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Costs and benefits of reducing air pollution from shipping
A focus on the Mediterranean Sea

A study for the European Commission, DG ENV
Consortium: IIASA, MET.NO and EMRC

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EMEP Steering Body and Working Group on Effects
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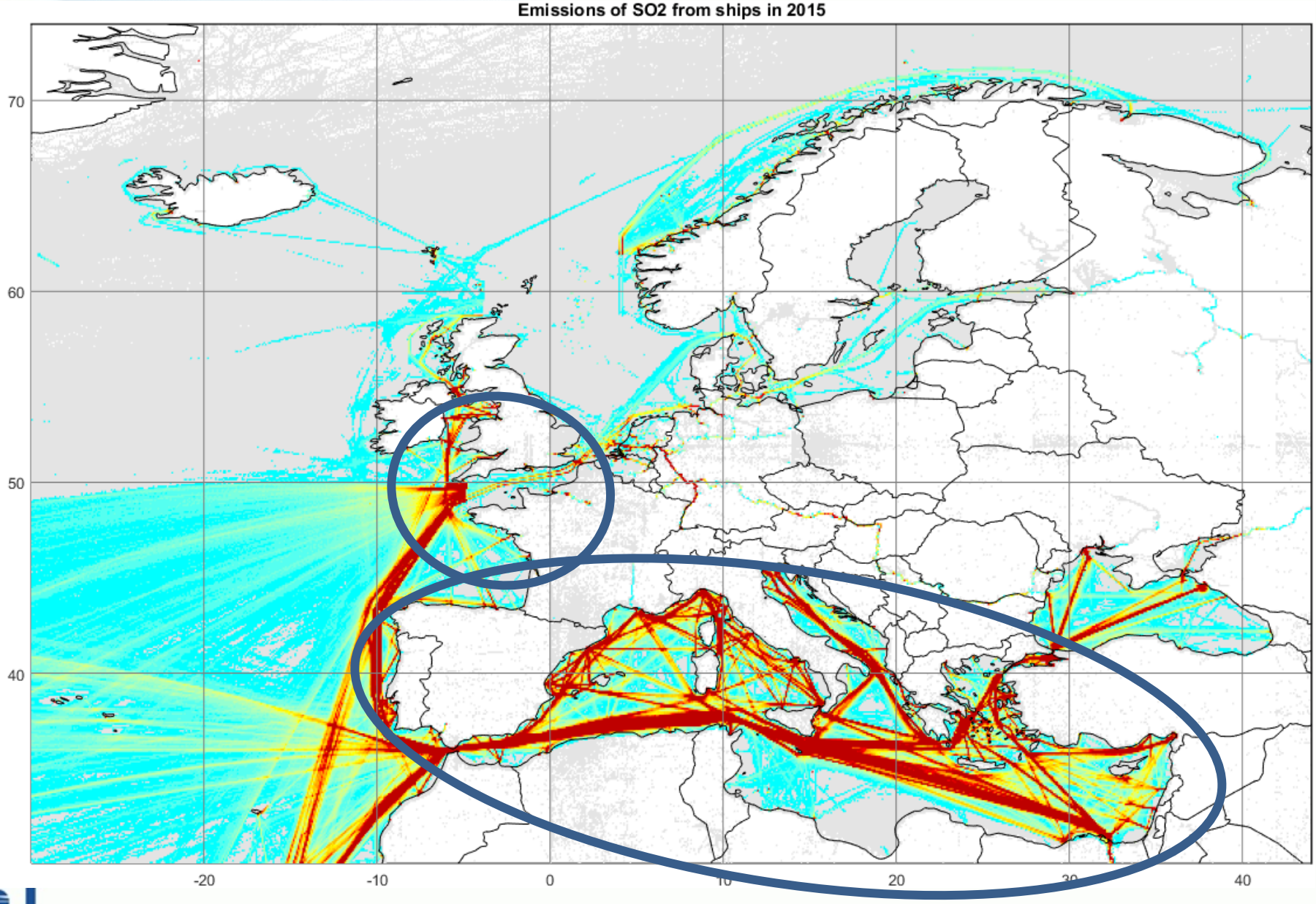
Shipping routes and SO_2 emissions around Europe (2015)



Source: FMI STEAMv3 2017

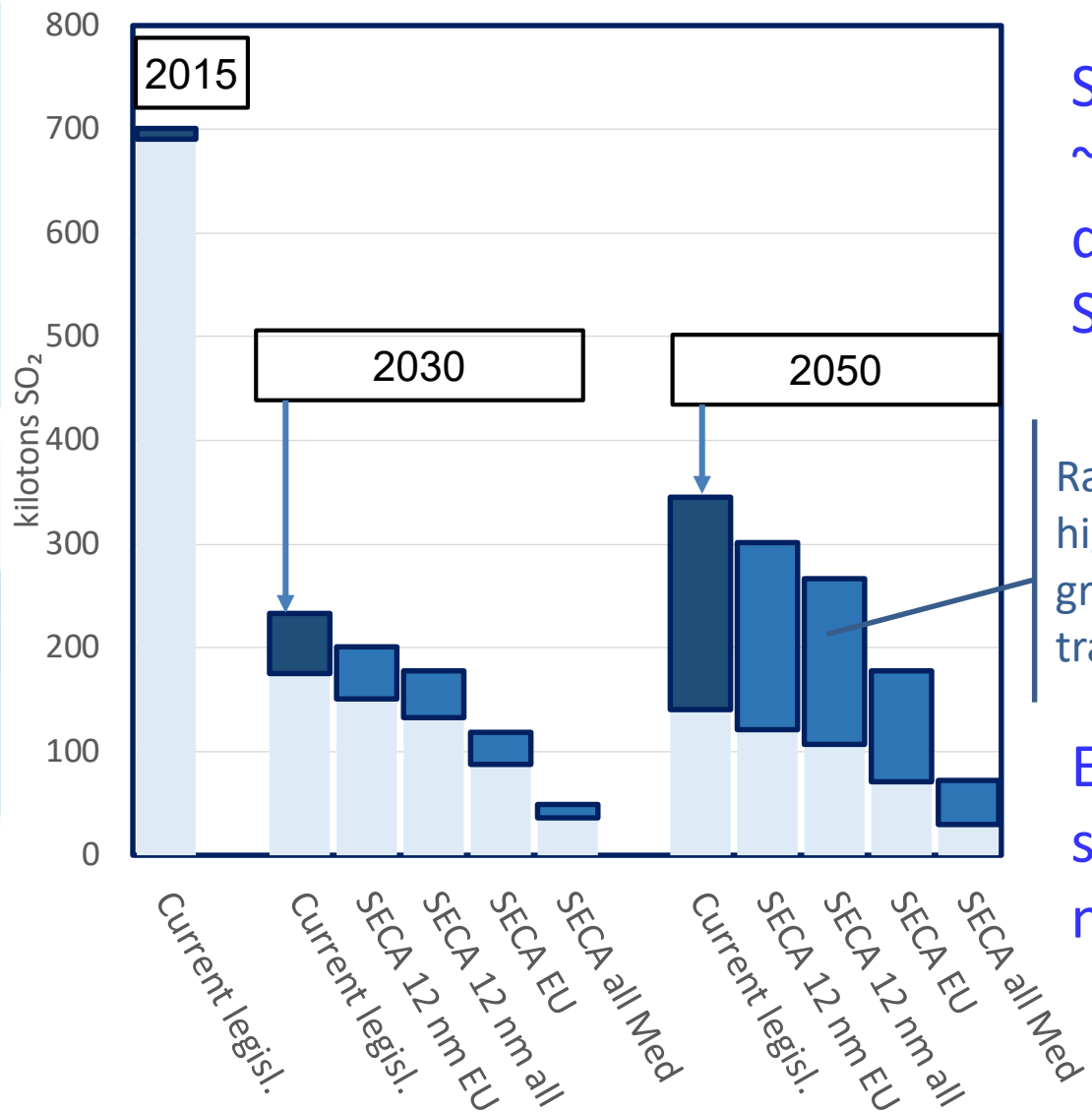
Health impacts from ship air pollution ⇔ Premature mortality due to fine particles ($PM_{2.5}$)

- Ships contribute ~4% to ambient $PM_{2.5}$ concentrations in EU-28
  6-8% in Greece, Italy, Turkey
  >10% Portugal, Spain, Cyprus and Malta

- ~12,000 premature deaths annually in EU-28 related to air pollutant emissions from international shipping in 2015

- ~50% of health damage occur in coastal areas, but long-range transport of PM and precursor gases => impacts also inland

SO_2 emissions in the Mediterranean Sea

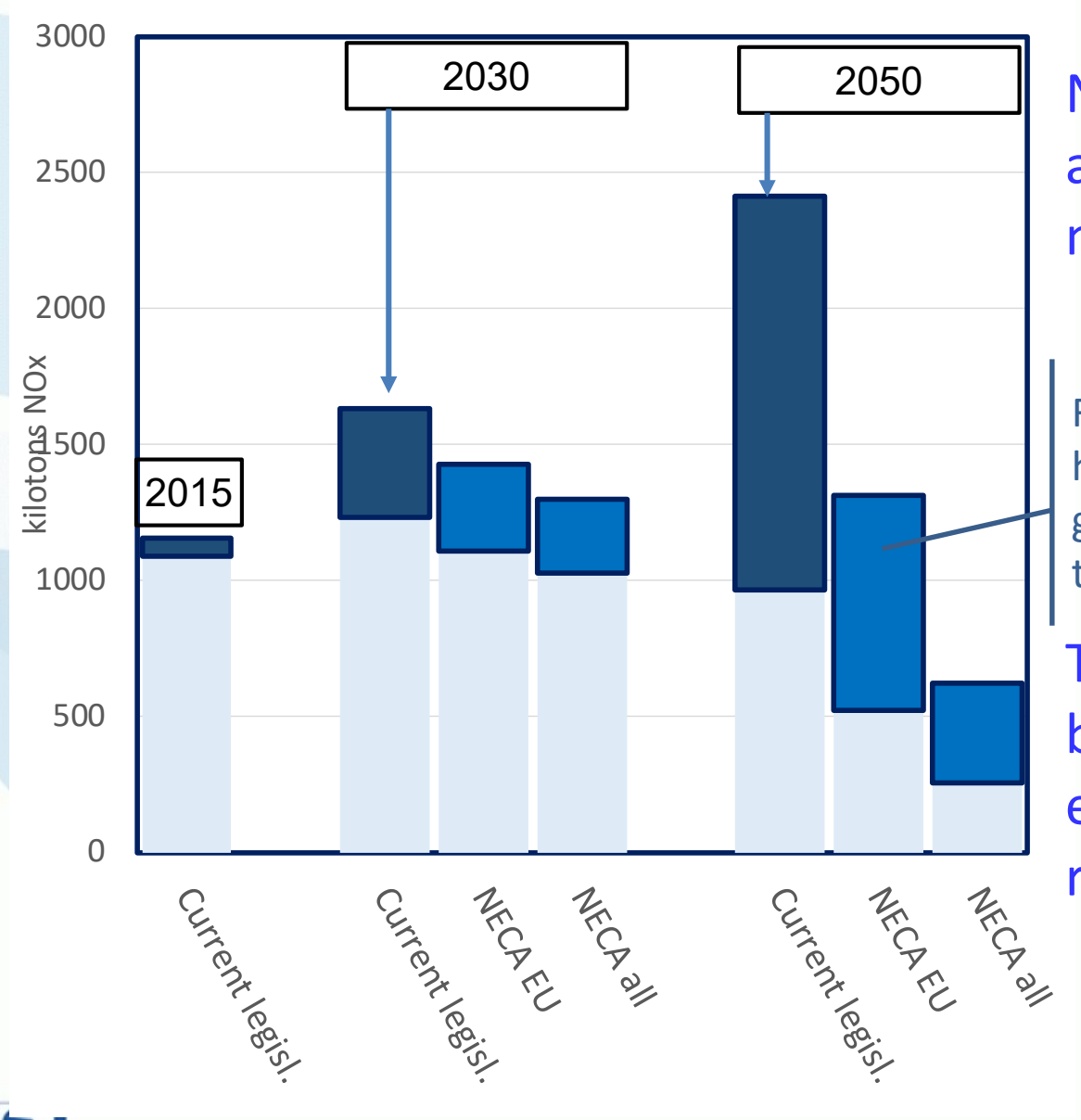


SO_2 emissions decrease ~80% already in 2020, could decrease another 80% when SECA imposed.

Range reflects high or low growth of ship traffic

Effectiveness depends on scope, doubles if EU and non-EU act together.

NO_x emissions in the Mediterranean Sea

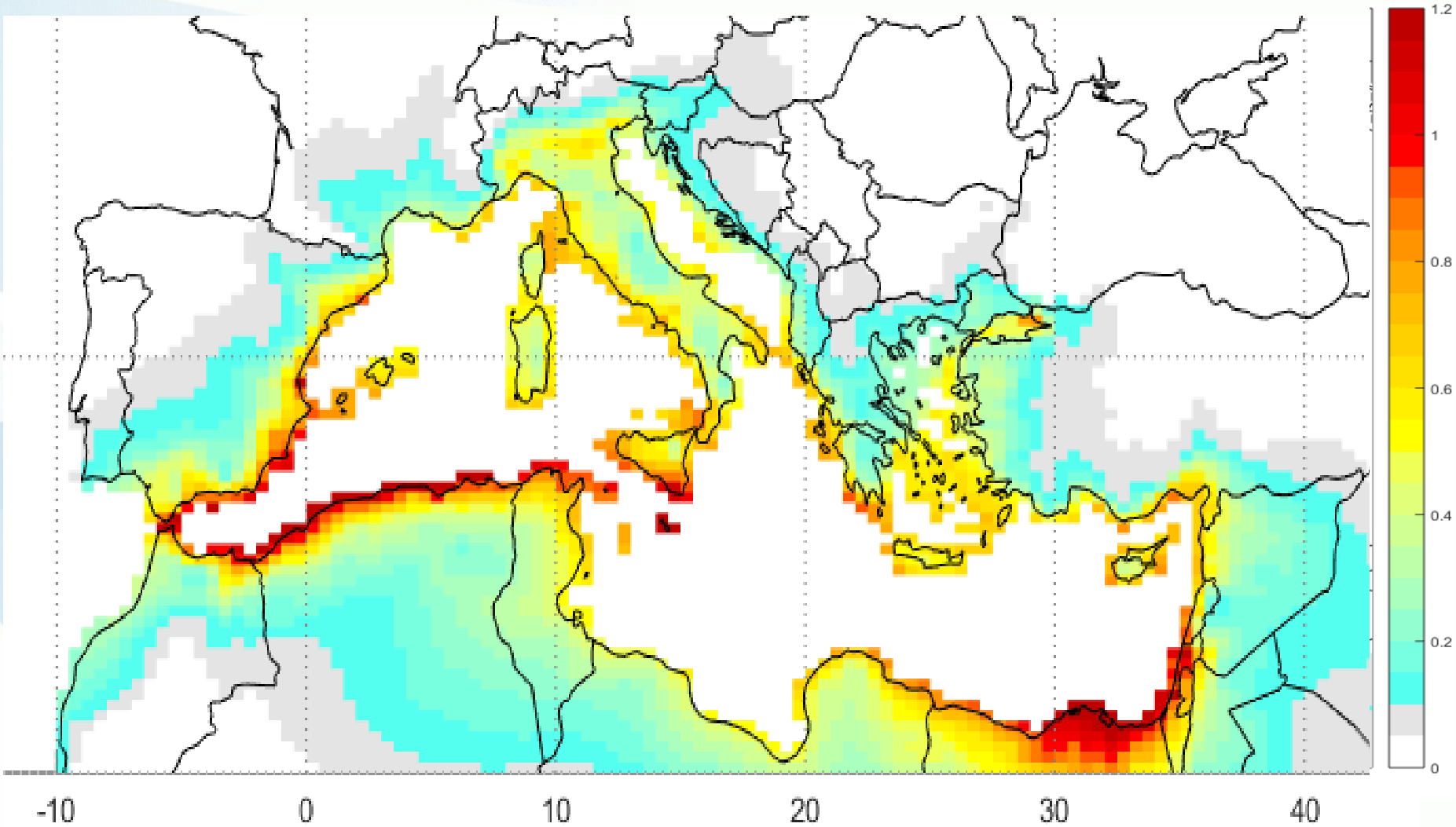


NO_x emissions increase in absence of control measures.

Range reflects high or low growth of ship traffic

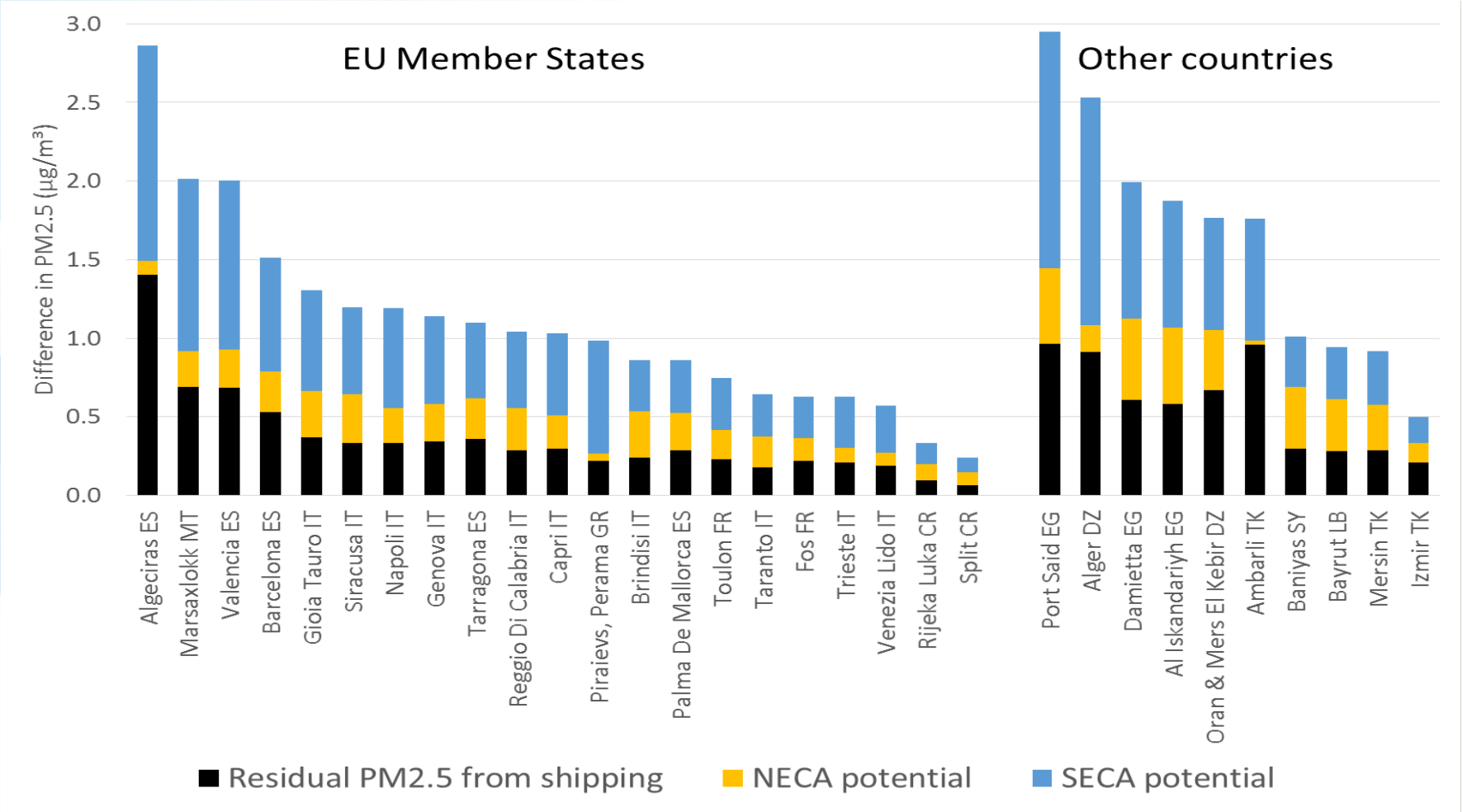
Tier III only for newly-built ships, hence full effect only after fleet renewal (beyond 2030).

Impact of a SO_x- and NO_x-ECA in the Mediterranean on ambient $PM_{2.5}$ concentrations in 2050 ($\mu g/m^3$)

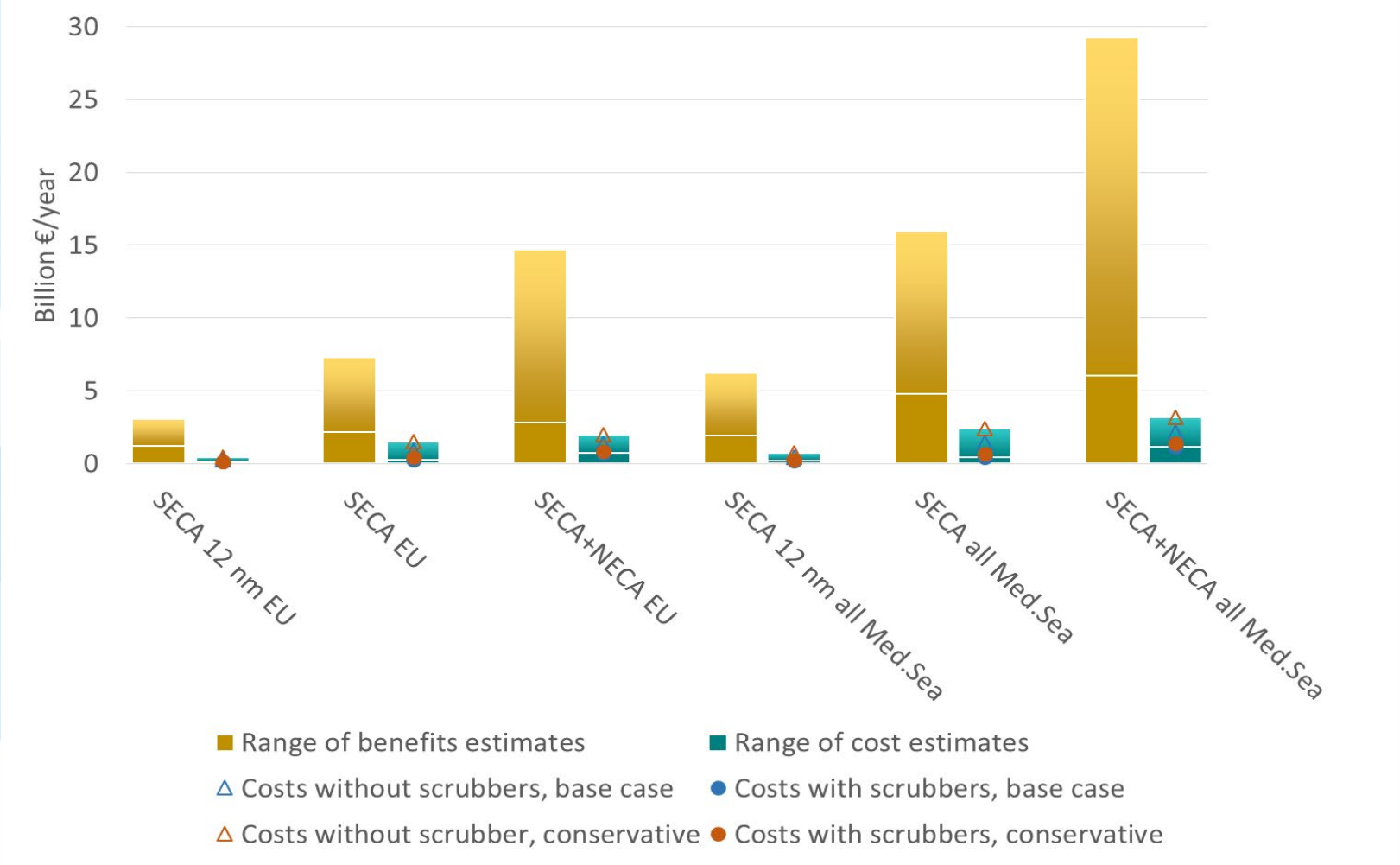


Biggest PM reductions close to the busiest shipping lanes in Northern Africa, Southern Italy, Southern Spain, Malta. Widespread reductions also further inland.

Reduction of $PM_{2.5}$ concentrations in port cities from SO_x- and NO_x ECA in Mediterranean Sea (2050 Baseline)



Monetized health benefits and costs of emission controls for the Mediterranean Sea 2050 (Baseline)



Range of benefits determined by assumed “value of life”.
Range of costs determined by assumed fuel price premium and scrubber utilization.

Key findings

- SO_2- and NO_x ECAs in the Mediterranean Sea:
  - Will improve air quality by lowering ambient $PM_{2.5}$ by 1-2 µg/m^3.
  - Can prevent more than 4,000 cases of premature death annually by 2030 and up to 11,000 annual cases by 2050.

- Double benefits when action of EU + non-EU coastal states aligned.

- Benefits outweigh costs by on average a factor of 7 in 2030 and a factor of 12 in 2050, but costs and benefits occur to different groups in the societies.

- Climate policies have significant co-benefits for air quality.