

# Shipping emissions in ports

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Governance Challenges for a Sustainable Maritime Supply Chain

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## Structure

1. Why is it relevant?
2. Current situation
3. Instruments
4. Governance challenges

## 1. Relevance

Shipping as share of global emissions:

- CO<sub>2</sub> 2-3%
- SO<sub>x</sub> 5-10%
- NO<sub>x</sub> 15-30%



# 1. Relevance

## Share of emissions in port-cities

**Table 4. Shipping emissions as share of total emissions in port-city**

<b>Port</b>	<b>SO<sub>2</sub></b>	<b>PM</b>	<b>NO<sub>x</sub></b>	<b>Source</b>
Hong Kong	54%	-	33%	Civic Exchange 2009
Shanghai	7%	-	10%	Hong et al. 2013
Los Angeles/Long Beach	45%	-	9%	Starcrest 2011
Rotterdam	-	10-15%	13-25%	Merk 2013
Kaohsiung	4-10%	-	-	Liu et al. 2014
Hong Kong	11%	16%	17%	Yau et al. 2012
Taranto	7%	-	3-17%	Gariazzo et al 2007
Izmir	10%	1%	8%	Saracoglu et al. 2013
Venice	-	1-8%	-	Contini et al. 2010
Brindisi	-	1%	8%	Di Sabatino et al. 2012
Los Angeles/Long Beach	-	1-9%	-	Agrawal et al. 2009
Melilla	-	2-4%	-	Viana et al. 2009
Algeciras	-	3-7%	-	Pandolfi et al. 2011

Source: Own data collection.

# 1. Relevance

## Impacts:

- Health impacts: early mortalities
- Social impacts
- Climate change impacts in port-cities
- Sustained acceptability of port investment and expansion



## 2. Current situation

How much?

	Shipping emissions in ports (mln tonnes)
CO <sub>2</sub>	18.3
NO <sub>x</sub>	0.4
SO <sub>x</sub>	0.2
PM <sub>10</sub>	0.03
PM <sub>2.5</sub>	0.03
CO	0.03
CH <sub>4</sub>	0.002

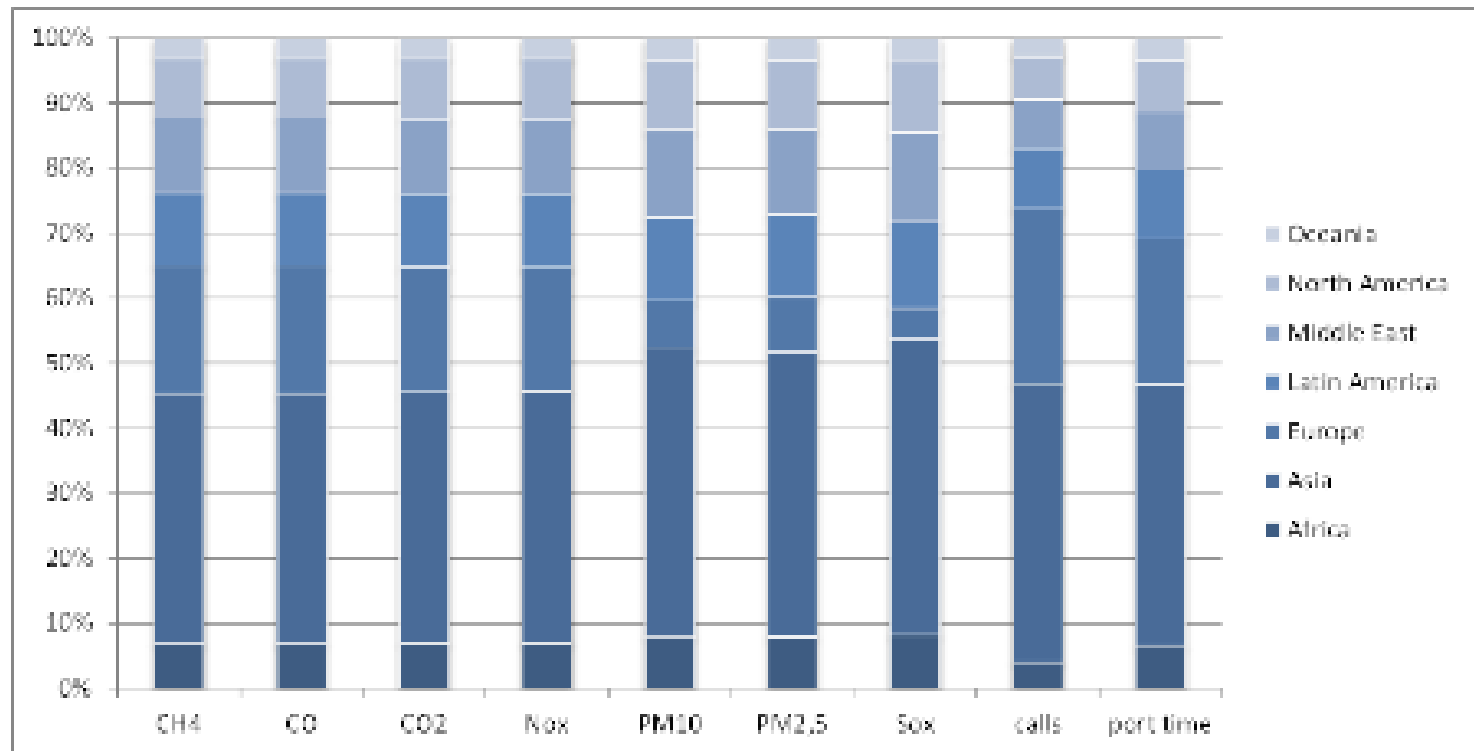
Source: Author's calculations and elaborations, based on data from Lloyds Marine Intelligence Unit

This represents 3-5% of total shipping emissions



## 2. Current situation: where?

Figure 2. Shipping emissions, port calls and port time per continent (2011)



Source: Author's calculations and elaborations, based on data from Lloyds Marine Intelligence Unit

## 2. Current situation: where?

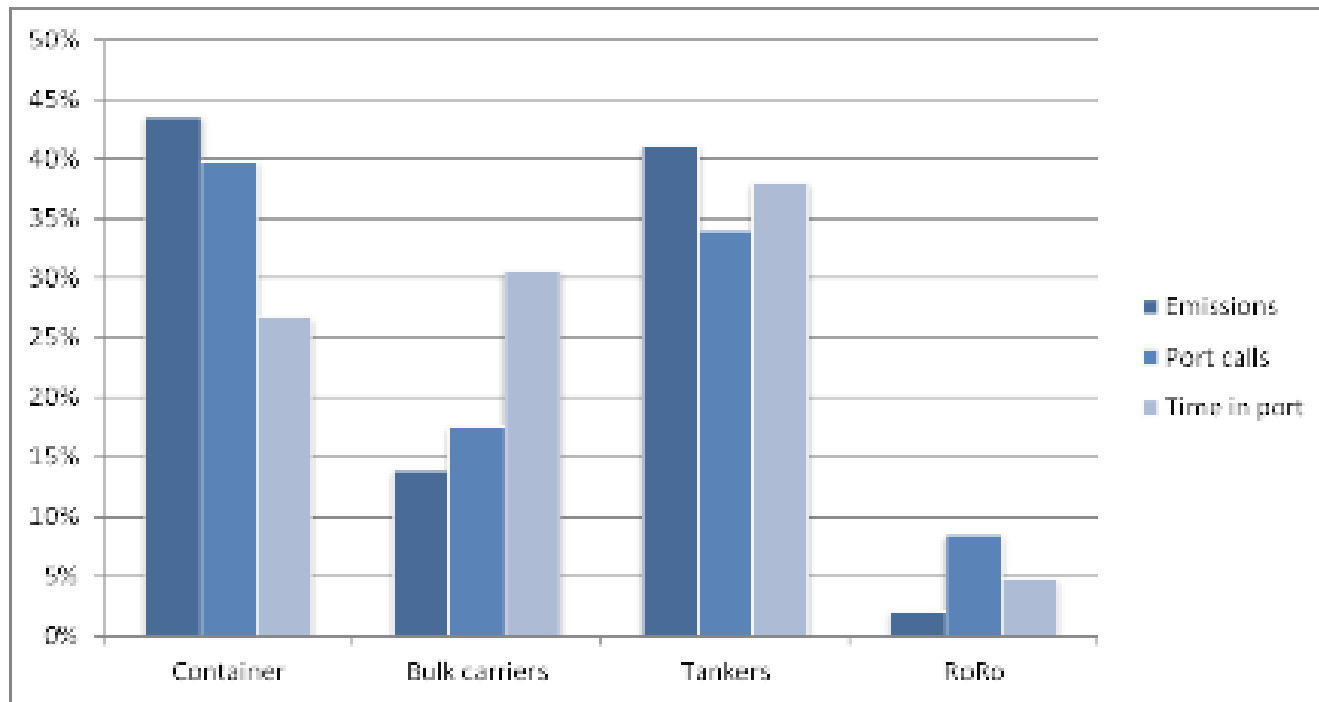
<b>Top 10 ports (CO<sub>2</sub> emissions)</b>	<b>Share of total</b>	<b>Top 10 ports (SO<sub>x</sub> emissions)</b>	<b>Share of total</b>
1. Singapore	5.9%	1. Singapore	6.5%
2. Hong Kong	2.2%	2. Hong Kong	2.3%
3. Rotterdam	2.0%	3. Port Klang	2.2%
4. Port Klang	1.9%	4. Tianjin	2.1%
5. Tianjin	1.8%	5. Shanghai	2.0%
6. Shanghai	1.7%	6. Fujairah	2.0%
7. Fujairah	1.7%	7. Busan	1.7%
8. Busan	1.4%	8. Kaohsiung	1.6%
9. Kaohsiung	1.4%	9. Ulsan	1.0%
10. Antwerp	1.2%	10. Beilun	0.9%
<b>Total Top 10</b>	<b>19.0%</b>	<b>Total Top 10</b>	<b>22.3%</b>

Source: Author's calculations and elaborations, based on data from Lloyds Marine Intelligence Unit



## 2. Current situation: which ships?

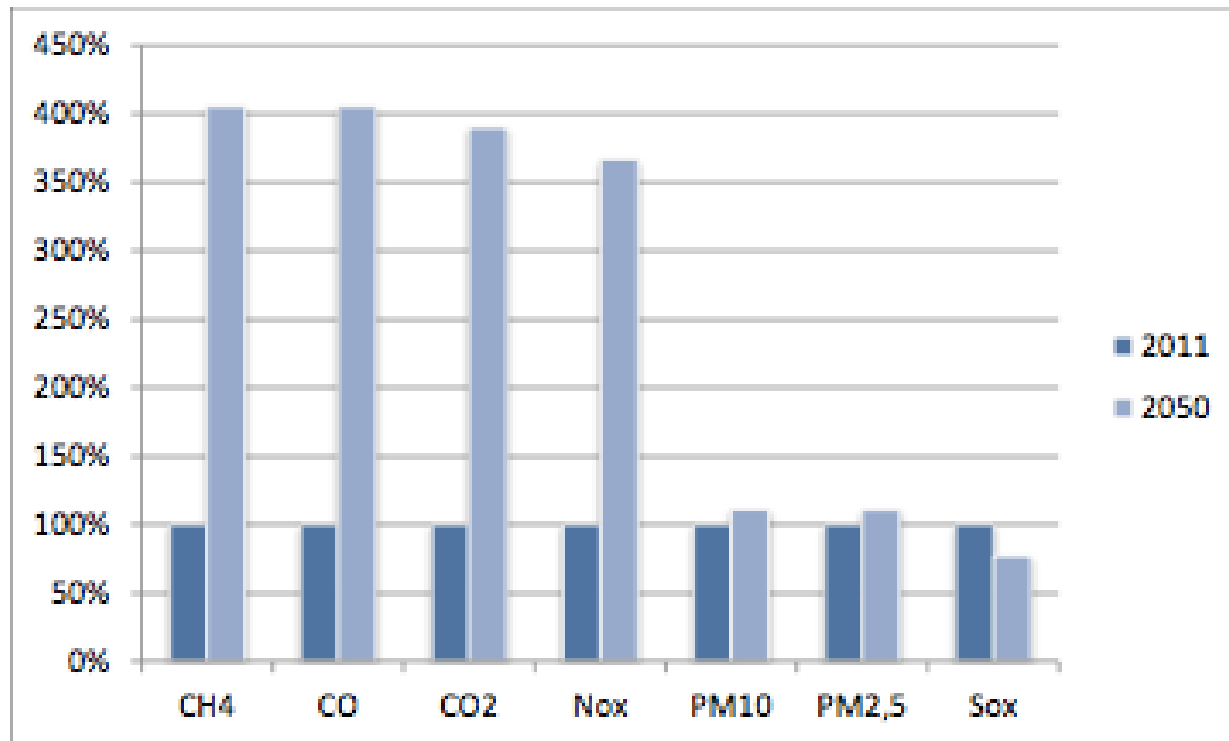
Figure 1. Ship types and their shares in emissions, port calls and port time (2011)



Source: Author's calculations and elaborations, based on data from Lloyds Marine Intelligence Unit



## 2. Current situation: heading where?



Source: Author's calculations and elaborations, based on data from Lloyds Marine Intelligence Unit



### 3. Instruments

How to mitigate emissions:

- Speed
  - Utilisation/size
  - Design
  - Energy (alternative fuels, renewable energy)
  - Related: filters, scrubbers
-

### 3. Instruments

	International regulation	Port instruments
Speed	-	Speed limit Port tariff discount
Utilisation	-	Tariffs
Design	EEDI	Green port tariffs
Energy	ECAs, global sulphur cap	Shore power Fuel switch LNG bunkering



### 3. Instruments of ports; examples

Table 6. Shore power facilities in ports in 2011

Port	Country	Ship type	Traffic share of terminal(s) with shore power	Frequency of use shore power facilities
Antwerp	Belgium	Containers	n.a.	0%
Prince Rupert	Canada	Containers	-	(25%)
Shanghai	China	Containers	-	(25%)
Shekou	China	Containers	-	(25%)
Long Beach	USA	Containers	100%	50%
Los Angeles	USA	Containers	-	(25%)
Oakland	USA	Containers	100%	38%
Zeebrugge	Belgium	RoRo	28%	45%
Luebeck	Germany	RoRo	n.a.	11%
Kemi	Finland	RoRo	100%	55%
Osaka	Japan	RoRo	-	(25%)
Gothenburg	Sweden	RoRo	100%	40%
Trelleborg	Sweden	RoRo	34%	0%
Tacoma	USA	RoRo	8%	100%
Long Beach	RoRo	Tankers	-	0%

Source: own data collection based on information provided by the port authorities

### 3. Instruments of ports; examples

**Table 9. Voluntary Fuel switch programmes in ports in 2011**

Port	Country	Programme	Max. sulphur level:	Coverage
Hong Kong	China	Fair Winds Charter	0.5%	19%
Seattle	US	ABC Fuels	0.5%	73% <sup>4</sup>
Vancouver	Canada	EcoAction Program	0.5%	18% <sup>5</sup>
Singapore	Singapore	Green Port Program	1%	0.4%
New York/New Jersey	US	OGV Low sulphur program	0.2%	(10%)
Houston	US	DERA Fuel Switch Program	0.2%	(10%)

Source: own data collection based on information provided by the port authorities. Numbers for Singapore cover 2012. The percentages between brackets are assumptions, as the ports in question never responded to our inquiry.

## 4. Governance challenges

- Port sensitiveness (local/national, corporatism)
- Interdependence of actors, chicken/egg
- Port competition, so need for regional cooperation
- Regulatory uncertainty and first mover disadvantages



# Thank you

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