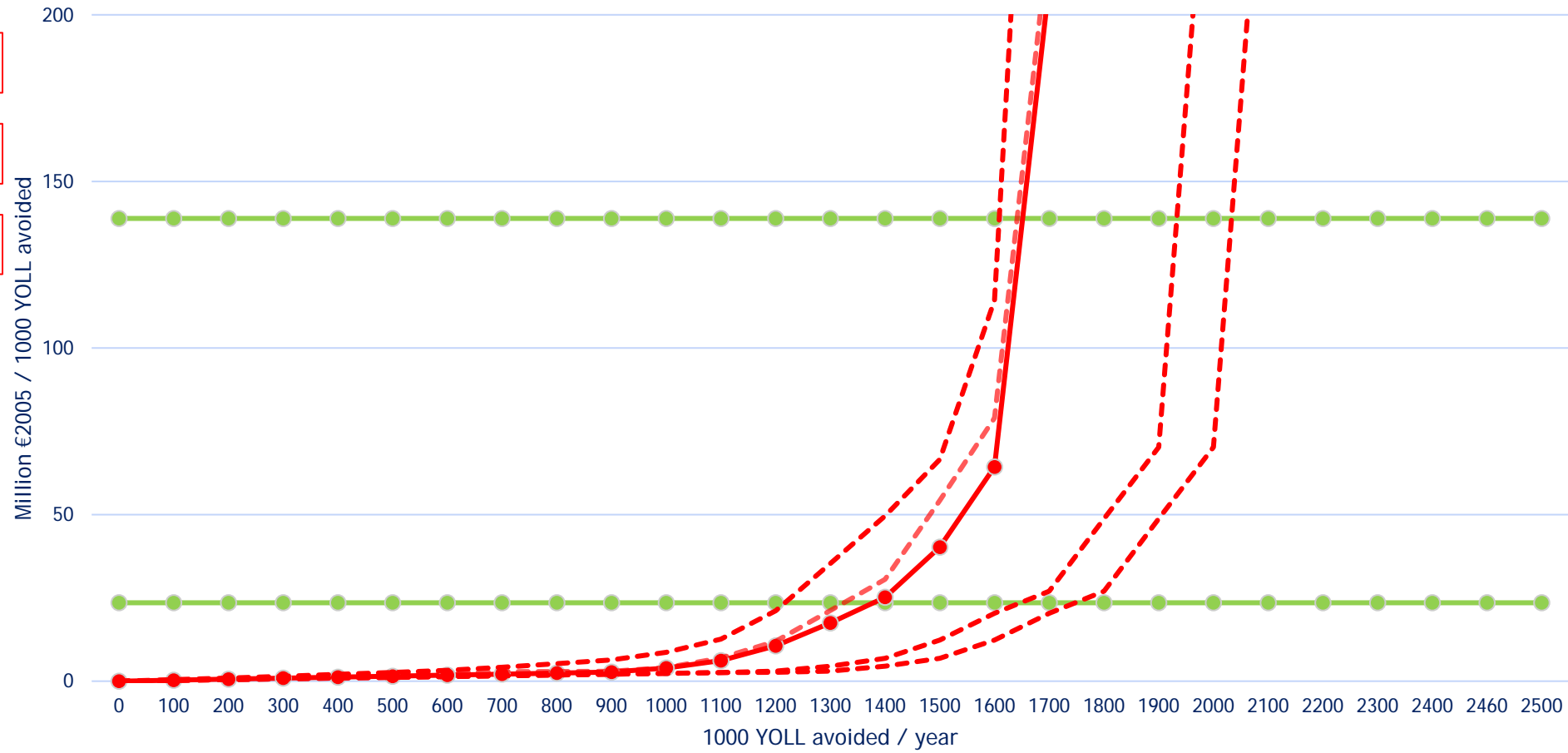
## Data gaps and uncertain future (illustrative examples)

Effect of inv. perspectives?

Effect of EU GHG policy?

Effect of shipping?

(Cofala et al. (2019) & extension of Åström et al (2018))



Cost-efficient emission reduction:

## Data gaps and uncertain future (illustrative examples)

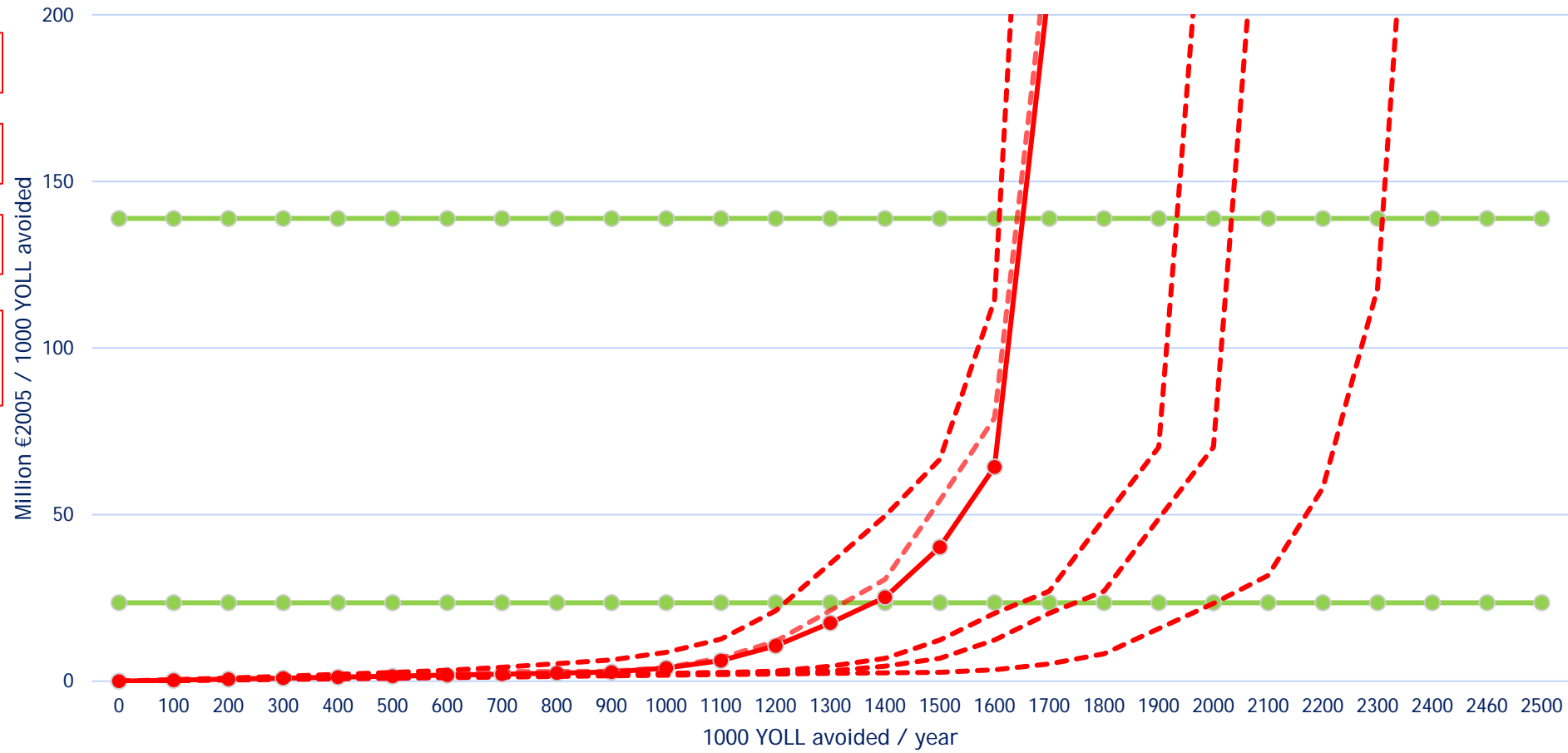
Effect of inv. perspectives?

Effect of EU GHG policy?

Effect of shipping?

Effect of behavioural change measures?

(hypothetical based on own studies)



Cost-efficient emission reduction:

Effect of inv. perspectives?

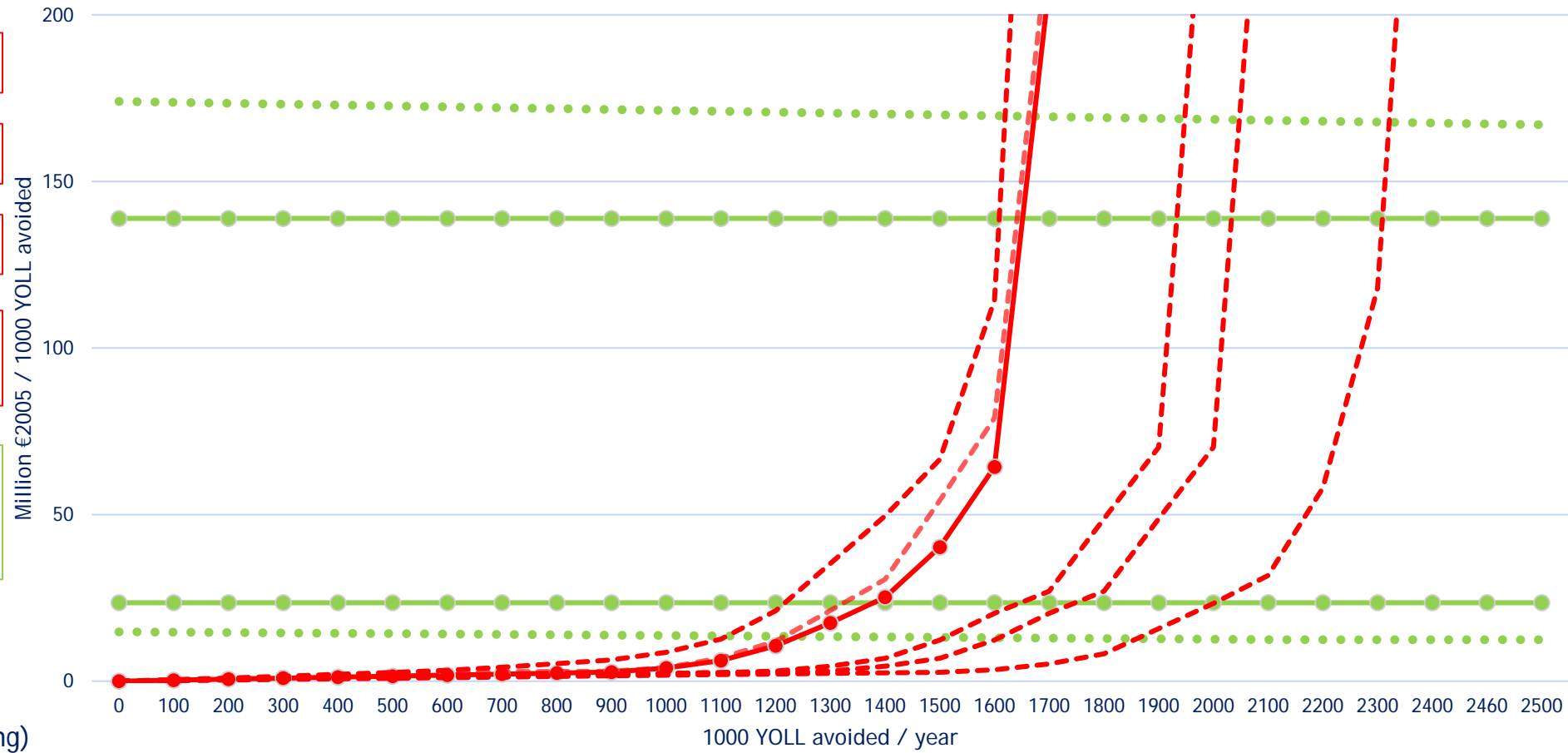
Effect of EU GHG policy?

Effect of shipping?

Effect of behavioural change measures?

Effect of morbidity-, ecosystem, and SLCP climate effects?

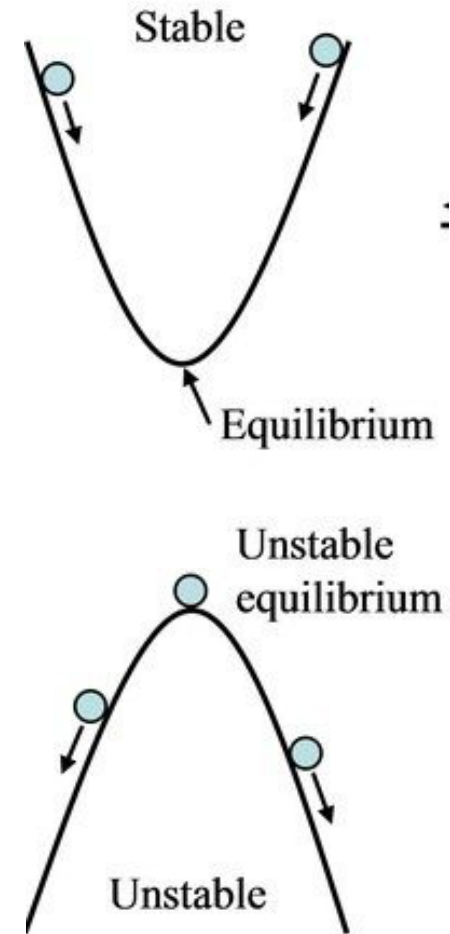
(Hypothetical based on Gustafsson et al. (2018), Kriit et al. (under review) Ytreberg et al. (2021), Åström & Källmark (Forthcoming))



Cost-efficient emission reduction:

## THE ECONOMY MIGHT NOT BE STABLE

- What if there is pathway dependency?
- What if a technology is transformative?
- What if feedbacks are positive?



## SO IS THE USE OF CBA FOR TARGET-SETTING A PROBLEM?

- Scrutinizing the CBA concept indicate problems, but...
- Policy support models not used to predict the future
- Policy support models interact with the policy environment
- Alternative economic approaches have yet to provide advice
- Politicians are accounting for priorities outside the model domain in the negotiation process
- Example: negotiations for a National Emissions Ceilings Directive (NEC)

## SOME EXTRACTS OF THE NEGOTIATION PATH

- Changed target year from 2025 to 2030
- Internal EC discussions adjusted ambition
- Proposed NEC in Dec. 2013
- Complementary climate policy analysis Oct. 2014
- Proposal almost cancelled in Dec. 2014
- Letter from mayors of Paris and London 27<sup>th</sup> May 2016

MAYOR OF LONDON

*La Maire de Paris*

Ms Sharon Dijksma  
Dutch Minister for the Environment and  
President of the European Union Environment  
Council  
Ministry of Infrastructure and the Environment  
P.O. Box 20901  
2500 EX The Hague  
The Netherlands

Date: May 27<sup>th</sup>, 2016

Dear Ms Dijksma

We write as the leaders of two of the largest cities in the European Union whose citizens disproportionately feel the impact of pollution blown across the continent. This letter urgently sets out our joint priorities for the National Emissions Ceiling Directive that is currently being discussed and finalised.

In the coming month, the institutions of the European Union and its member states have a once in a generation opportunity to proactively address Europe's air quality public health crisis. Across the continent the equivalent of 400,000 people die each year as a result of long-term exposure to air pollution.

Estimations by the European Commission suggest that weaker national emissions ceilings would lead to about 16,000 extra deaths in the EU every year<sup>1</sup>. This is not acceptable and we require our Governments to follow the bold lead taken by our cities in tackling this issue.

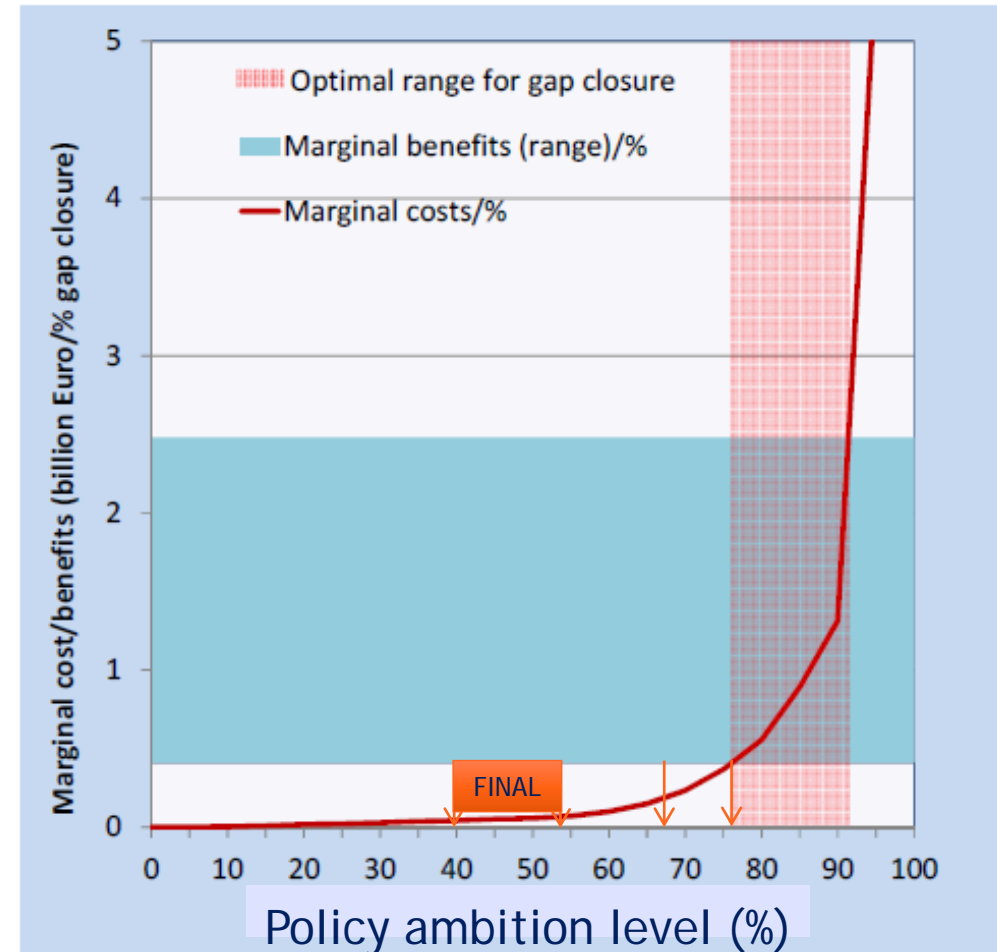
Accordingly we are calling on Europe's institutions and all member states to adopt binding targets for both 2025 and 2030 within the National Emissions Ceiling Directive. These ceilings must at a minimum meet the position adopted by the Parliament in October 2015 although we believe that even greater ambition is still required. It is also essential that both ammonia and methane remain in the scope of the directive given their broader contribution to the formation of air pollution.

All sectors must contribute to the fight against air pollution, including agriculture and road transport. For this reason we also call on Europe's institutions and all member states to adopt a Euro 6 testing regime that works. The current testing proposals allow vehicle nitrogen oxides (NOx) emissions to exceed the agreed emissions limits by more than double until 2020 with ongoing flexibility beyond this. It is unacceptable to introduce emissions thresholds, only to allow them to be violated. It cannot be right to impose a duty upon public authorities to comply with air pollution standards, while at the same time giving the automotive industry the green light to infringe them.

<sup>1</sup> In his speech at the Environment Council's debate on 16 December 2014, EU Environment Commissioner Vella estimated that every percentage change from the 56% health improvement proposed by the European Commission for the National Emissions Ceiling Directive would result in around 1,000 additional premature deaths in the year 2080. The four percentage weakening proposed by the Council's general approach would therefore lead to around 14,000 additional premature deaths EU wide in the year 2080.

## SOME EXTRACTS OF THE NEGOTIATION PATH

- No decision 20<sup>th</sup> of June 2016  
(the last opportunity during Dutch presidency)
- Brexit vote June 23<sup>rd</sup> 2016
- Dutch foot-work ensures provisional agreement on the 30<sup>th</sup> of June 2016



Amann et al. 2014

## IN SUMMARY

- Using CBA to set targets can be questioned, but...
- The analytical setting of the policy support models is relatively robust, although improvements are still desirable
- Policy support models are not crystal ball predictions
- Policy support models interact with the policy process



# WAYS FORWARD?

- Continuous method and data development
- Extend representation of uncertainties
- Increase effort to incorporate state-of-the-art economics into policy support models
- Include presentation of targets from models based on non-economic rationales! Examples:
  - Equity in costs,
  - Equity in human and environmental health,
  - Achievement of existing targets

<https://doi.org/10.1016/j.eiar.2022.106941>

