Oxford Institute for Energy Studies

Bunker Fuel Emissions and Adaptation Funding

Differentiated mitigation of bunker fuel emissions and innovative financing for adaptation

UNFCCC COP 13 Side Event, Bali

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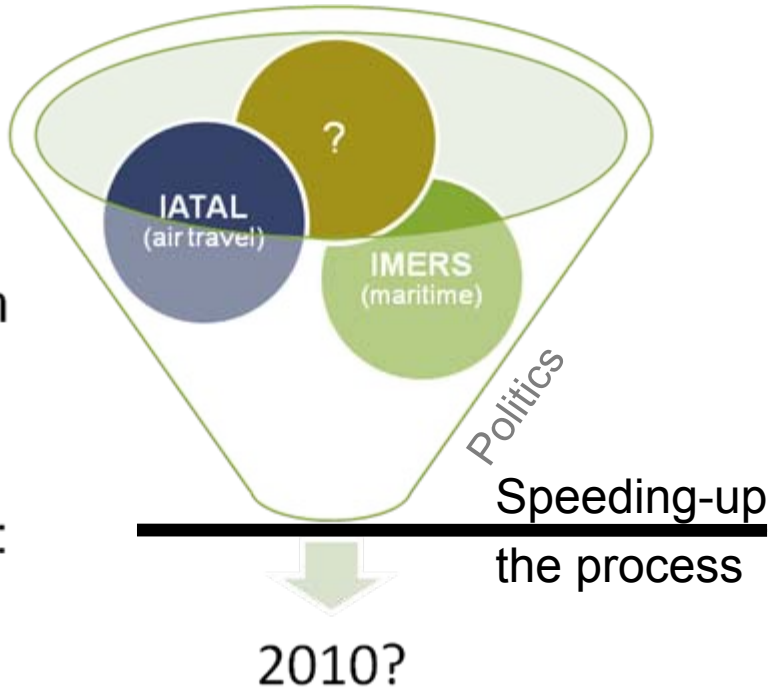
Agenda

- Outline of key proposals and issues:
  - IATAL, **Int**ernational Air Travel Adaptation Levy (**A**daptation)
  - IMERS, Int. Maritime Emission Reduction Scheme (**A** + **M**itigation*2)

- Status and support to keep momentum

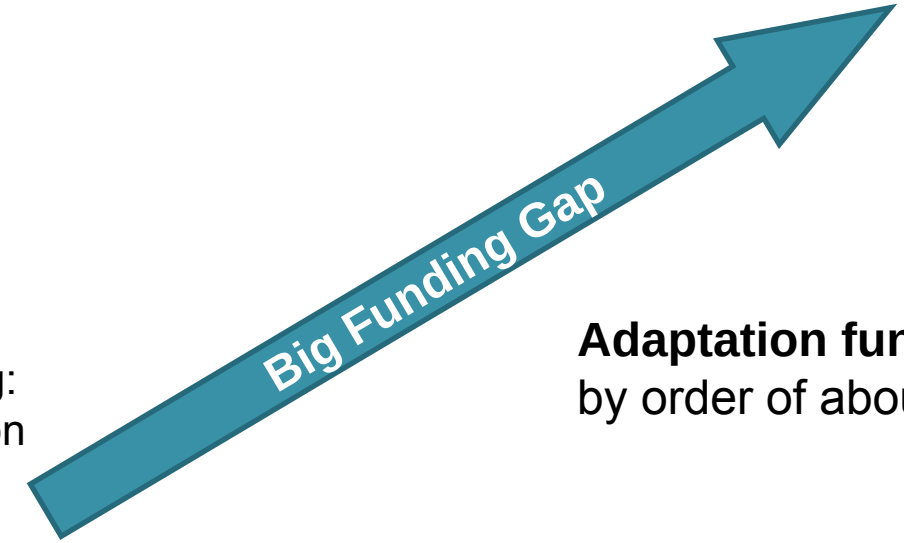
- Discussion on:



* Mitigation*2, means near- and long-term emission mitigation, including industry improvements.

Financing Background

- **Current financial mechanisms are inadequate** in both design and scale
  - **New innovative means are needed** to generate additional funding at scale
    - **A supra-national approach** would avoid competition with domestic budget priorities
  - Adaptation to climate change is crucial to developing countries
    - The poorest countries are most vulnerable and will be hit hardest by CC
  - Mitigation cannot be substitute for adaptation, and vice versa
  - For international transport longer-term mitigation is as important as reducing emissions today (mitigation*2 needed; rapid emissions growth, lack of substitutes)



Adaptation **needs**:
in order of **$10's bn pa**

Adaptation **funding**:
Total donors: ~0.2bn
CDM: $0.2 – $1bn
(till 2012; %2 levy)

Adaptation funding is inadequate
by order of about 50:1

IATAL — an outline proposal for an International Air Travel Adaptation Levy

Benito Müller and Cameron Hepburn

Oxford Institute for Energy Studies
EV 36
October 2006

International Air Travel Adaptation Levy

IATAL as Mitigation Instrument

IATAL (M) ≈ Responsibility ≈ per passenger flight emissions

preferred solution

IATAL as Solidarity Contribution

IATAL (S) ≈ Capability ≈ ticket price

✓

IATAL as both

IATAL (MS) ≈ Responsibility × Capability

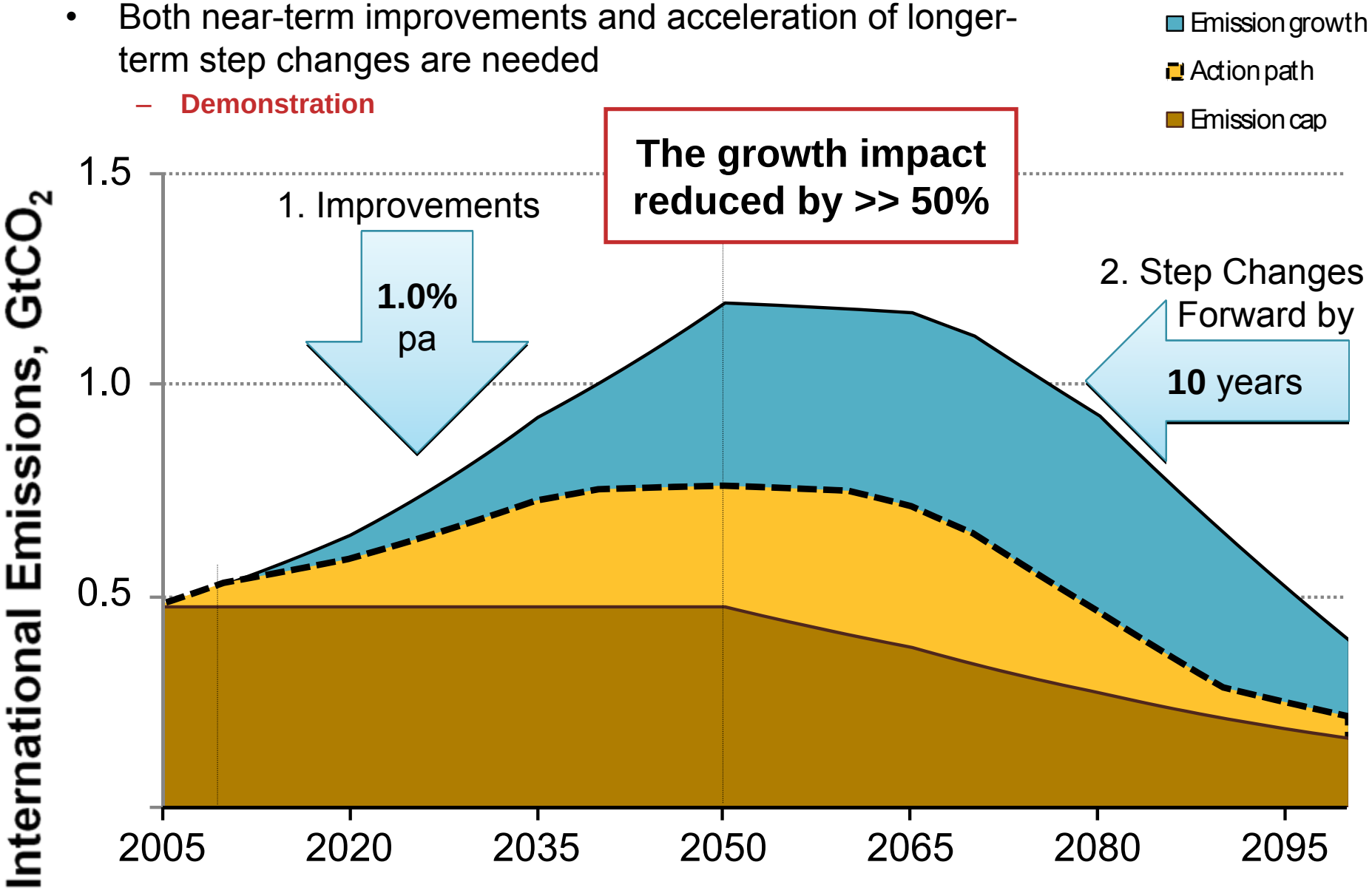
IATAL: Delivering Adaptation Funding

- Passenger numbers have increased by 45% over the last decade alone, and in 2004 airlines carried 1.9 billion scheduled passengers
- An average levy of €/$5 per ticket would generate around €/$10billion
- A 2 percent levy – assuming an average ticket price of €/$ 200/500 – would generate €/$ 7.6/19bn annually
- Disbursement possibly through Adaptation Fund under Kyoto Protocol

Importance of Long-term Mitigation – shipping example

Financing Innovation to Bring Forward Step Changes …

- Both near-term improvements and acceleration of longer-term step changes are needed
  - **Demonstration**



International Maritime Emission Reduction Scheme

New 2007 Initiative and Proposal on the IMO table (IMERS)

IMERS

Ambition and Goals:

- Address **differentiated** priorities in one cohesive supra-national scheme
  - **Halve** maritime GHG **emissions** (through near- **and** long-term mitigation)
  - **Reduce the gap** in financing for adaptation (in $bn annually)

Cost:

Adding $1 to price of **$1,000** of imported goods (=0.1%)

Key design details:

- **No allocation** of emissions to countries, **one aggregated emission cap**
- **A fund** established to invest in mitigation of shipping GHG emissions, and to provide contributory funding to climate change adaptation in developing countries
- **Double mitigation:** Reduction of GHG achieved by near-term technical and operational improvements and accelerating long-term breakthroughs
  - Mitigation outside the sector to optimize cost efficiency added
- **A hybrid economic instrument** based on harmonized charges & a quantity target
  - A charge-and-cap approach (see supporting slide # 18)

Complying with Calls from China, Saudi Arabia & Others
How?

1. Mitigation
   → Halving int. maritime emissions which are #9 WW (when compared with countries)

2. Adaptation
   → Reducing financing gap by $2bn annually, operational BEFORE 2012

3. Technology Transfer & Innovation
   → Breakthroughs Technology Fund, Infrastructure Improvements

4. Adequate & predictable funds
   → Funds from emission charge, set 1 year in advance by a formula; +$4bn/pa

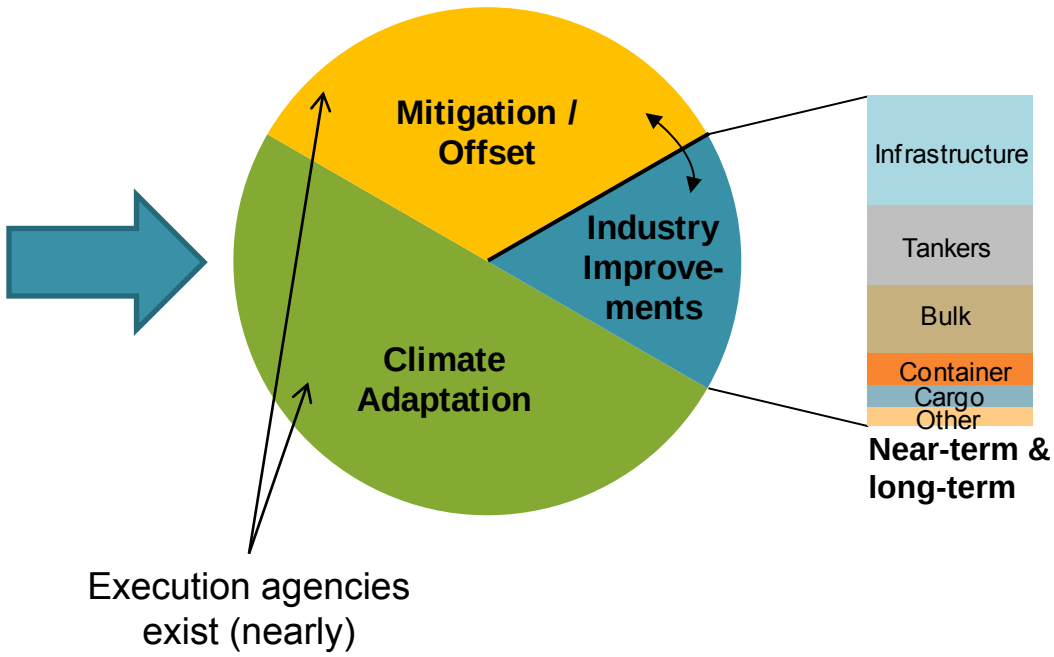
5. Not curtailing growth of developing countries
   → Minute impact on end prices of 0.1%, mostly in developed countries (70%)

→ **Differentiated approach** at the point of distribution rather than collection

Governance, Collections and Investments
Sample details

International Governance (UN / IMO)
Portfolio split; Annual level of charges

Data and Charges Collection
1. Fuel data
2. Charge = Emissions x Unit charge
   Example: Unit charge in 2010 = \$10/tCO_2
   International emissions covered ~ 0.4 $GtCO_2$
→ Significant global funds raised



Adding \$1 to price of \$1,000 of imported goods shipped by sea
→ **End customer impact on prices: <u>0.1% only</u>** (transport charges +3%).

Unit charge depends on emissions growth above the cap/goal and the forward market price for CO_2 (assumed as \$25/tCO_2). Unit maritime emissions charge for 2010 is estimated at \$10/tCO2. Recovered through increased transport charges. Total funds raised will exceed \$4bn per annum.

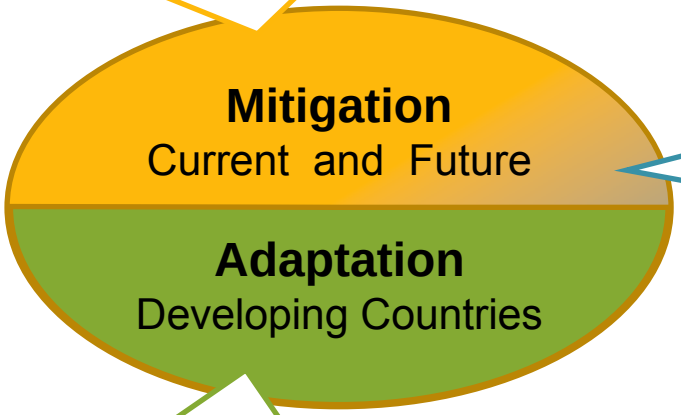
Benefits to Developing Countries

Common but differentiated responsibility principle → delivered in a new way

2. Significantly increased demand for CDM & JI projects

- The oversupply of CDM/JI drives the prices down
- The additional global demand estimated at 40 MtCO2 in 2010 (valued at $1bn)

Differentiated at the point of distribution→

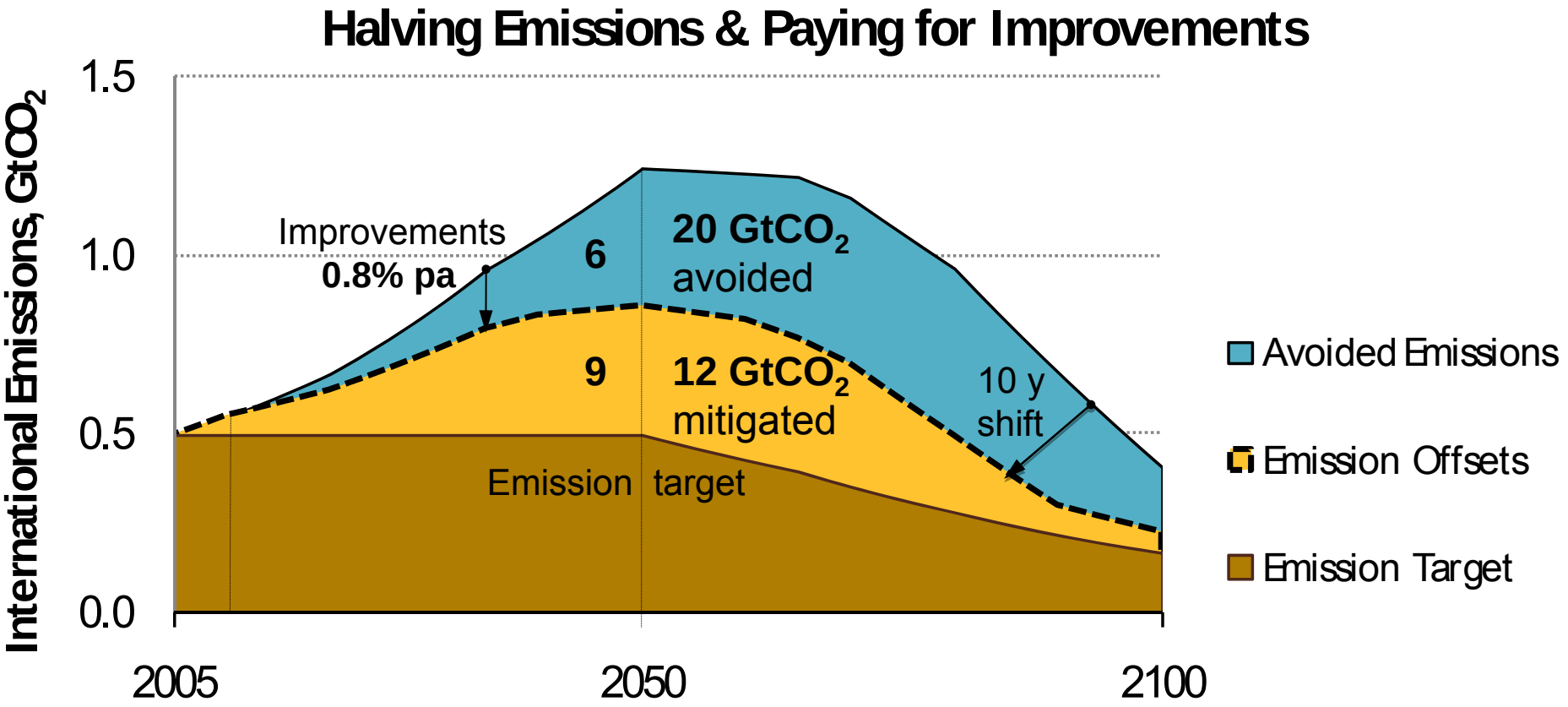


3. Infrastructure improvements, transfer of technologies, and stimulation of innovation

1. Major funding for adaptation to climate change

- Estimated at **$2bn per annum** (assuming equal split of funds & carbon market price of $25/$tCO_2$)
  - Thus far the international community has promised $200m for adaptation measures, but the required funds are estimated at tens of $billions (circa 50:1 gap ratio)

Environmental Benefits



- Achieving 0.8% annual industry improvements and bringing forward the step changes by 10 years will more than halve the total shipping emissions above the emission target
  - Results by 2050*: avoided emission: 6$GtCO_2$, mitigated (offset): 9$GtCO_2$, total: **15 $GtCO_2$**
- **Cost of 3y delay: 0.7$GtCO_2$ = $17bn** by 2050 alone
  - Equivalent nearly to 1.5 years of emissions; see for details slide # 18.

*Note: there is no trade-off with SO_2 emissions; they will also be reduced through the increased fuel efficiency.

Low Requirements → High Practicability

Longstanding data **challenges eliminated; ATTRACTIVENESS → slide 19**

SCHEME DESIGN	
1. **Emission allocation**:	-- (**None**; SBSTA option 1 – no allocation)
2. **Allowances distribution**:	-- (**None needed**)
3. Participating entities:	Fuel payers; ship managers and/or suppliers for reporting
4. Reporting, Verification and Compliance:	Direct electronic; compliance enforced in selected ports, both for the provision of data and payment of charges
IMPLEMENTATION FEASIBILITY	
1. Accurate data & availability:	Emission growth: available
2. **Minimum operational data**:	**Fuel data**, used or delivered: **available**
3. Reuse of existing work, and procedures:	Voyage data for validation; CO_2 index from real data once the scheme operates, used as a performance measure for ships, routes etc.
4. Authorities and their roles:	IMO for governance; World Bank, or similar, to manage adaptation funding
SCHEME PARAMETERS	
1. Emission target:	Yes; calculations done for a target at 2005 level, constant till 2050
2. Emission baseline and/or emission growth:	**Baseline not needed** (currently commercially inadequate) **Emission growth only needed** (average 2.1% pa used till 2035)
3. Grouping for equity:	**Bubbles** for containers, bulk, tankers, etc., could further **improve** the scheme **equity and speed up implementation**

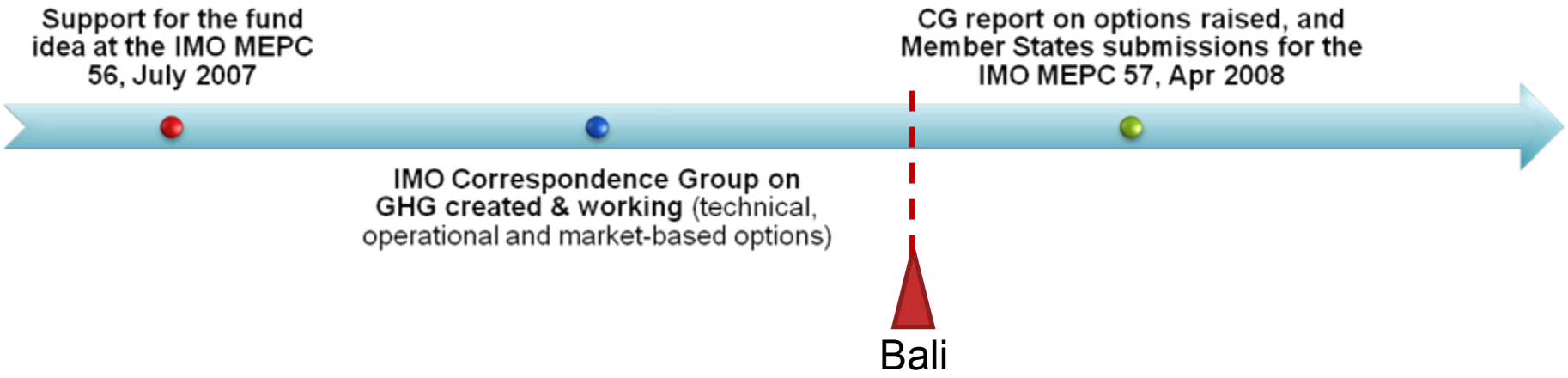
Discussed at the **Workshop** on emissions from aviation and maritime transport (**Norway**, Oslo, 4-5 Oct 2007)
Report at: http://www.iisd.ca/YMB/sdosl/ Materials: http://www.eionet.europa.eu/training/bunkerfuelemissions/

Workshop follow-up: come to room **Tidal, GH, Monday, 10 Dec, 18:00 – 19:30h**

MOST IMPORTANT: Multilateral Status

Very good progress so far → more pull for adaptation is needed!

- **IMO multilateral process is in progress**
  - Concept submission to the IMO MEPC 56 by Norway *(a high level submission)*
  - Significant support for the idea at MEPC, limited reservations *(hard work behind)*
    - » MEPC, the influential Marine Environment Protection Committee



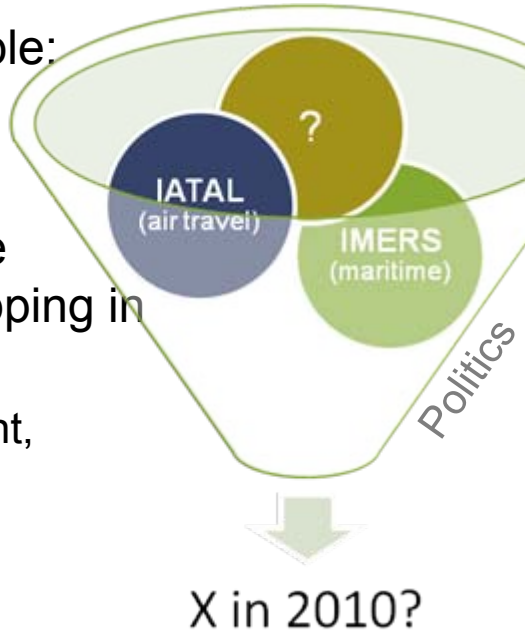
- **To keep momentum**
  - More leadership, coordination and "can do" attitude within countries is needed
    - Especially pull for adaptation from developing countries
    - Policy coordination within developed countries (maritime, climate change, etc.)
  - A dedicated project to build trust and shape the solution?
    - Never time for quality discussions

Wrap-up & Discussion

- Adaptation funding can be addressed at scale with innovative instruments
- Combining mitigation with adaptation through a charge-and-cap delivers:
  - Maximum efficiency with minimum rate
  - Near-term emission reductions, AND stimulation of longer term technology innovation & transfer
  - **AND reduces the adaptation financing gap by $2bn/pa WITHOUT constraining economic growth!**

IMERS

- The challenge and opportunity for the proposal on the IMO table:
  - **Speed-up through quality discussions / consultations:**
    - Perhaps through a project approach?
  - **If a global approach is not found**, complex and expensive solutions are likely to emerge (such as trying to include shipping in a regional trading scheme)
    - Local funds likely to go to priorities different than development, climate change and even shipping improvements



- Discussion
  - Shouldn't this idea be an "agent for change" and be implemented in 2010?

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Additional Materials

Backup slides and further information

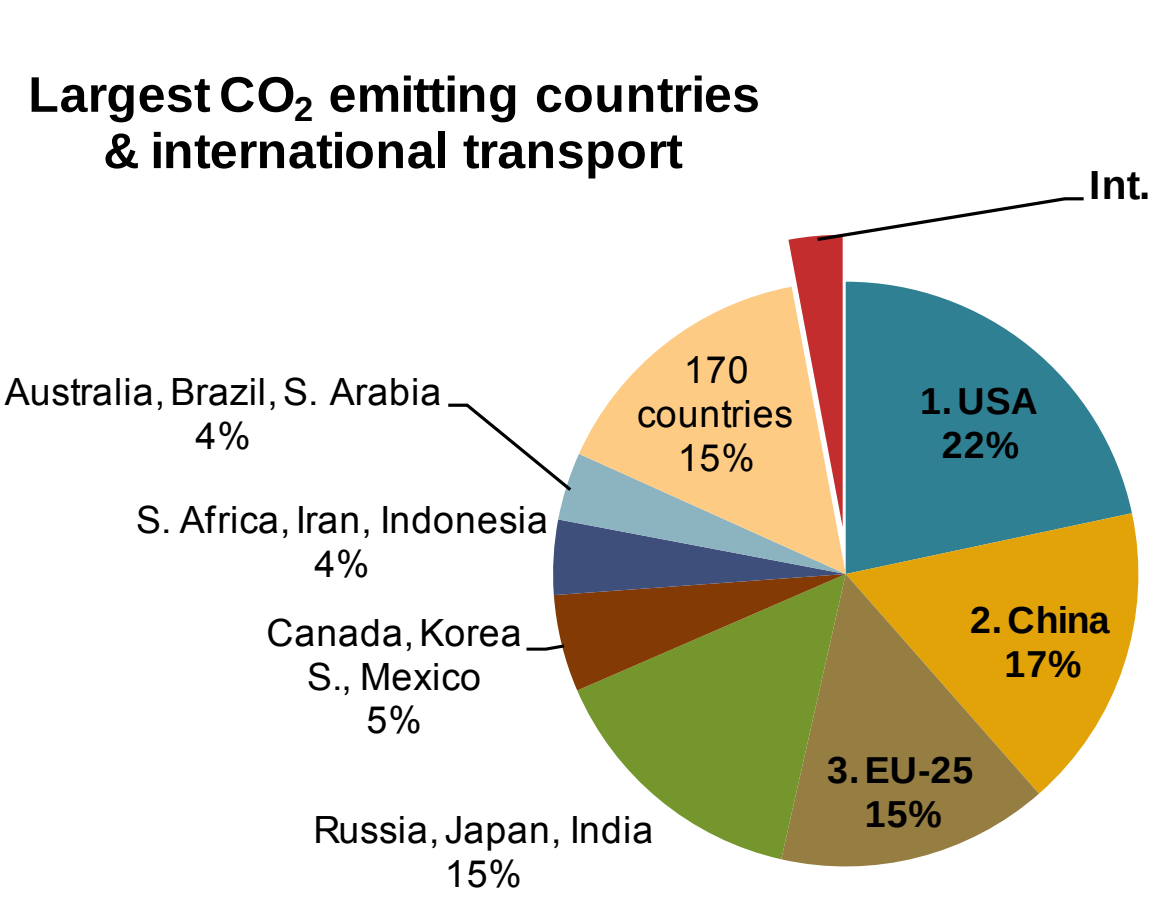
More details: www.IMERS.org/bali

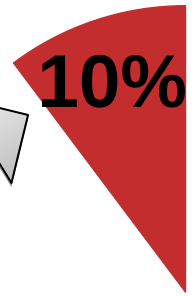
Contact at COP 13: 0817 083 1178 (mobile)

Tackling International Transport CO_2 Emissions ...

Emissions are Far from Small*, and Grow Rapidly

Largest CO_2 emitting countries & international transport





in 2050, if nothing is done

* International maritime CO_2 emission accounts "only" for ~1.8% of total emissions from fossil fuels. However, it is **#9 if compared with the largest emitting nations and its share can triple by 2050**. International aviation emission at 1.2% is #16, and its share can increase 5 times by 2050. Exempt from taxes, and unaffected by the Kyoto Protocol.

Source data: wri.org + bunker estimates for 2003

" Charge-and-cap" is a name I gave to:

A novel hybrid economic instrument based on a harmonized charge:

- **Using a carbon price established** by the large emitting industries
- **Delivering quantity target** through a "clearing house" for a sector or its part (bubble[1])

GHG Policy Options

Highest

Lowest
Cost-effectiveness[2]

1. **Hybrid price-quantity**
2. Tax or charge
3. Hybrid cap-and-trade scheme
4. Cap-and-trade with banking, borrowing, and allocation auctioning
5. Traditional cap-and-trade scheme
6. Non-market regulations and standards

[1] Bubble – a regulatory concept whereby several emitters are treated as if they were a single emission source.
[2] Benefits of a GHG tax could be 1/3 higher than those of cap-and-trade, on national level. Source: US CBO, 2007.

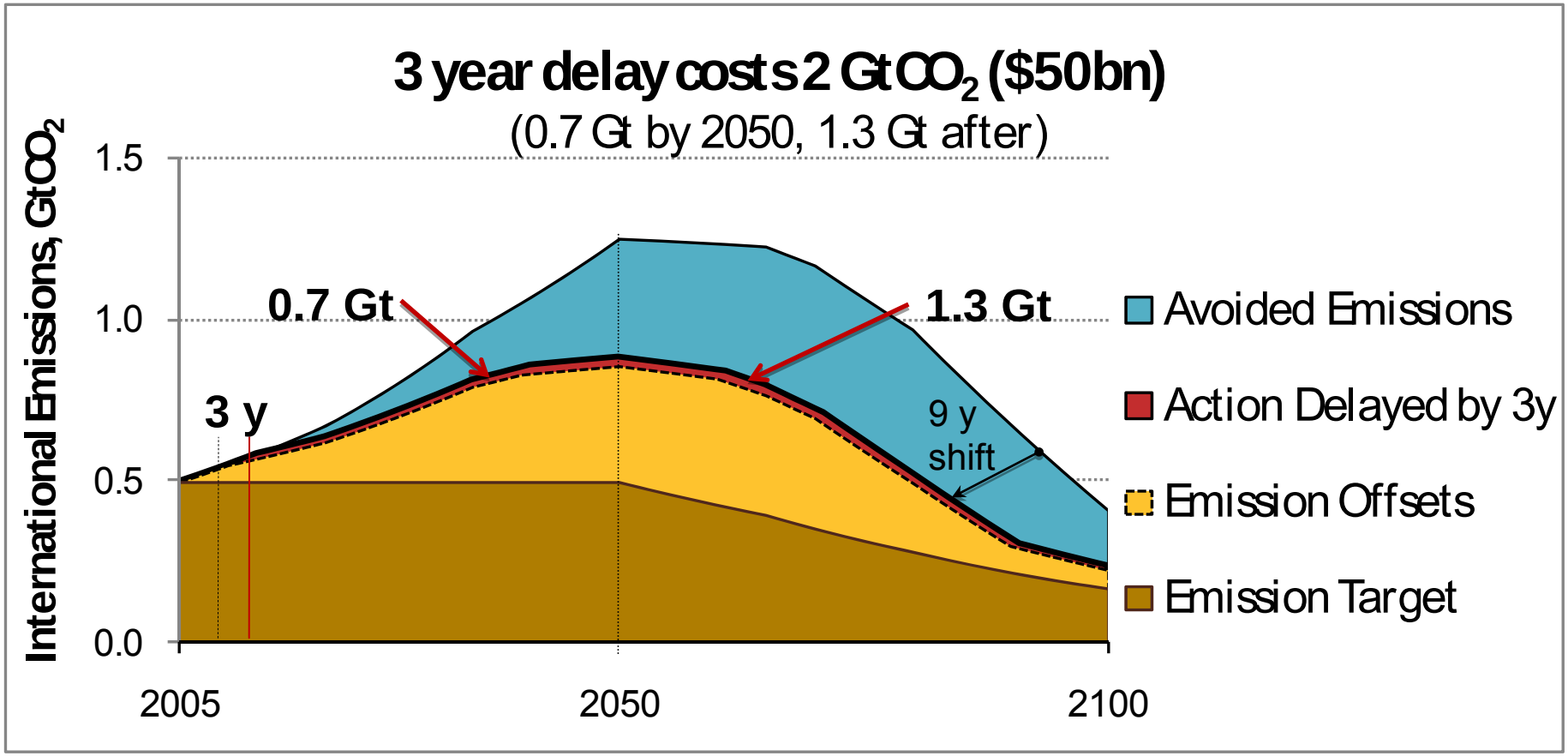
High Attractiveness
Summary

IMERS

SCOPE AND GOALS		
• Geography:	Worldwide	
• Participants:	**All vessels > 400 GT**	
• Emission target:	Global, or per vessel bubbles (containers, bulk, tankers, …)	
• **Additional goal**:	**Adaptation** to climate change in developing countries	
• Emissions:	International, CO_2 only at the beginning	
POLITICAL APPEAL		
• **Common but differentiated responsibility:**	**Through financing policy** for adaptation; differentiation at point of distribution rather than collection	
• **Impact on competitiveness**:	**None** in sector; negligible outside shipping	
• **Benefits to participants**:	A hassle-free long-term solution, increased cash flow, compliance easily verifiable, long term investment clarity, better image of shipping	
• **Legal basis & precedents**:	Could be under MARPOL; IOPCF - a precedent for a direct fund	
COSTS		(for 2010, key assumed prices: fuel $300/tHFO, carbon $25/tCO2)
• **Price impact:**	**Low: 0.1%**, equivalent to **adding $1 to price of $1,000** of imported goods	
• **Participant costs**:	**Negligible**	(20 minutes reporting time for ship managers per month)
• Unit emission charge:	$10/tCO2	(linked to emissions and carbon price)
• Operational costs:	Under 5%	(a centralized solution)
EFFECTIVENESS		(assuming 500 $MtCO_2$ baseline in 2005; for 1$GtCO_2$ – multiply results by 2)
• **Emission mitigation**:	Mitigation of **15 $GtCO_2$ by 2050**	(50% of it is emission avoidance)
• **Improvements**:	**0.8% - 1% annually**, and a technology **breakthroughs fund**	
• **Adaptation**:	**$2bn/pa, for developing countries** (e.g. contribution to the Adaptation Fund)	
• Market linkages:	**Cost-effective** through usage of carbon markets, and a dedicated maritime emission registry	
FLEXIBILITY		
• **Mechanisms used**:	**CDM, CERs** without limits; also **programmatic CDM** for increased quality	
• **New and existing ships; and new entrants**:	Applies to both existing and new ships; **no problems** with including new entrants as scheme is based solely on charges, rather than allowances	
• **Adjusting to new realities**:	Charge **annually**; funding **policy** reviewed and adjusted **periodically by IMO**	
• **Starting small, and learning by doing**:	Can be limited to ship type or size threshold; **easy scaling up** thanks to the harmonized charge that does not vary with the number of participants	

Cost of 3 years delay = 4 annual emissions = $50bn (by 2100)
Action can halve the impact and pay for improvements!

- Let's assume emission reduction potential of 0.8% pa, delayed by 3 years:
  - Improvements start 3 years later
  - Bringing forward step changes is reduced by 1 year (from 10 to 9)
    - The impact and cost of delay is shown below

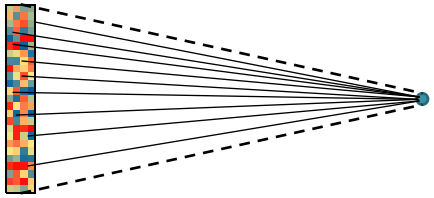


Fuel reporting options & implementation costs

→ Reduce reporting complexity and costs to participants

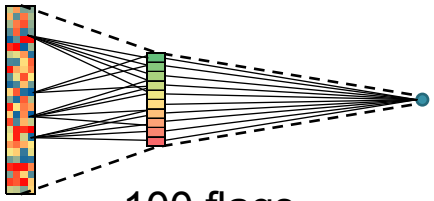
A. Ship Managers Direct

1,000 ship managers/ companies



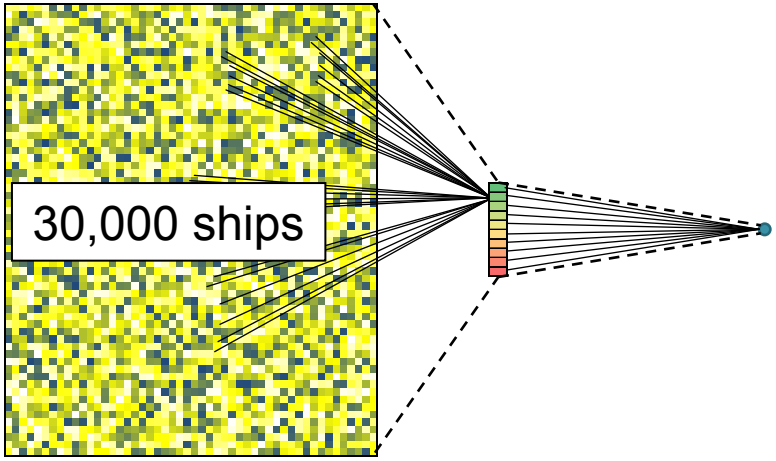
1 database
(fuel used ➔ CO_2 emissions calculated)

B. Ship Managers via Flag States



100 flags

C. Ships via Flag States



Scale: 1:10 (1 square = 10 ships, etc.)

	Time to Results	Reporting Effort	Project Risk	**COST Relative**
A	4 months	1	5%	**1**
B	24 months	5	20%	**100**
C	36 months	20	30%	**1,000**

Say: $1mln, $100mln and $1bn
Confidentiality and security are best for the simplest option.

Up-stream options, through suppliers

- less flexible – not shown

Reporting alternatives; Verification and Enforcement

→ Reuse available data and services

- Up-stream approach
  - Data and charges collected through fuel suppliers
  - In theory simpler but in practice probably not, also less flexible:
    - Very similar to tax on fuel, with its negative perception
    - More difficult to implement a supra-national approach, politically and operationally
    - Difficult to implement performance-based charges or incentives
- Secondary data
  - Data from fuel suppliers can be used for validation and proving the overall scheme consistency
  - Voyage data could be used for error validation (AIS, and similar)
- Verification and Enforcement
  - At selected ports
    - For submission of correct reports (versus bunker delivery notes, for instance)
    - For payment of charges
    - Raised through software tracking; spot checks

Reporting foundation

→ 1. Use real data, and learn; 2. Reduce risk of fraudulent behavior

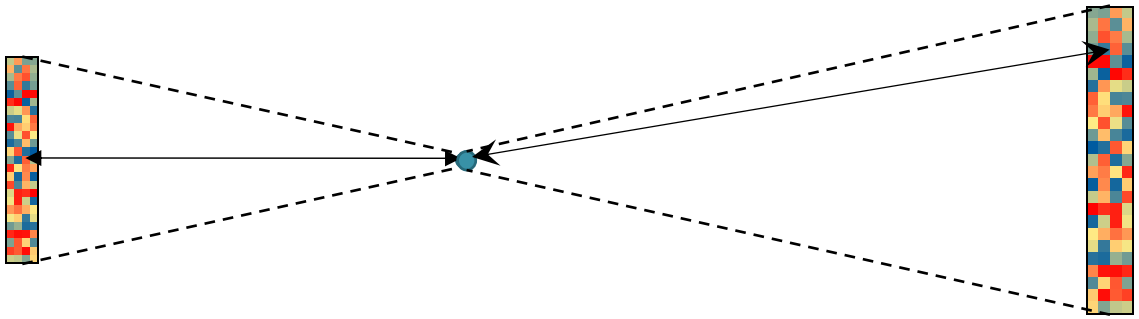
1. **Foundation -** Reporting of fuel per voyages completed in a given period (month)
   - **Compulsory** data (total fuel)

IMO #	Voyage	End Date	HFO	DO/GO
1234567	15	25 Jun 07	4,876	64

   - Optional entries: Call sign, Location, Distance (nm), Cargo (tons), Cargo (alt unit)
     - If collected the IMO CO_2 index could be calculated and used

2. If and when a market-based scheme is agreed, the "fuel payer" details are added (to reflect the various business models)

Fuel Payer ID
…



Ship Managers

"Fuel Payers" (charterers etc.; approx. 2,000)

Fuel Reporting & Validation (incl. FP ID) ● **Consolidation, billing & collection of charges**

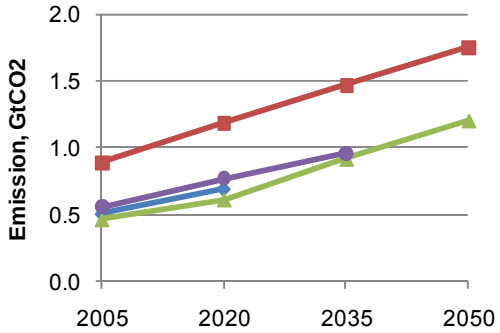
(separate flows reduces risk of fraud)

Relative scheme parameters might be best

→ Use reliable data

- A scheme that relies on relative parameters, such as emission growth, has many advantages
  - Issues of an unreliable emission baseline are avoided
  - Starting small and including new participants are easy
- Example for the shipping CO_2 forecasts

Absolute forecasts differ



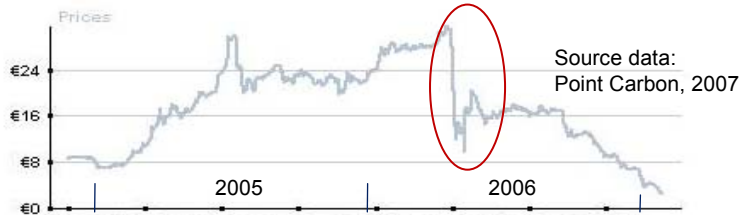
Normalized forecasts are very similar:

(after excluding military vessels, not present in all)

Source for multiple	2005	2020	2035	2050
IMO, 2000	1	1.36	-	-
Eyring, 2005	1	1.35	1.88	2.42
den Elzen, 2006	1	1.32	1.97	2.58
Eyring, 2007	1	1.39	1.92	-
IMERS average	**1**	**1.35**	**1.93**	**2.50**

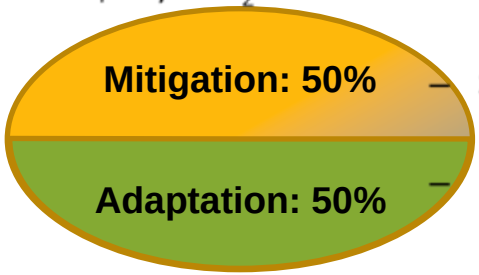
Differences **within 3%**

- *Efficiency depends on reliable data; a lesson from the EU ETS:*



Estimated Costs

- **Minimizing costs, maximizing benefits** (example)
  - International transport is crucial for trade and sustainable development
  - **Impact on end user prices:**
    - **$1 for $1,000** of imported goods**, i.e. 0.1%** (shipping costs of goods +3% only)
  - Split of charges at the initial years (potential):
    - $\$10/tCO_2$ would suffice (= 40% of carbon price of $\$25/tCO_2$)



- $\$3/tCO_2$ for offset, $1 for near term improvements, $1 for Technology Breakthroughs Fund
- Each $\$5/tCO_2$ goes for developing countries
  - To be managed by World Bank, go to the UN Adaptation Fund, or similar

Complexity and Scale
Potential Number of Ships within the Entire Scheme

- Sample coverage for ships > 500 GT (recommended option >400 GT, as per MARPOL)
  - 75% by number of ships (32 thousands of ships)
  - 99% by tonnage of ships (570 millions GT); around 95% by emissions
    - Relevant statistics for ship number and tonnage are aggregated below (for cargo carrying ships)
  - Around 1,000 ship managers

Distribution of fleet in 2005 by type and size

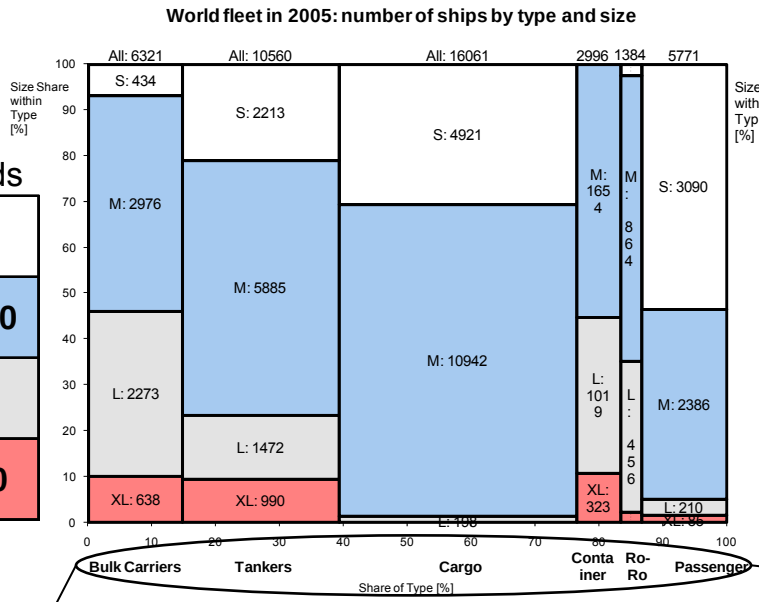
1. NUMBER of ships (Total ships = 43,093)

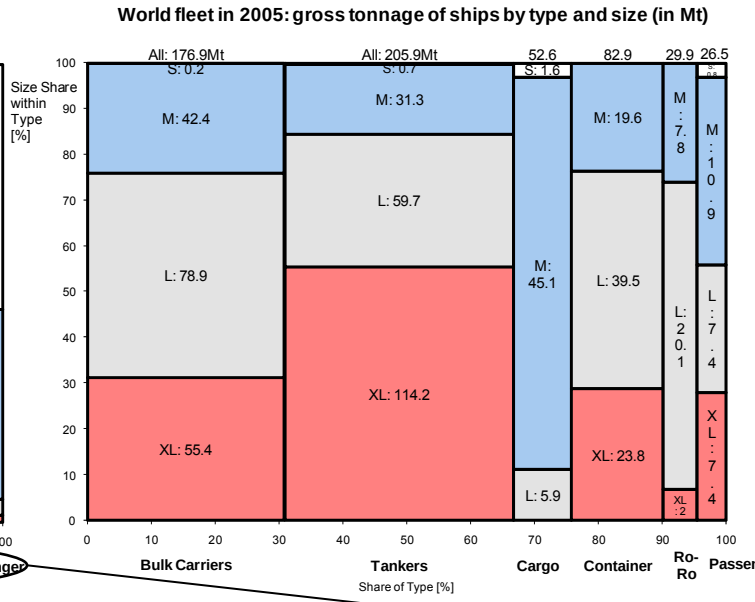
2. TONNAGE of ships (Total tonnage= 574.7 Mt)

Ship sizes & GT thresholds

S (small):	**GT< 500**
M (medium):	**500 - 25,000**
L (large):	**25,000 - 60,000**
XL (very large	**GT>60,000**

Based on source data from: Equasis, 2007



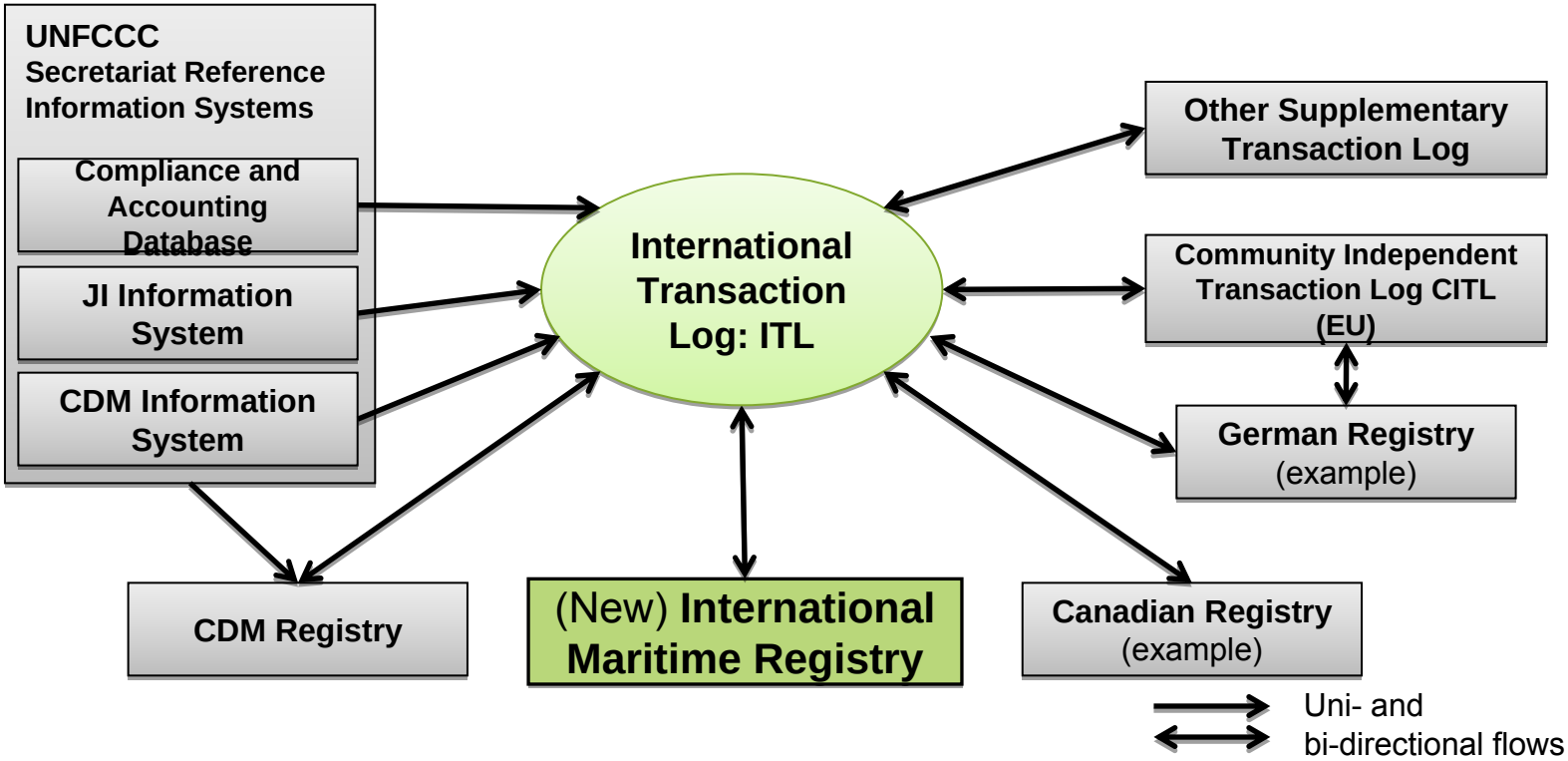


Ship Types: Bulk Carriers | Tankers | Cargo | Container | Ro-Ro | Passenger

International reporting and mitigation compliance

→ Integrate in a flexible manner

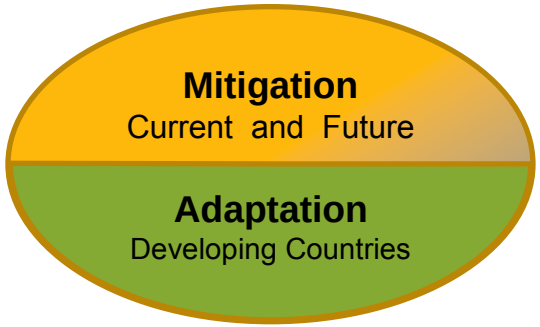
- Addition of a single maritime registry to the networks of linked registries will guarantee compliance with the current and any future GHG regime



- International and domestic reporting
  - GHG emissions from the domestic sectors of sea-going ships could be provided/aggregated by the scheme for the parties and/or UNFCCC *(assuming no change in the IPCC rules)*

Data conclusions

- GHG data issues can be addressed with a charge-and-cap instrument
  - Emission allocation and allowances distribution → eliminated
  - Absolute emission baseline → not needed; emission growth used instead
  - Reporting → simplified; effort for participants → reduced
  - Resulting lower costs and simplicity translate to → better compliance



- Data and policies must work cost-effectively together, and soon
  - Devil is in details - the sooner some policies are reviewed from the implementation and cost perspectives the better
  - IMERS delivers maximum efficiency at the lowest cost to industry, and practically no impact on the competitiveness

Benefits to Ship Owners & Charterers

- Hassle free solution for CO2 emissions with minimal administration costs
  - No allowances to manage, no individual cap to comply with, services provided, no set-up costs
- No impact on international competitiveness
  - Level playing due to global implementation
- Increased cash flow (EBIDTA) as a result of improved operations and reduced fuel
- Reduced risk of fuel disputes
- Compliance easily verifiable
  - Via fuel and voyage data, and analytical tools
- Reduced risk of multiple regulations
- Benefits of better image (clean transport, social responsibility)

Climate change action makes good business sense