Is slow steaming a sustainable mean for reducing liner shipping CO_2 emissions?

Pierre Cariou

Euromed Management, Marseilles

4th Euromed Management Forum 2010

Tuesday September 14, Marseilles

EUROMED MANAGEMENT

Background

Containerships: 4% of all vessels but 20% of emissions from international shipping.

10% reduction in speed would decrease CO_2 emissions by at least 10-15% (Buhaug et al., 2009, Psaraftis et al., 2009, Corbett et al., 2009, Eide et al., 2009, Longva et al., 2010).

EUROMED MANAGEMENT

Slow steaming has been implemented due to over-capacity (500 vessels idle in Jan. 2010) and a rise in fuel price ($700 IFO in July 2008).

But is it sustainable? Morten Engelstoft, Maersk Line chief operating officer: "Slow steaming is here to stay" (Lloyd's List, 7 July 2010).

EUROMED MANAGEMENT

This presentation attempts:

1. to measure the rate at which CO_2 emissions have already been reduced since 2008 via slow steaming, and for which container trades;

2. and to estimate, the bunker break-even price for which slow steaming is sustainable in the long run.

EUROMED MANAGEMENT

Methodology

1. Impact of slow steaming on CO_2 emissions

$$\Delta CO_{2,ds\rightarrow ss} = 3.17 x \sum_{k=1}^{n} \left(ME_{k,sea} xD_{k,sea} + ME_{k,port} xD_{k,port} \right) = 3.17 x \Delta FC_{ds\rightarrow ss}$$

$$ME_{k,sea} = SFOC_k xEL_k xkWh_k$$

2. Long-term sustainability of slow steaming

$$BP^* \geq \frac{OC_{\Delta n,ds\rightarrow ss} + \Delta Rot_{ds\rightarrow ss} xIC_{teu}}{\Delta FC_{ds\rightarrow ss}}$$

EUROMED MANAGEMENT

1. Impact of slow steaming on fuel consumption

Typical 4,000 teu containership

a. design speed 24 knots: SFOC=195 g/kWh & EL=90%
FC=43,000x0.9x195x24= 180 tons per day

b. -30% in speed or 17-18 kts : SFOC=205 g/kWh & EL=40%
FC=43,000x0.40x205x24= 85 tons per day or around 55%

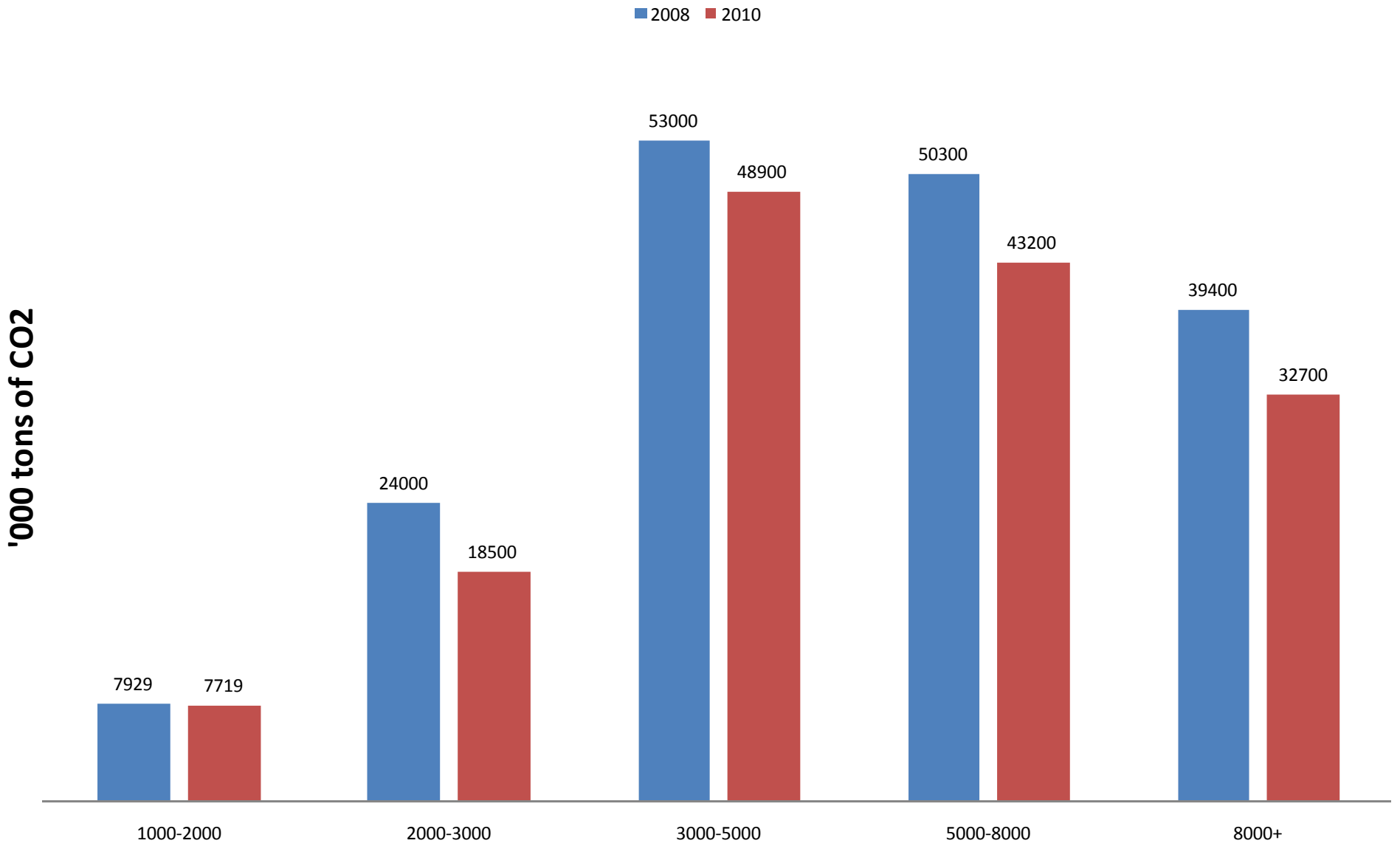
EUROMED MANAGEMENT

Information on 2,051 containerships over 1000 teu (Alphaliner, Jan. 2010)

Total	**Number of services**	**% slow steaming**	**Number of Vessels**	**% slow steaming**
Multi-trades	63	57.1	539	64.2
Europe / Far East	28	78.6	115	74.8
Asia / North America	52	42.3	323	47.1
North Atlantic	22	22.7	98	30.6
Australasia/Oceania related	17	23.5	96	27.1
Latin America/Carib. related	73	20.5	314	24.2
Mid-East/South Asia related	87	23.0	342	25.7
South /East Africa related	16	31.3	97	29.9
West Africa related	29	20.7	127	37.8
Total	387	35.4	2,051	42.9

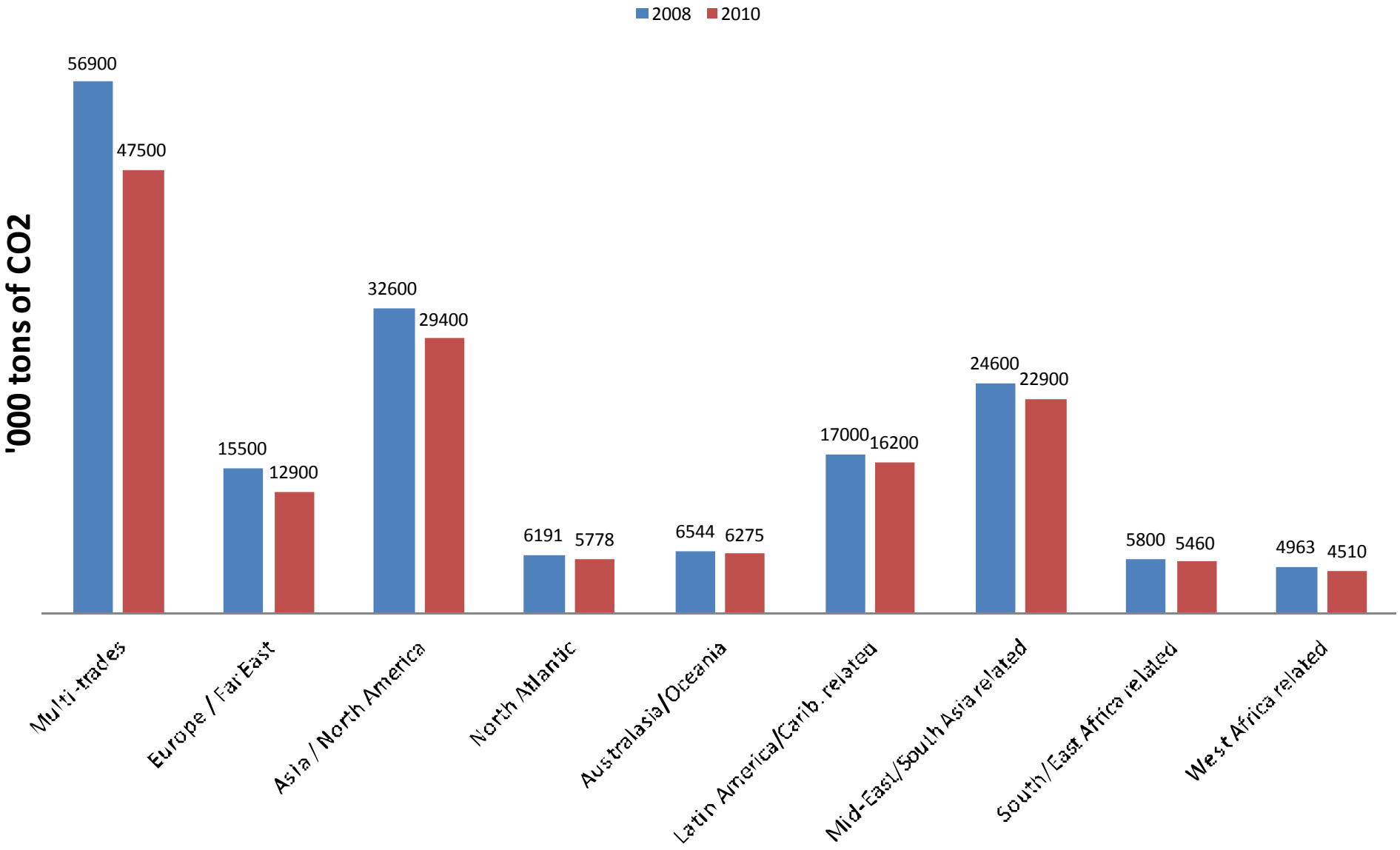
EUROMED MANAGEMENT

Impact of slow steaming on CO_2 emissions by vessel size (2008-2010)



EUROMED MANAGEMENT

Impact of slow steaming on CO_2 emissions by trades (2008-2010)



EUROMED MANAGEMENT

2. The sustainability of slow steaming

Former results need to factor in:

1. the cost of adding vessels to a service under slow steaming;

2. the increase in inventory costs for shippers.

EUROMED MANAGEMENT

1. Additional operating costs

The average daily operational costs (OC_k) was retrieved from HSH Nordbank et al. (2008) at $7,000 per day for 1000-2000 teu vessels, $8,000 per day for 2000-3000 teu vessels and $9,000 per day for more than 3000 teu vessels

EUROMED MANAGEMENT

2. the increase in inventory costs for shippers

We rely on estimates Eefsen and Cerup-Simonsen (2010) of an average value of $27,331 USD per TEU and a 35% interest rate pro anno.

EUROMED MANAGEMENT

For instance, 57.1% of the 63 multi-trades services are under slow steaming in January 2010.

57.1%x63= 36 vessels were added since 2008.

For vessels deployed on multi-trades services, the average daily operating cost is $8,833.

EUROMED MANAGEMENT

The break-even bunker price point (equation 3) is then a function of:

1) annual savings on consumption equal to (56,900-47,500)/(2x3.17) =$1,482 thousand tons of fuel;

2) additional operational costs equal to $(8,833x365) million a year per vessel or $116 million for the 36 vessels added;

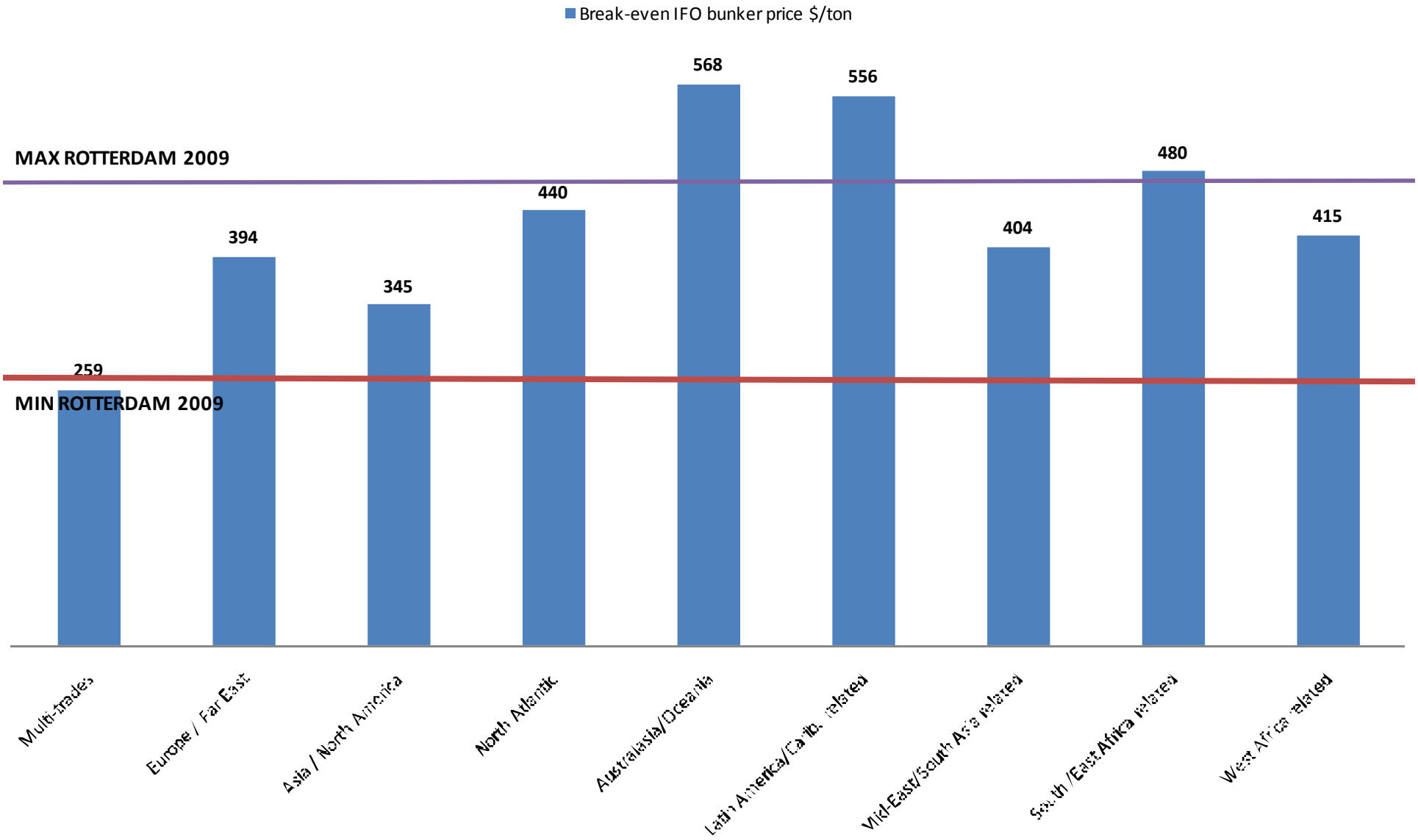
EUROMED MANAGEMENT

3) In-transit inventory costs that for the (64.2%x3.2 million) teu under slow steaming with around 70% being full container and spending one additional week at sea, are equal to $(7 days x 27,331 USD/teu x 35%/365)*(64.2% x 3.2 million x 70%)= $266 million.

The bunker break-even price for multi-trades services is $(116+266) million /(1,482,000 tons) or $259/ton.

EUROMED MANAGEMENT

Break-even IFO bunker price $/ton



EUROMED MANAGEMENT

Conclusions

Slow steaming is a cost-effective option to reduce CO_2 emissions in the short-term.

This article estimates that it has reduced emissions by around 11% during the last 2 years, close to the target of -15% for 2018 proposed in MEPC60/4/36, and without implementing any new technology.

EUROMED MANAGEMENT

Conclusions

These achievements remains fragile and highly dependant on the evolutions in bunker prices, freight rates and inventory costs.

As freights will sooner or later goes up, the only chance for slow steaming to be sustainable is:

EUROMED MANAGEMENT

Conclusions

1. for bunker prices to remain at high levels;

2. and/or for powerful market-based solutions (tax-levy or cap-and-trade system) to be implemented to keep bunker prices at these high levels.

EUROMED MANAGEMENT

Thank you for your attention