An Emission Control Area zone for the Mediterranean Sea

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MEDPorts Forum - 25th June 2019

Introduction

- Air pollution is still responsible for about **790 000 extra deaths** in Europe (*European Heart Journal* study, 2019)
- Heavy fuel oil ships are the most **harmful** transport fuel in use today
- **Several pollutants** : particulate matter (PM), ozone (03), nitrogen dioxide (NO2) and sulfur dioxide (SO2)

Air quality in Europe

- **Air quality is a priority** for European authorities as the **directive 2008/50/EC** shows it

- **Infringement procedures** have been initiated against a significant number of Member States though : **20 Member States out of 28**

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Air quality in Europe

- **Several countries** have **already** been **referred to the CJEU** for non-compliance with air quality standards for **NO2** and **PM10**

- **Mediterranean Member States** are likely to be convicted in the short- or medium-term

- Thus, the implementation of **an ECA zone in Mediterranean Sea will help to comply with european air quality standards**

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Stakeholders *:*

ECAMED set-up : 4 steps

- **Step 1 : detailed description of maritime shipping traffic in the Mediterranean Sea**
- **Step 2 : calculation of current emissions and scenarios**
- **Step 3 : simulation of air pollutant concentrations and deposition**
- **Step 4 : costs-benefits analysis**

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INERIS maîtriser le risque pour un développement durable

Cerema

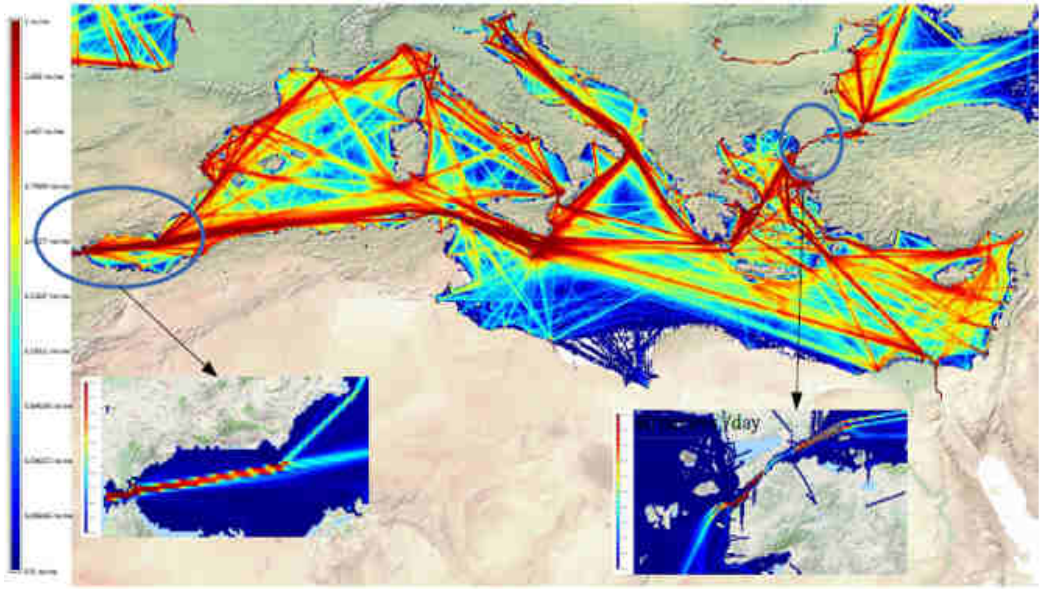
CITEPA

Plan Bleu

Brief presentation of the ECAMED study

- General methodological aspects :
  - **Reference period for traffic datas:** 2015
  - **Pollutants :** SO2, NO2, ozone, PM
  - **Meteorology :** 2010
  - **Domain :** all the Mediterranean Sea
  - Constant traffic
  - **Official emission factors**
  - **Concentrations** simulated by a french consolidated chemistry-transport model (CHIMERE)
  - **Mortality and morbidity** : calculated and monetized thanks to the model Alpha Risk Poll
  - Qualitative analysis of the impacts on ecosystems
  - **Costs** calculated thanks to fuel prices and technologies

Step 1 : Detailed description of ship traffic



Step 2 : calculation of current emissions and scenarios

- **Equation used to calculate emissions based on AIS data from ships :**

$$E(i,lon,lat,t) = \sum_{j}\sum_{m}\sum_{p}\left[\Delta t \sum_{e}\left(P_e . LF_e(lon,lat,t) . EF_{e,i,j,m,p}\right)\right]$$

- **5 scenarios** :
  - **Reference situation (2015/2016)**
  - **2020 reference scenario**
  - **SECA scenario**
  - **Scenario SECA/NECA 50 %**
  - **Scenario SECA/NECA 100 %**

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Step 2 : calculation of current emissions and scenarios

- **Results** :
  - The IMO Global Sulphur Cap 2020 will reduce the emissions of :
    - SOx by 80 %
    - PM by 72 %
    - **NOx by 5 %**
  - The implementation of a **SECA** :
    - **SOx by 95 %**
    - **PM by 80 %**
    - Black Carbon by 51 %
    - **NOx by 5 %**
  - The implementation of a **NECA** will reduce **nitrogen** emissions by :
    - **38 %** if **50 % of ships are TIER III**
    - **and 77 %** if **all the ships are TIER III**

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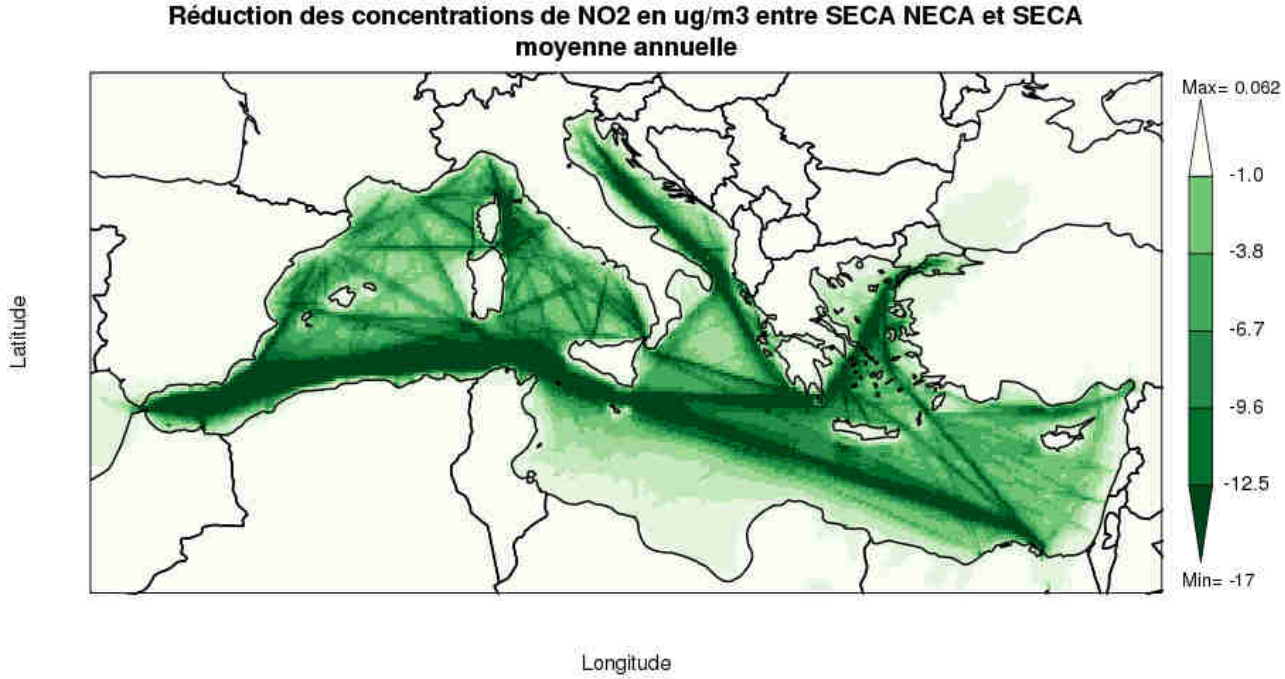
Step 3 : Simulation of air pollutant concentrations and deposition

- Impact of a SECA/NECA on nitrogen dioxide annual mean concentrations compared to the 2020 situation (offshore)



Absolute NO_2 annual mean concentration differences between SN100 and REF_MGO scenarios (in g/m³)

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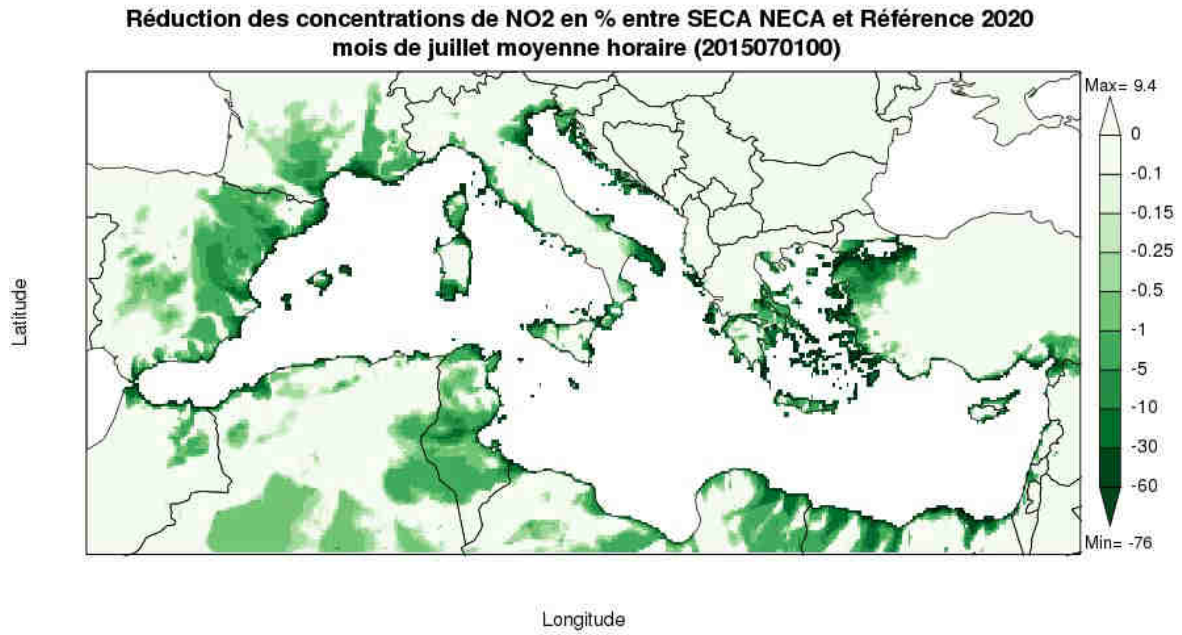
Step 3 : Simulation of air pollutant concentrations and deposition

- Impact of a **SECA/NECA** on **nitrogen dioxide** annual mean concentrations **compared to the 2020** situation (**in-land**)



Relative NO_2 annual mean concentration differences between SN100 and REF_MGO scenarios (in □). Focus on land territories

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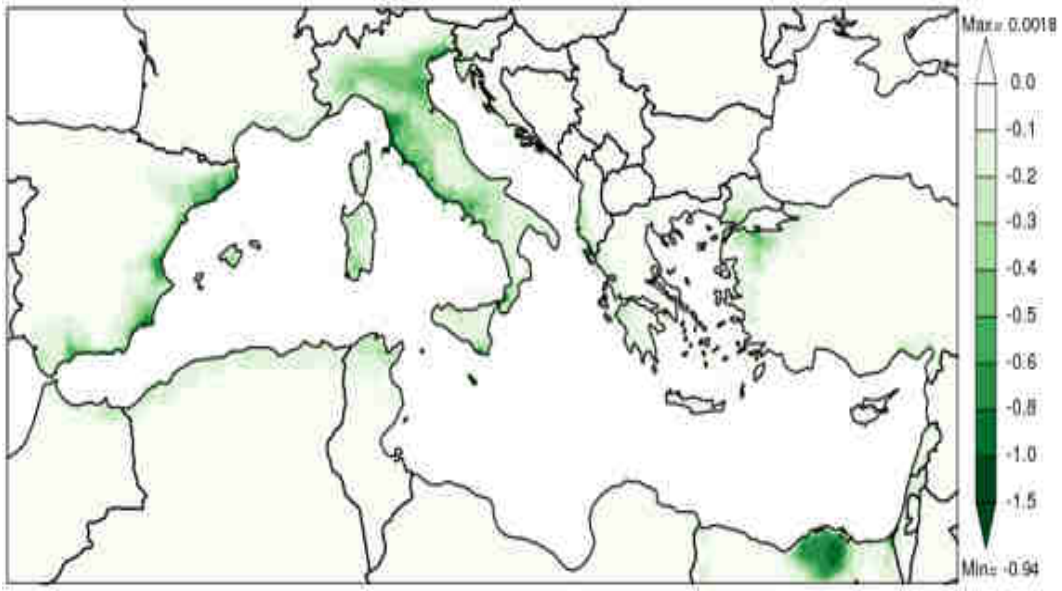
Step 3 : Simulation of air pollutant concentrations and deposition

- Impact of a **SECA/NECA** on fine **particulate matter** annual mean concentrations **compared to the 2020** situation (in-land)



Absolute $PM_{2.5}$ annual mean concentration differences between SN100 and REF_MGO scenarios (in µg/m³). Focus on land territories

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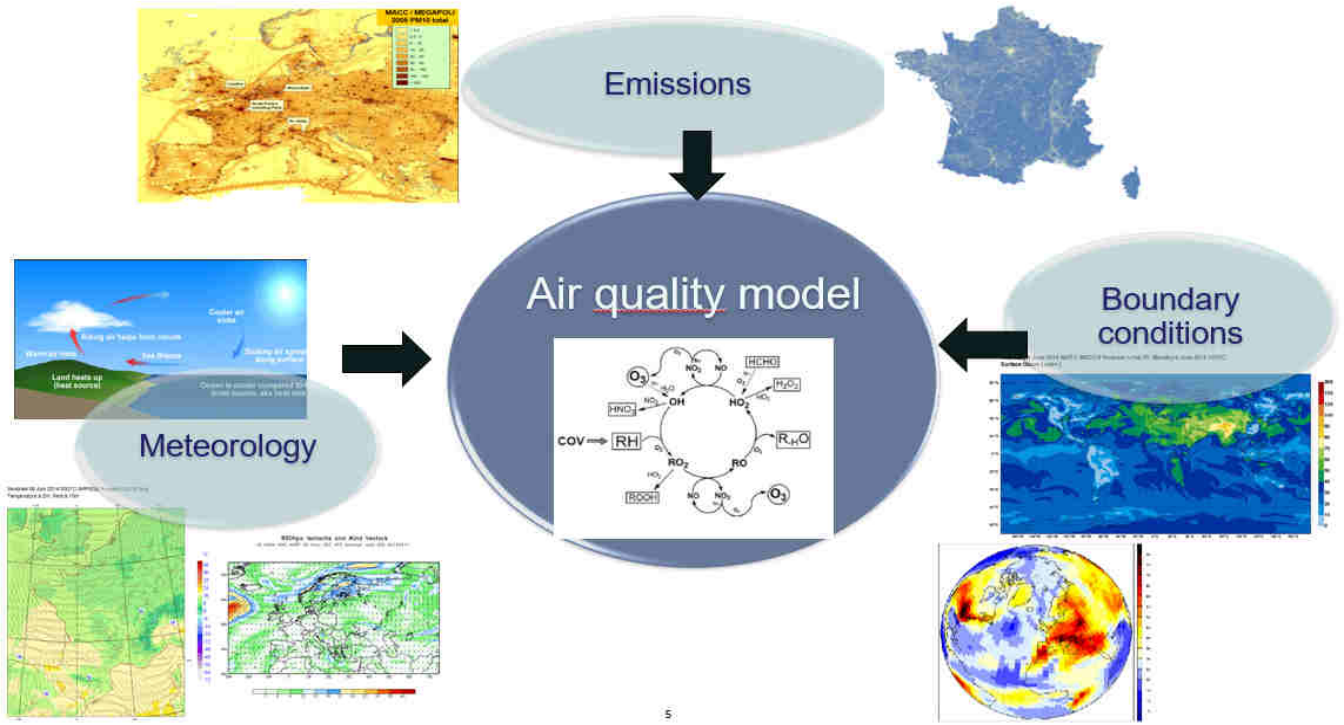
Step 3 : Simulation of air pollutant concentrations and deposition



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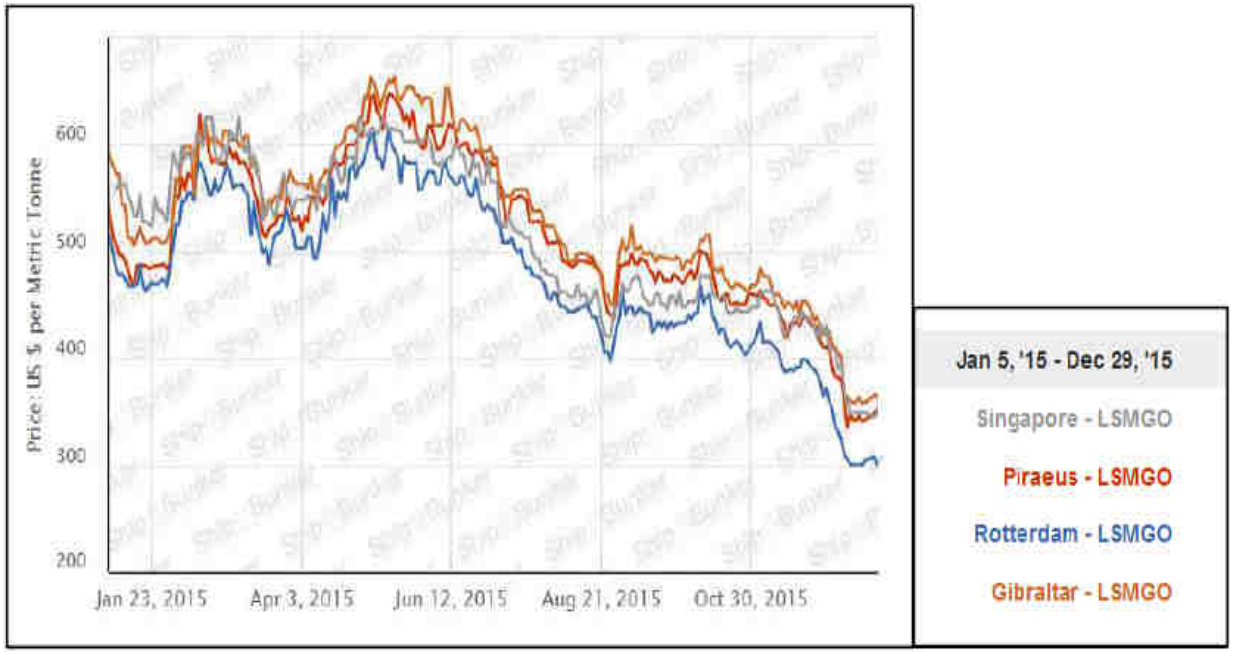
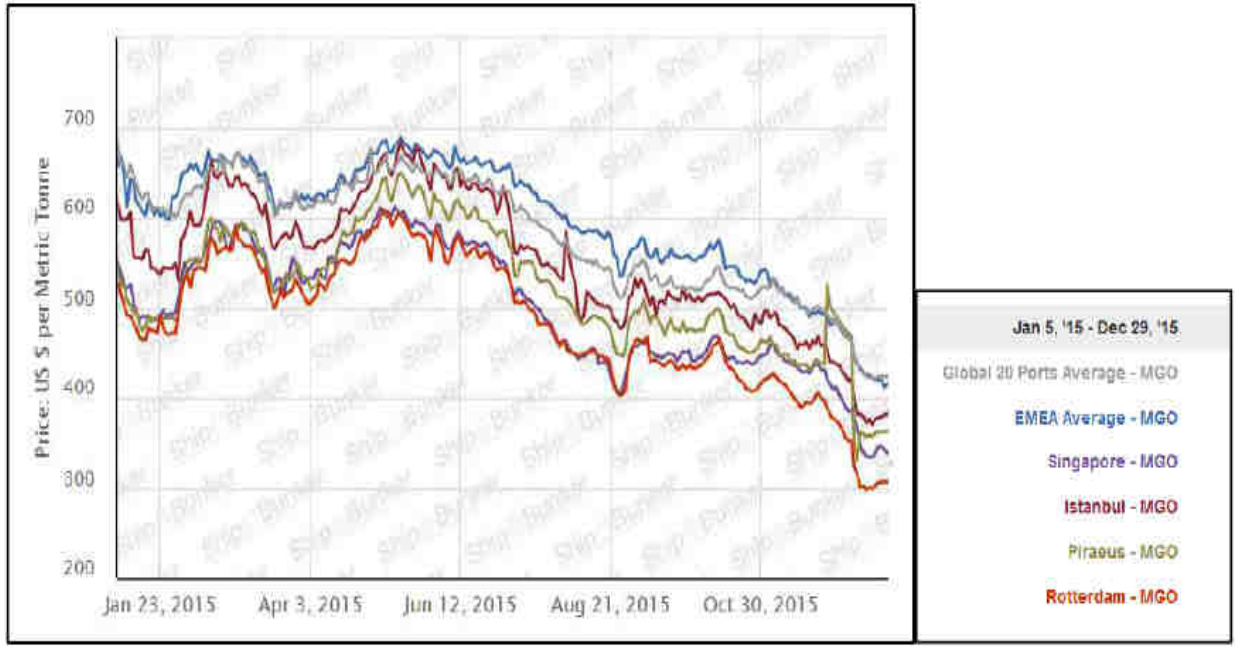
Step 4 : Cost-benefits analysis



Price trends for LSMGO Max 0.10% Sulphur Distillate (USD$ per metric ton) in 2015

Step 4 : Cost-benefits analysis



Price trends for MGO Max 1.50% S (USD$ per metric ton) in 2015

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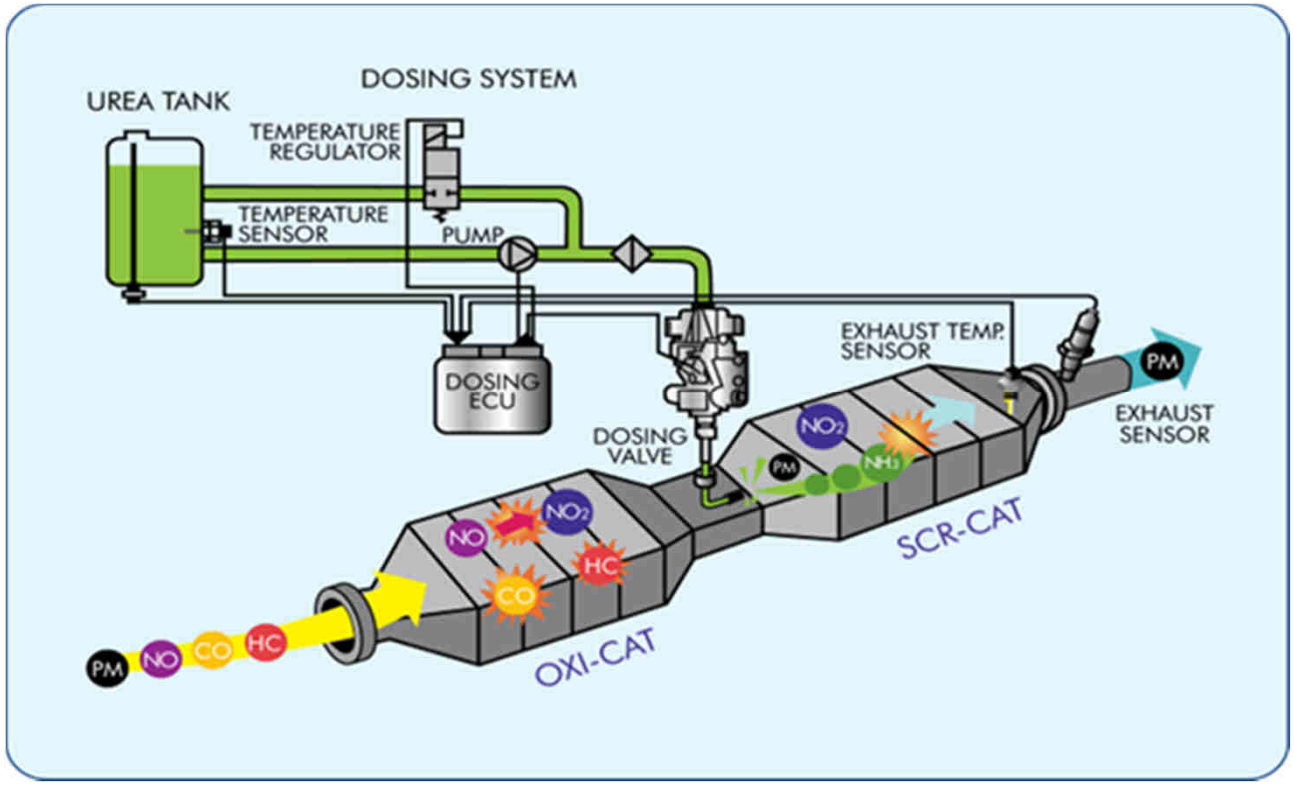
Step 4 : Cost-benefits analysis



Selective Catalytic Reduction is one of the most widely used mean to comply with Tier III standards, id est to reduce NOx emissions

NB : only applies to new ships

Step 4 : Health impacts

Health impact	Impact unit	Pollutant	Unit valuation (€ price base 2015)
Acute Mortality (All ages) median VOLY*	Premature deaths	O_3	66 728
Respiratory hospital admissions (>64)	Cases		2 567
Cardiovascular hospital admissions (>64)	Cases		2 567
Minor Restricted Activity Days (MRADs all ages)	Days		49
Chronic Mortality (All ages) LYL median VOLY	Life years lost	$PM_{2.5}$	66 728
Chronic Mortality (30yr +) deaths mean VSL**	Premature deaths		2 567 364
Infant Mortality (0-1yr) mean VSL	Premature deaths		3 851 047
Chronic Bronchitis (27yr +)	Cases		61 987
Bronchitis in children aged 6 to 12	Cases		680
Respiratory Hospital Admissions (All ages)	Cases		2 567
Cardiac Hospital Admissions All ages)	Cases		2 567
Restricted Activity Days (all ages)	Days		106
Asthma symptom days (children 5-19yr)	Days		49
Lost working days (15-64 years)	Days		150
Bronchitis in children aged 5 to 14	Cases	NO_2	680
Respiratory Hospital Admissions (All ages)	Cases		2 567
Chronic Mortality (All ages) LYL median VOLY	Life years lost		66 728
Chronic Mortality (30yr +) deaths mean VSL	Premature deaths		2 567 364

(*) VOLY = Value of Life Year ; (**) VSL = Value of Statistical Life ; values for the willingness to pay by society to reduce the risk of premature mortality.

Concentrations response functions according to WHO/Europe (2013) - HRAPIE study - Health Risks of Air Pollution in Europe. 67% of NO_2 chronic mortality accounted for in monetary cost (benefit) to avoid risk of double counting with $PM_{2.5}$ chronic mortality.

Synthesis of health impacts (mortality and morbidity) considered in the ECAMED HIA and their monetary unit values

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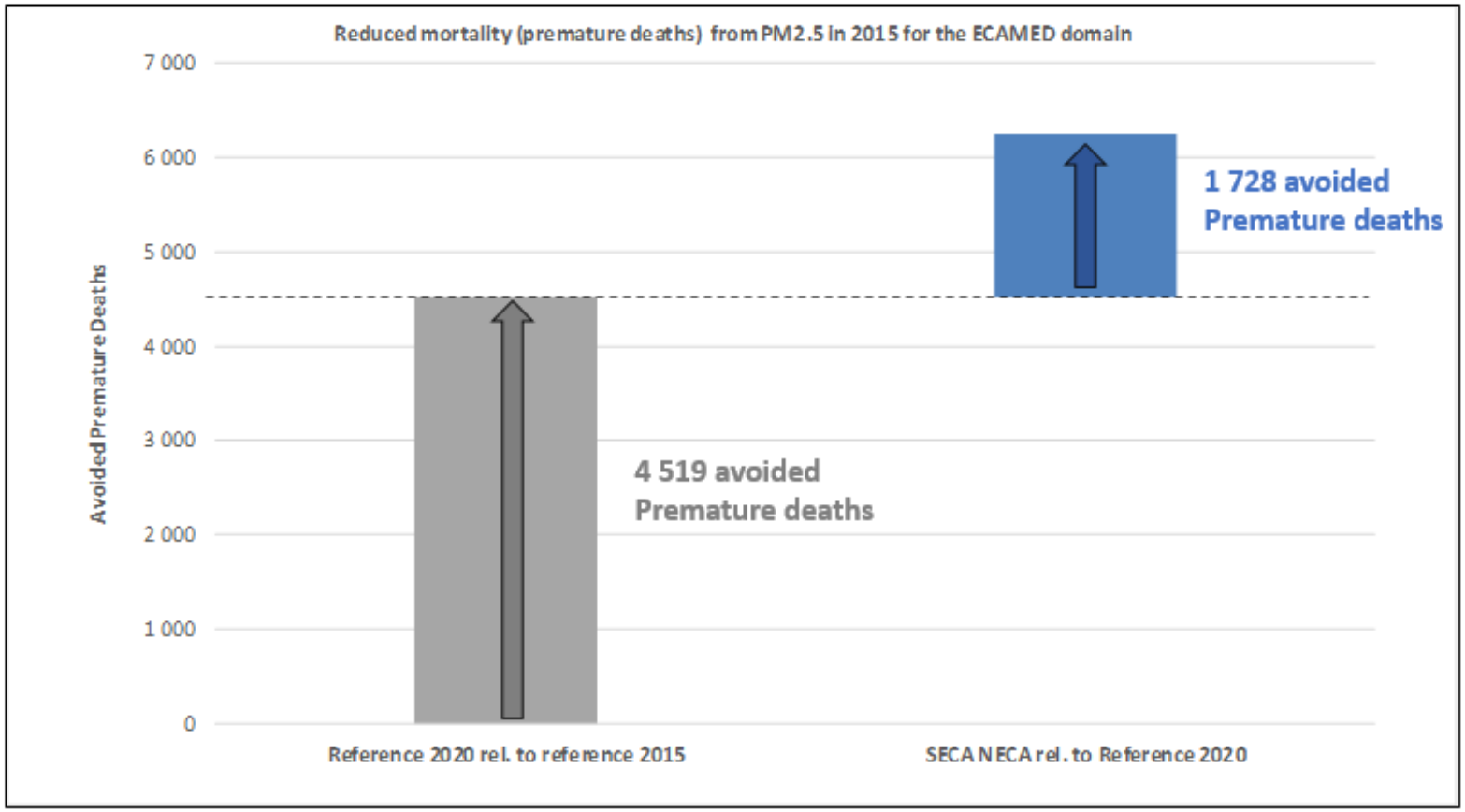
Step 4 : Health impacts



Reduction in $PM_{2.5}$ mortality (premature deaths) – overall ECAMED domain

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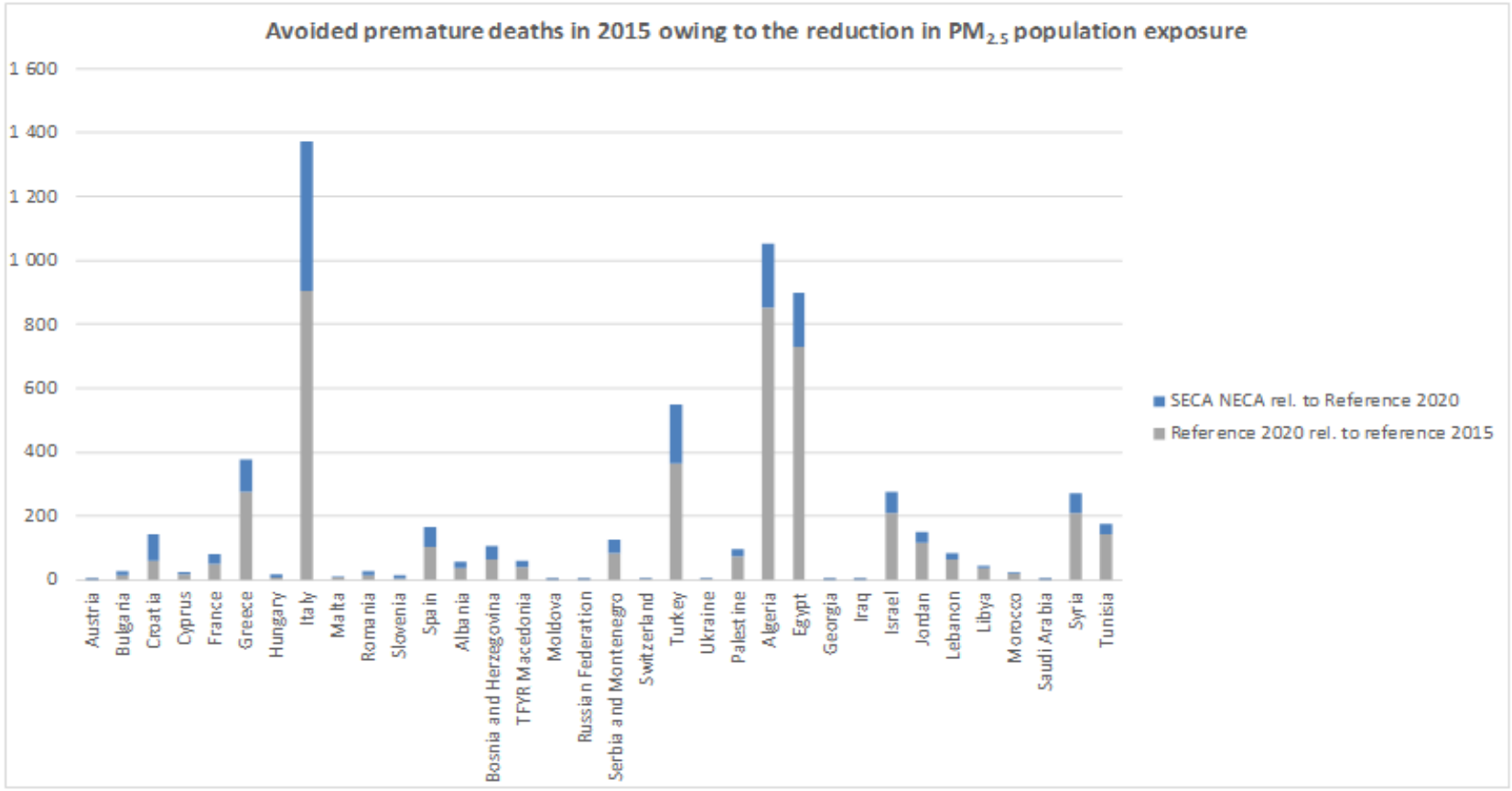
Step 4 : Health impacts



Reduction in $PM_{2.5}$ mortality (premature deaths) – ECAMED domain per country

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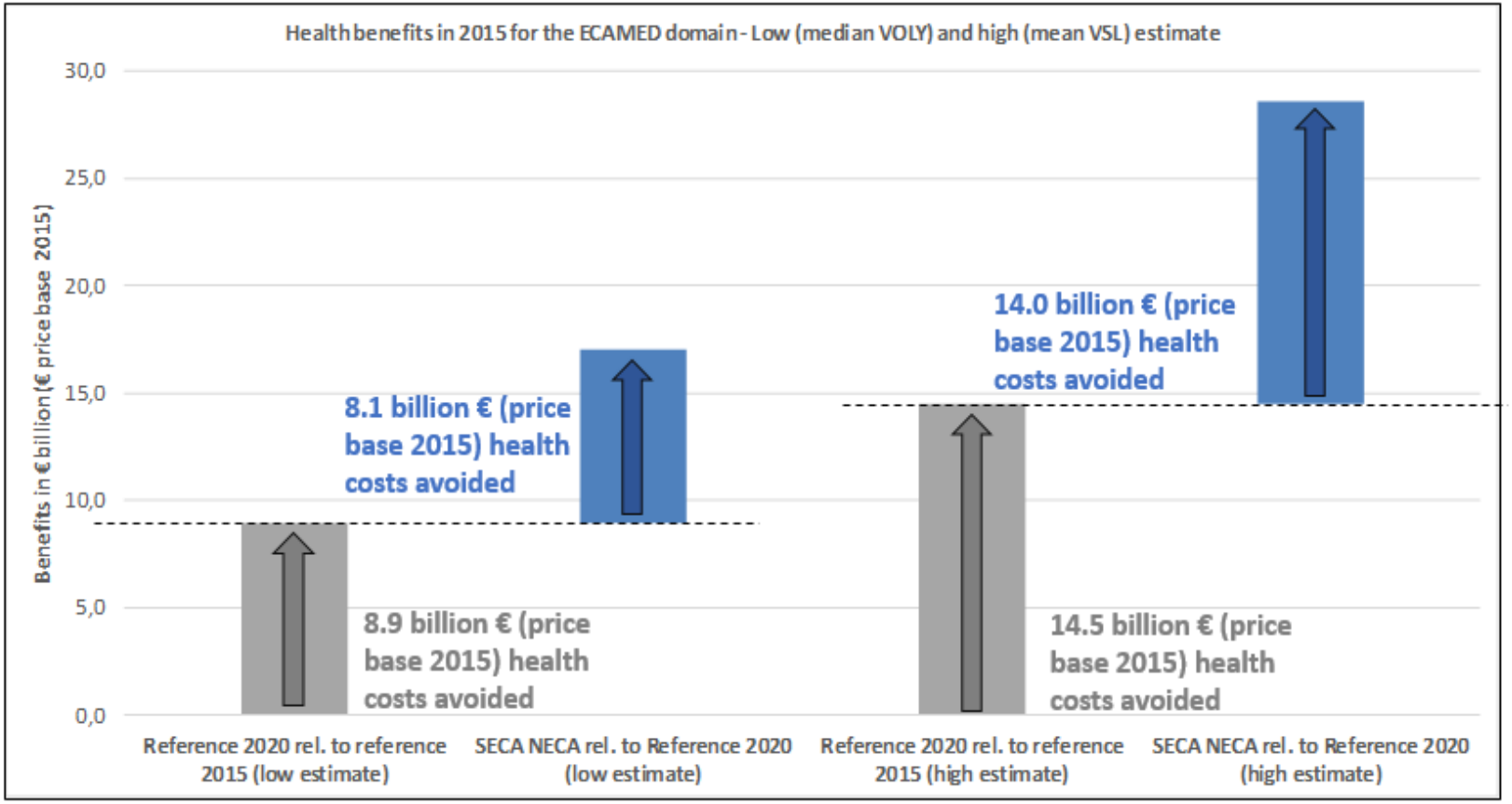
Step 4 : Cost-benefits analysis



Aggregate health benefits – overall ECAMED domain

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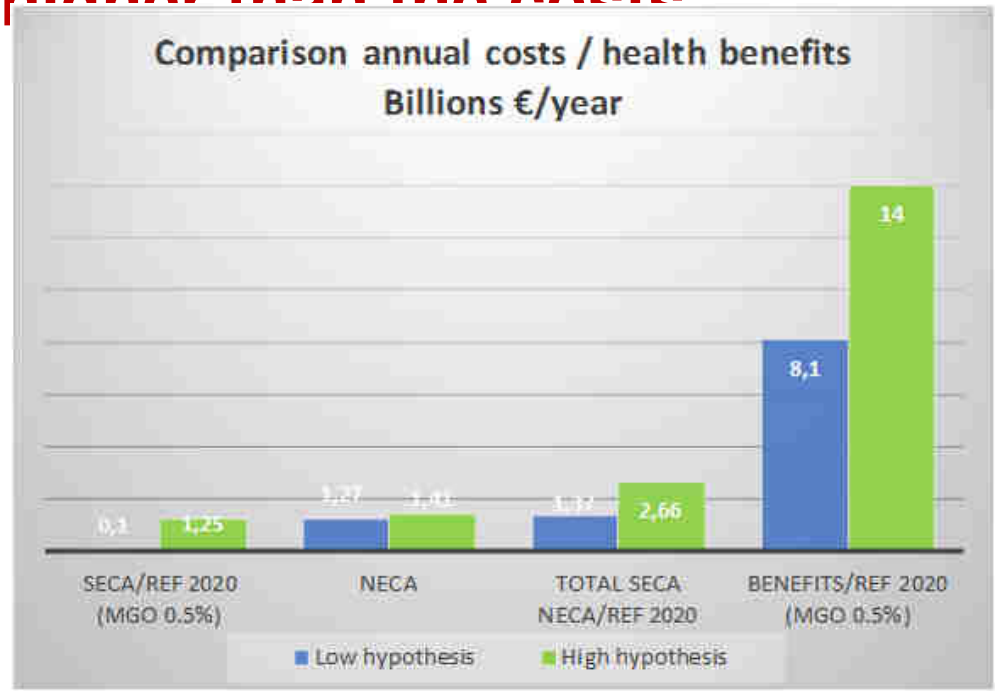
Step 4 : Cost-benefits analysis

- **Whatever the mitigation scenario, benefits are always significantly higher than the costs**



Final results of the cost-benefits analysis

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Conclusion

- In the worst-case scenario, **health benefits of implementing a SECA/NECA are 3 times higher than costs**

- All **data sets** have been archived and will be used for **further analysis** (second half of 2019 / first half of 2020)

- **France, Europe and REMPEC : 3 different and complementary studies**

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Timeline

2019

- Awareness with the 3 feasibility studies (France, EU, REMPEC)
- Presentation of the study during MEPC 74 (13th May) and a side event (14th May)
- REMPEC Focal points meeting (11th to 13 June) -> agreed on SECA covering all Med Sea
- Summit of the Two Shores (24th June) -> agreed on the necessity of a SECA
- Presentation to the mediterranean ports – Forum MedPort (25th June)
- Bilateral meetings (with States and institutions)

2020

- Further studies with REMPEC, CEREMA, INERIS
- Preparation of a submission and involvement of the co-sponsors

- Submission to IMO at MEPC 76 (autumn 2020) with Mediterranean countries
  - negotiation of the date of entry into force at te IMO after the submission

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