A feasibility study for the implementation of an ECA in the Mediterranean sea

Laurence ROUÏL, Nadine ALLEMAND
Laurence.rouil@ineris.fr, nadine.allemand@citepa.org

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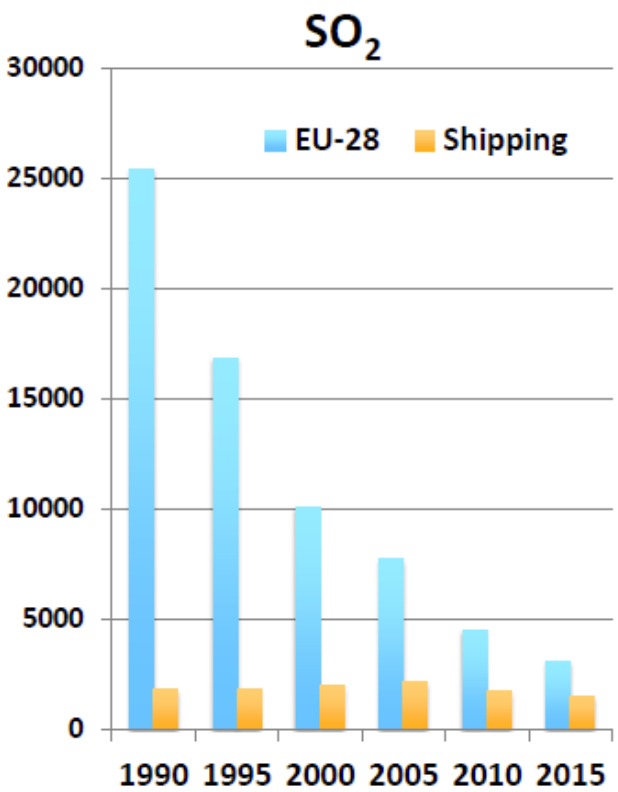
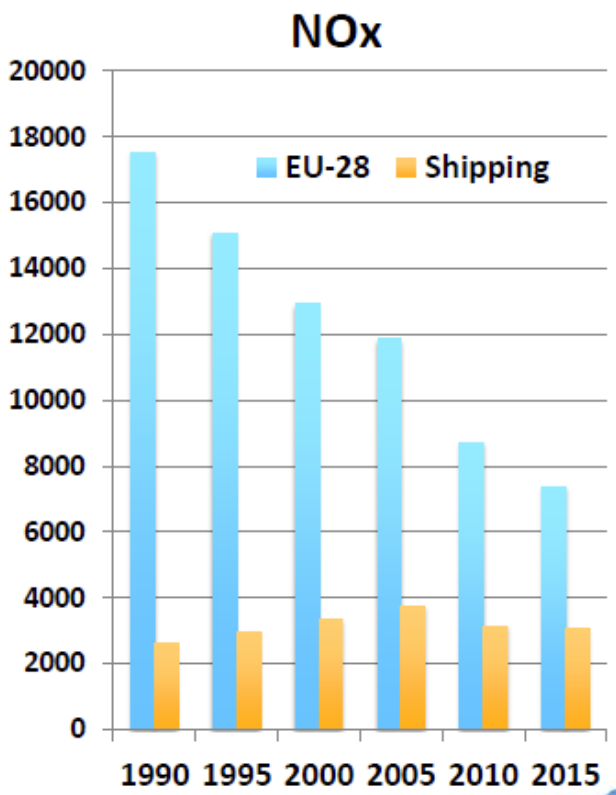
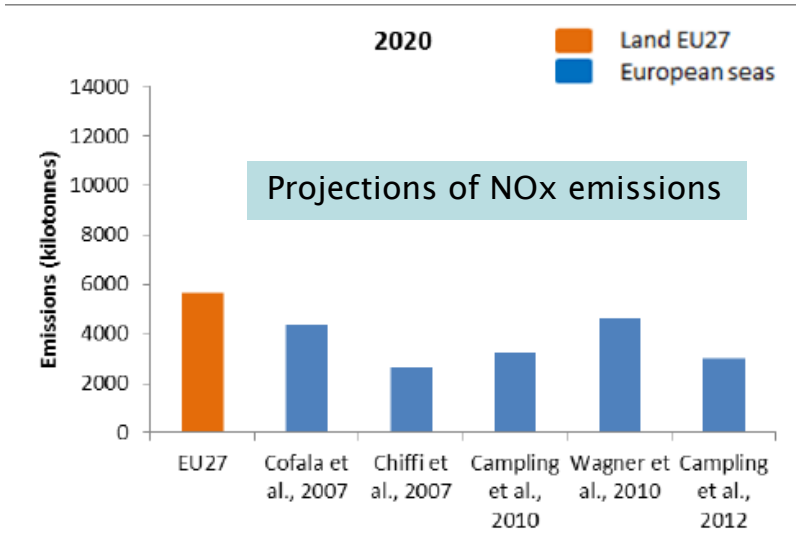
Rationale : shipping emissions versus in-land emissions

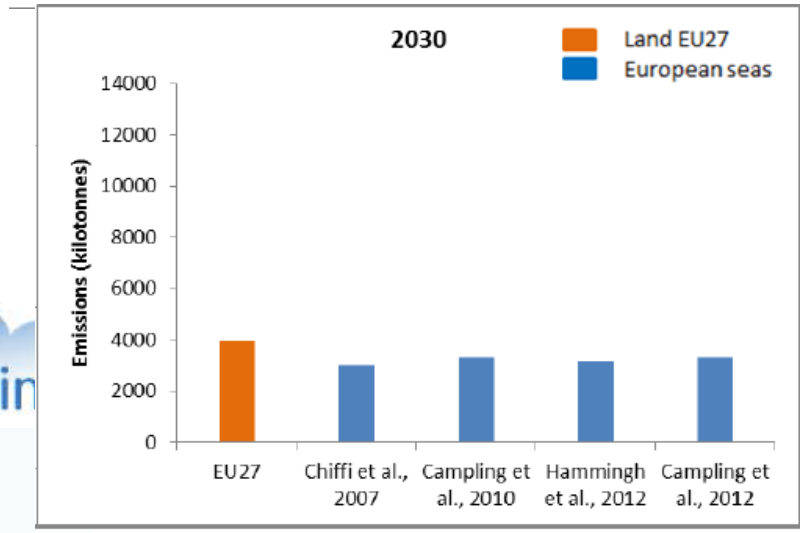


Land-based SO_2 cut by 88% 1990-2014



Land-based NOx cut by 58% 1990-2014





While EU regulations on air pollutants led to drastic reductions of in-land SOx an NOx emissions , shipping emissions kept constant

Source: EEA, 2012

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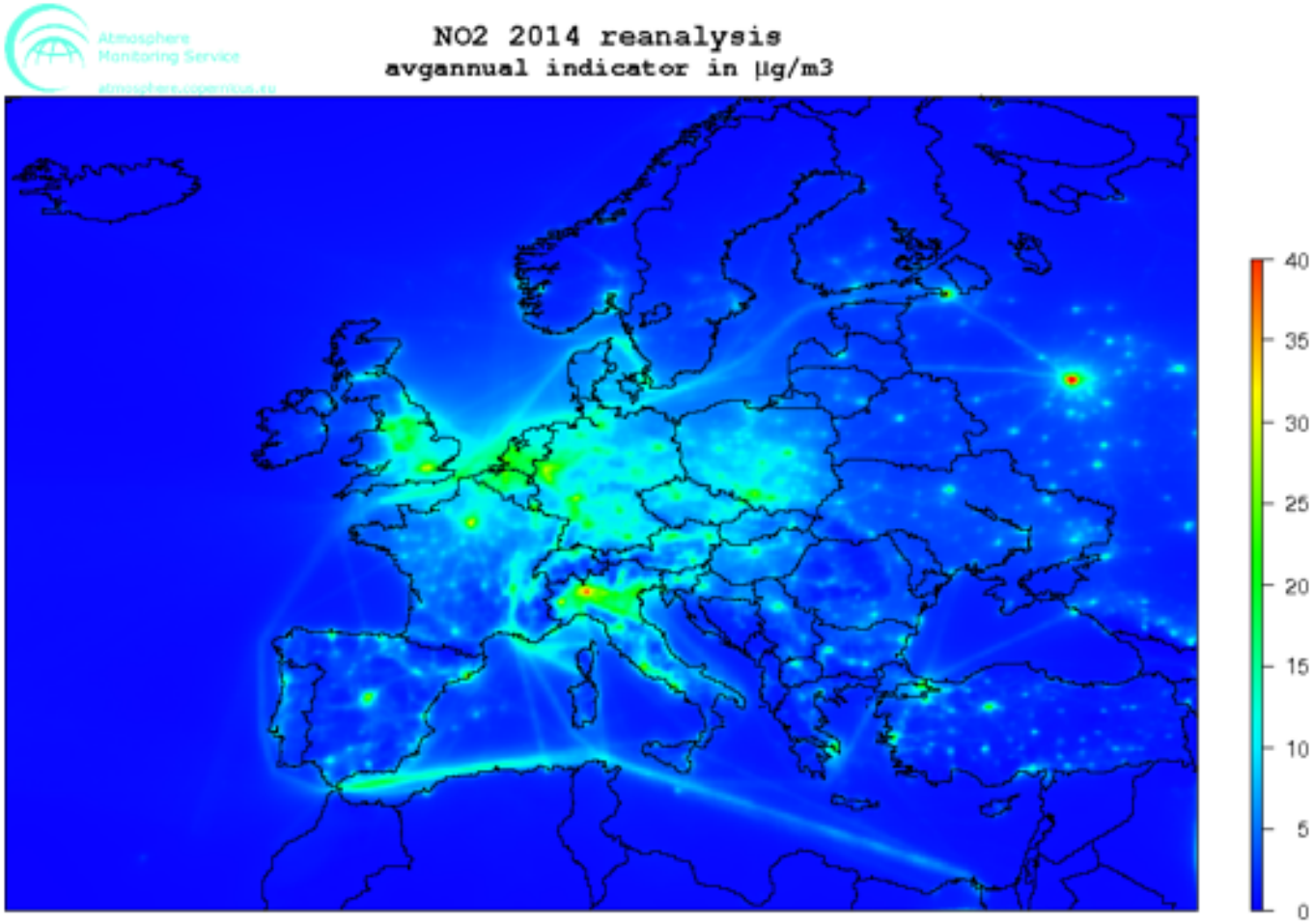
Impacts on air quality



Annual mean concentrations of NO2 in 2014
Source : Copernicus Atmosphere Services

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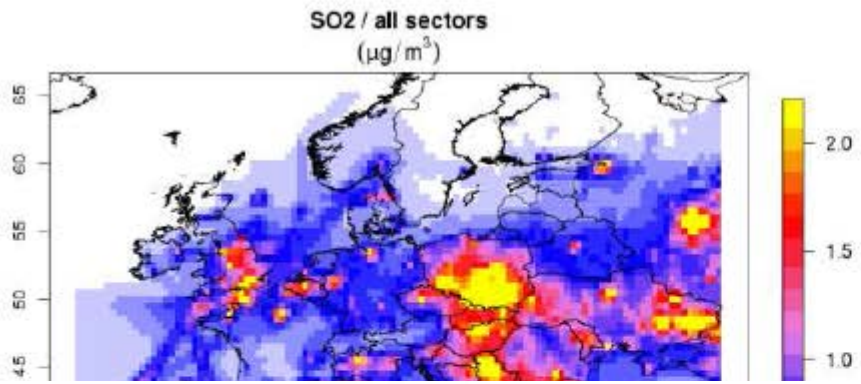
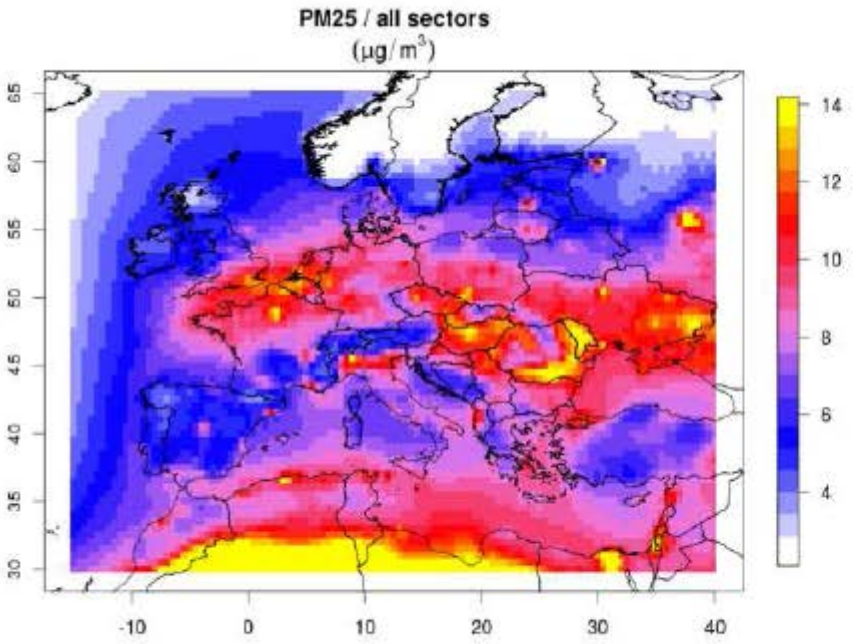
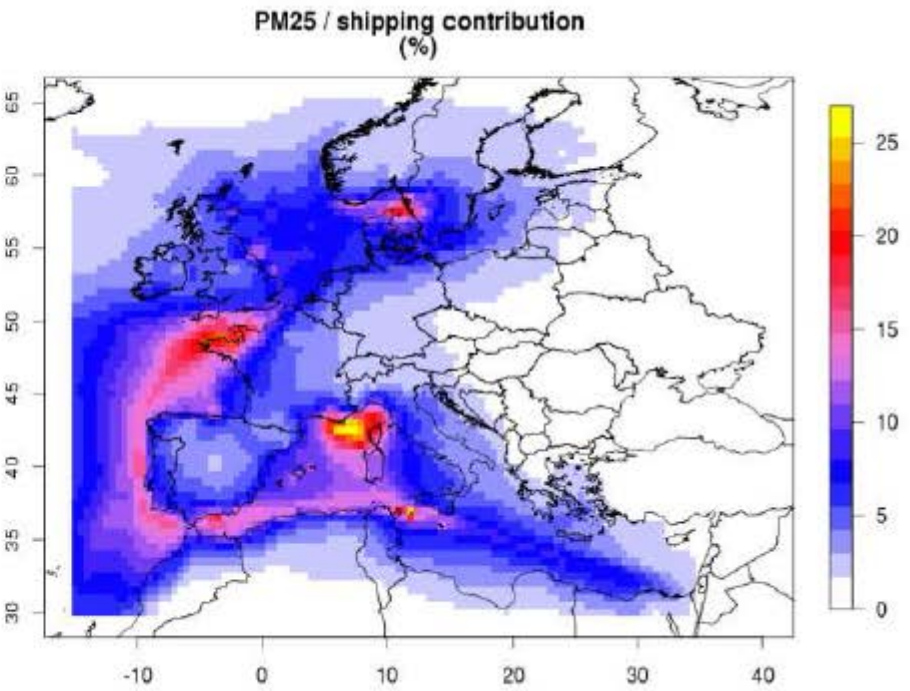
INERIS simulations for the year 2005

Simulations performed with the CHIMERE model – low resolution –25 km







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Reducing shipping emissions: a strategy for air quality action plans

- In France, the National Air Emission Reduction Plan (PREPA) under the Law for Energy Transition and Green Growth (2015) includes actions to promote, if relevant, the implementation of an emission control area in the Mediterranean Sea
- A feasibility study is necessary to assess potential impacts of such a decision
- It should review items considered by IMO within the framework of the MARPOL Convention (annex VI)
  - Pollutants proposed for control
  - Nature of ship traffic in the proposed ECA
  - Description of populations and ecosystems exposed to ship emissions
  - Assessment of impacts of ship emissions on atmospheric concentrations (+ health and environmental impacts)
  - Description of potential control measures
  - Cost benefit analysis
  - Proposed delineation for the control areas

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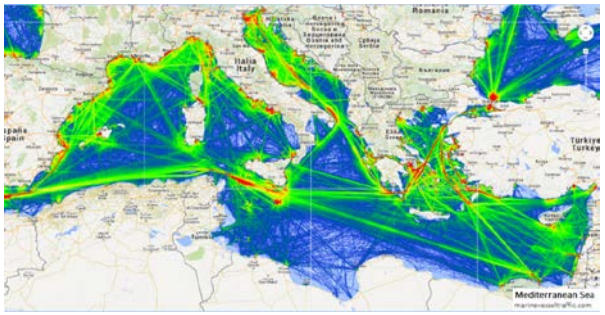
A solid consortium for a detailed analysis

Detailed description of the shipping traffic



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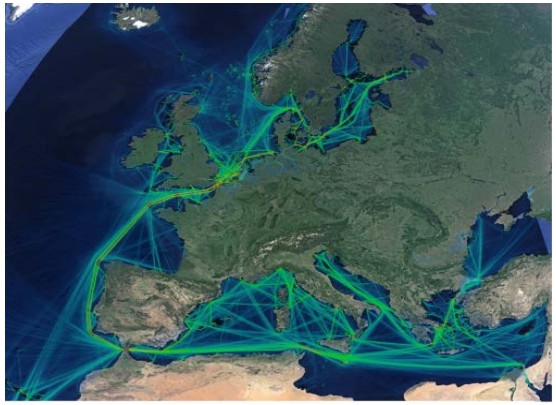
Emissions maps (source fim)



Current status : 2015-2016
Projections :

- S content reduced to 0.1% in fuel
- Cleaner engines (Tier3) to reduce NOx emissions

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Cost benefits analysis

Concentration maps

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Communication and concertation with interested stakeholders to harmonize practices, share results and analyse opportunities

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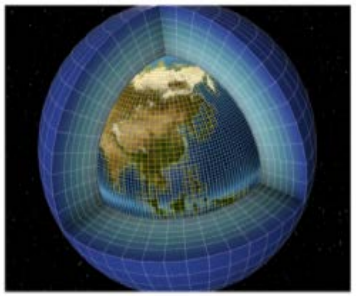
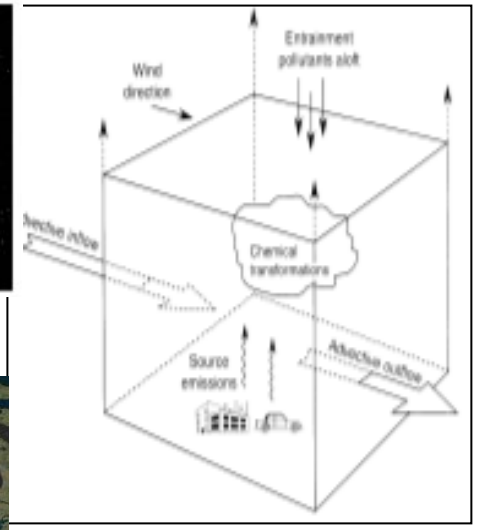
Methodological aspects

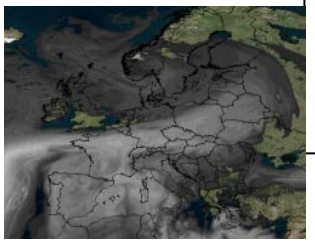
- Targeted domain : Mediterranean sea and Western Mediterranean area

- Reference period : 2015-2016
- Collection of data from the Sat-AIS, MARES and EMSA databases and others
- Some parts of the domain are not sufficiently documented (Greece, Libya..)





- Emissions computed and averaged to rebuild a “theoretical reference” year
- Pollutants : SO2, NOx, PM



- Concentrations simulated by the **CHIMERE** model (Chemistry-transport model)
- Pollutants : SO2, NO2, ozone, PM
- Resolution : 10 km to 4 km
- Meteorology : 2010

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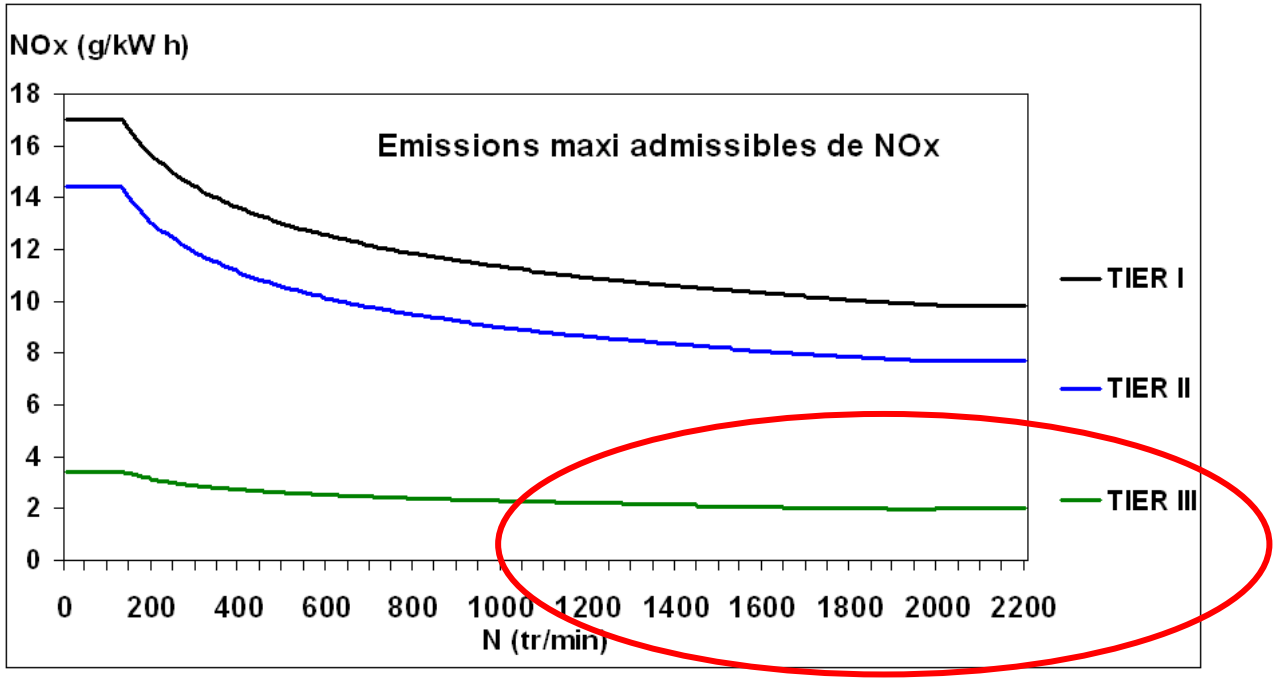
Scenarios and cost-benefits analysis (i)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NO SECA	4,50%			3,50%								0,50%	
SECA	1,50%	1,00%					0,10%						



3 scenarios are envisaged:

- Reducing SOx emissions
- Reducing NOx emissions
- Reducing both

Comparison with the reference case

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Scenarios and cost-benefits analysis (ii)

- Evaluation of the impacts on air pollutant concentrations with special care to
  - Ozone : a secondary photochemical pollutant resulting from NOx and VOCs emissions. Sensitive issue for the Mediterranean countries. Impacts on health and ecosystems
  - PM (particulate matter): primary and secondary pollutant. High sensitive issue for health
  - NO2 and SO2: resulting from NOx and SOx emissions. Sensitive issue for health and ecosystems (acidification and eutrophication)
- Mortality an morbidity end points will be calculated and monetized thanks to the model Alpha Risk Poll (Mike Holland EMRC- UK)

Source :
Schucht et al,
Env Science and Pol.
2015

Damage, in million €/year	Pollutant	2005	REF 20[illegible]	
Acute Mortality (All ages) median VOLY	O_3	1782		
Respiratory Hospital Admissions (65yr +)		54		
Minor Restricted Activity Days (15–64yr)				
Respiratory medication use (adults 20yr +)				
Chronic Mortality (All ages) median VOLY/VSL				18,450/48,944
Infant Mortality (0–1yr) median VSL				99
Chronic Bronchitis (27yr +)			11,612	3717
Respiratory Hospital [illegible]			45	14
Cardiac H[illegible]			28	9
[illegible]		39,475	8192	2638
[illegible]		4.3	1.0	0.3
[illegible]		32	9.4	3.0
[illegible] (children 5–14yr)		8886	2117	681
[illegible] chronic symptoms		13,710	4009	1284
[illegible] (median)/VSL (median)		366,845/523,213	89,807/186,171	27,790/58,283
[illegible]mental benefit REF – MIT *[sensitivity range]*	VOLY		62,000 [50,000–120,000]	
	VSL		127,000 [127,000–296,000]	

Same methodology already applied for the French air emission reduction action Plan (PREPA)

- Qualitative analysis of the impacts on ecosystems

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Key questions

- Key point for success : input data
  - Ship traffic an motorization: detailed description of the shipping activity in the Mediterranean area. Some datasets available but heterogeneous information
  - Population data and health data, especially outside European countries
- Key point for success: Communication and cooperation
  - Coordination with the REMPEC (Regional Marine Pollution Emergency Response Center) initiative
  - Coordination with the study conducted by the European Commission
  - Accounting for all stakeholders recommendations
- **Achievement of the feasibility study : September 2018**
- Mid-term analysis and communication : March-May 2018
- Simulation results available by the end of June 2018

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Thank you for your attention !!

Laurence ROUÏL
Laurence.rouil@ineris.fr,

Nadine ALLEMAND
nadine.allemand@citepa.org

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