



## The integrated European Satellite-Based and Aerial Oil Spill Surveillance and Vessel Detection Services

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–Satellite Based Monitoring Services

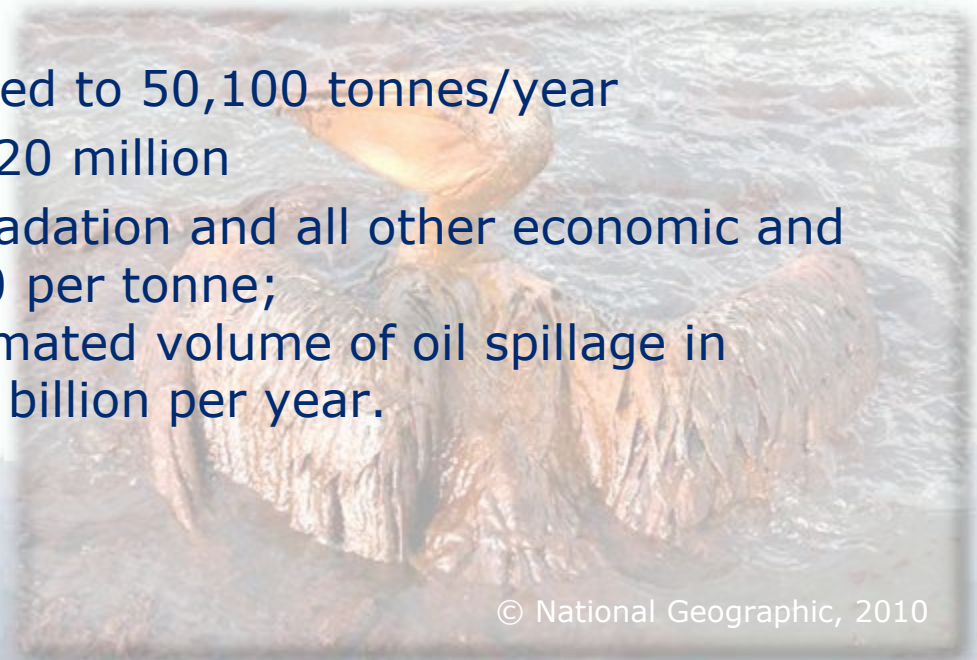
Dirk Reichenbach,  
Central Command for Maritime  
Emergencies, Germany

Interpill 2012



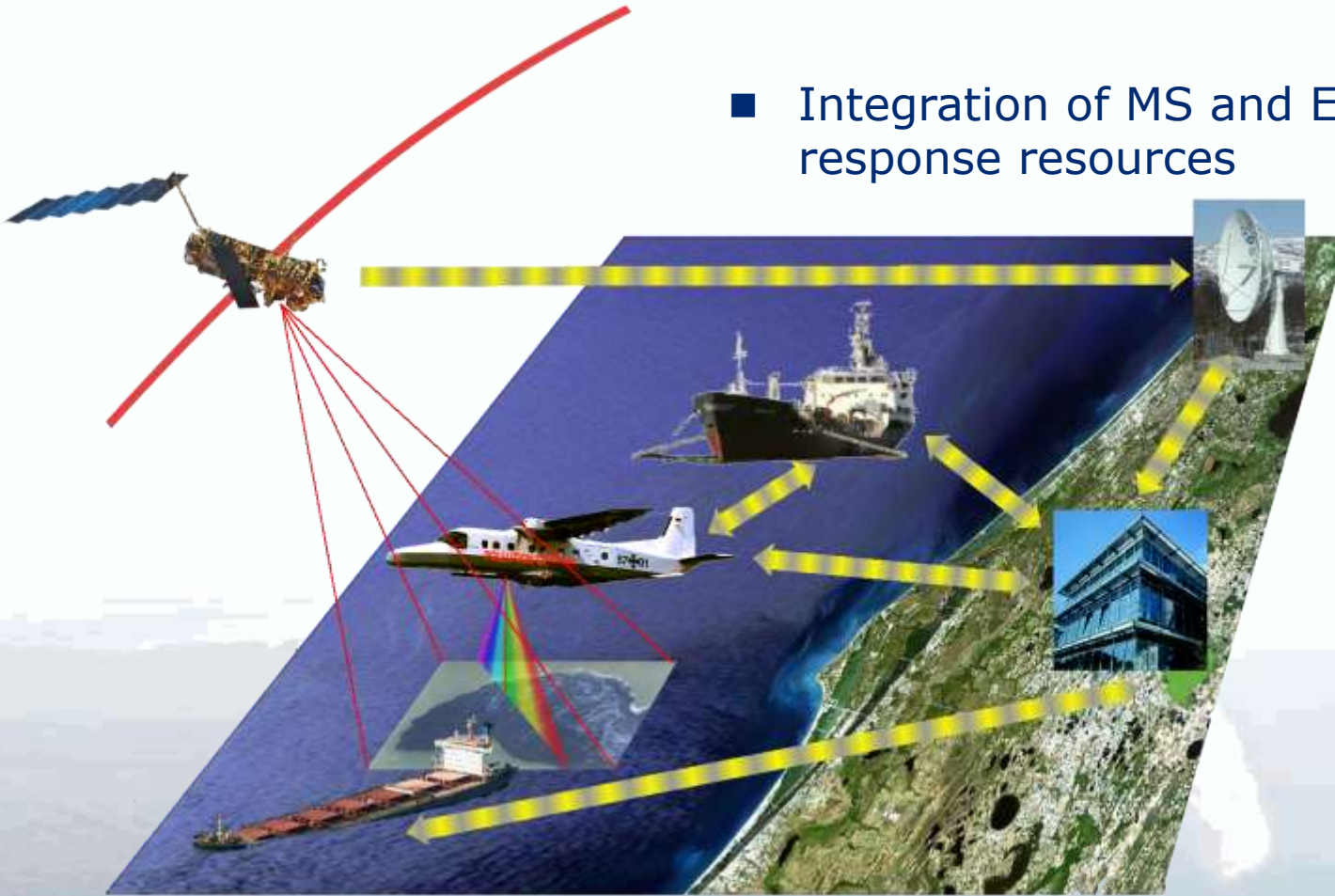
## The oil pollution issue

- About 457,000 tonnes of oil are released into the ocean every year (GESAMP 2007):
- PriceWaterhouseCooper has calculated the annual costs (2005 prices):
  - European spills estimated to 50,100 tonnes/year
  - for clean-up around €120 million
  - for environmental degradation and all other economic and societal costs €149,600 per tonne;  
Multiplied with the estimated volume of oil spillage in European waters: €7.5 billion per year.



# Integrated Surveillance System

- Surveillance of accidental spills
- Detecting illicit discharges
- Support in emergency situations
- Integration of MS and European response resources



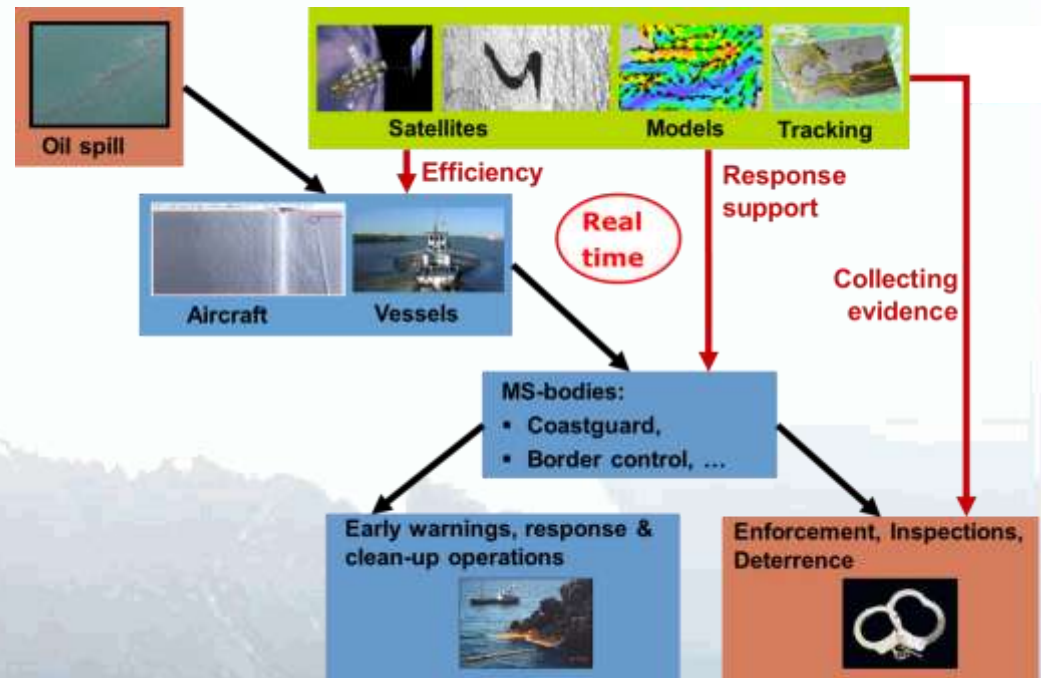
## What are the objectives of CleanSeaNet?

Art. 10 of Directive 2005/35/EC (as amended by 2009/123/EC) on "Ship-source pollution and on the introduction of penalties for infringements" :

"... EMSA shall:

a) work with the Member States in developing technical solutions and providing technical assistance in relation to the implementation of this Directive, in actions such as tracing discharges by satellite monitoring and surveillance;"

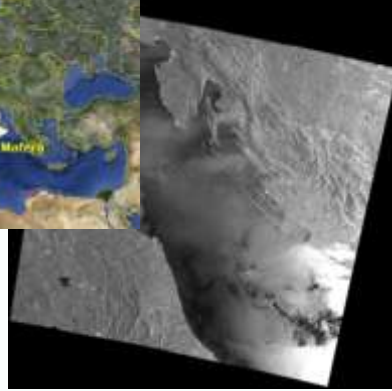
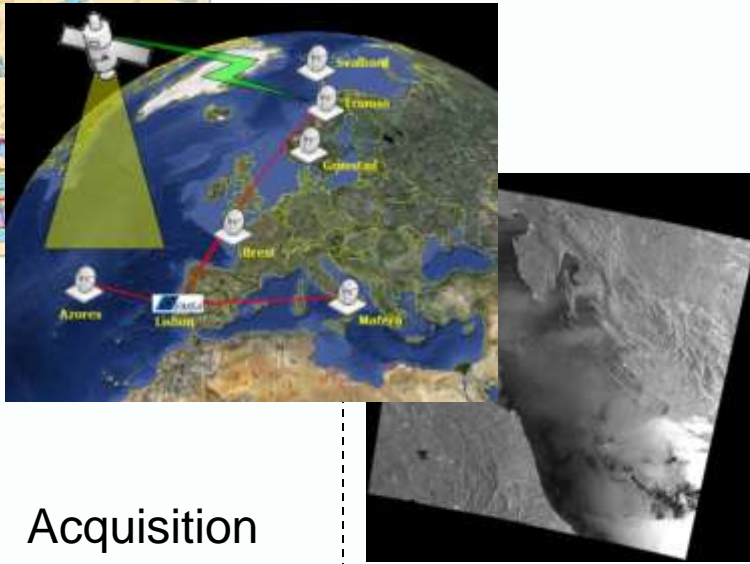
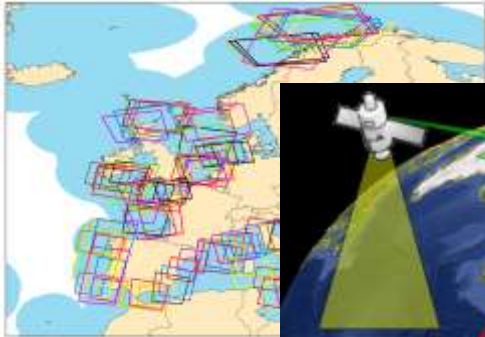
1. To assist Coastal States to locate and identify polluters in areas under their jurisdiction
2. To strengthen national response and enforcement mechanisms
3. To maximise the use of allocated budget through economy of scale



# CleanSeaNet Spatial Coverage



# CleanSeaNet : Near Real Time service – 30 min\*



Planning

Acquisition  
and  
Processing

Oil Spill Analysis

Product Processing  
and Alert Generation

- Analysis Results  
(Oil spills and vessel detection)
- Phone and email alert  
(Alert Report)
- Data dissemination
- Met-ocean & ancillary data

CleanSeaNet  
Service providers

EMSA  
CleanSeaNet Data Centre

F e e d b a c k

T0 = End of scene acquisition

T = T0 + 30 min

\* Satellite images are acquired in segments up to 1400 km long. 30 min are for a 400 km long image

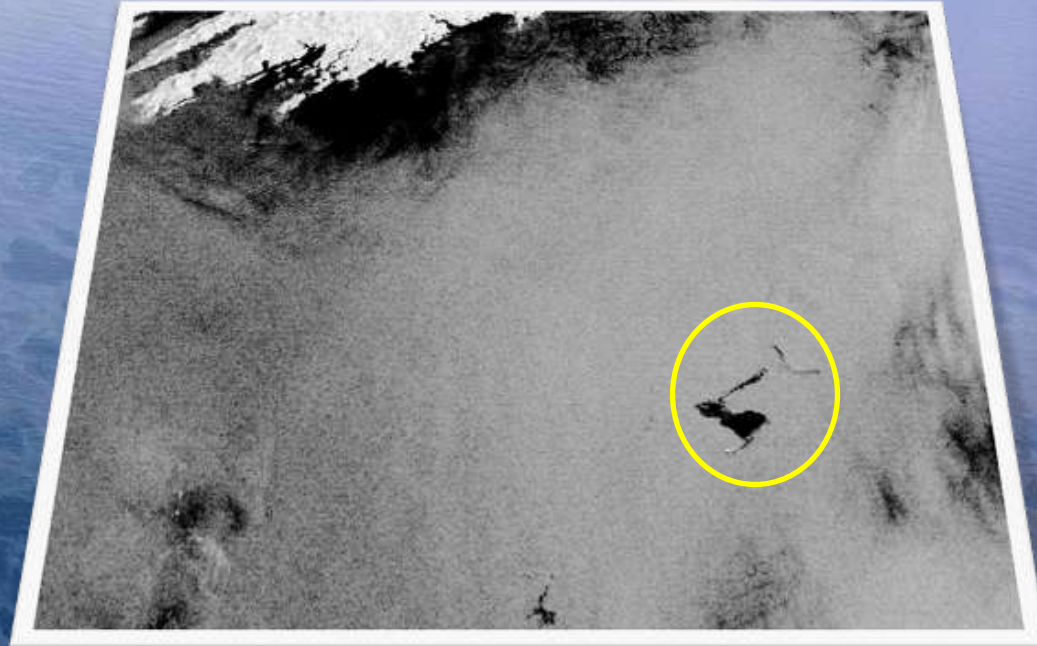
# CleanSeaNet satellite based service delivery

- **22 EU Coastal States plus Norway, Island, Croatia and Turkey**
- **More than 2000 Satellite images/services per year**
- **Oil spill identification** - alert report
- **Vessel detection information**
- Modelling data
  - Forward modelling
  - Backward modelling
- Electronic Nautical Charts
- AIS information via EMSA SafeSeaNet service
- Associated ancillary data:
  - meteorological wind and wave data,
  - **SAR derived wind and swell data**





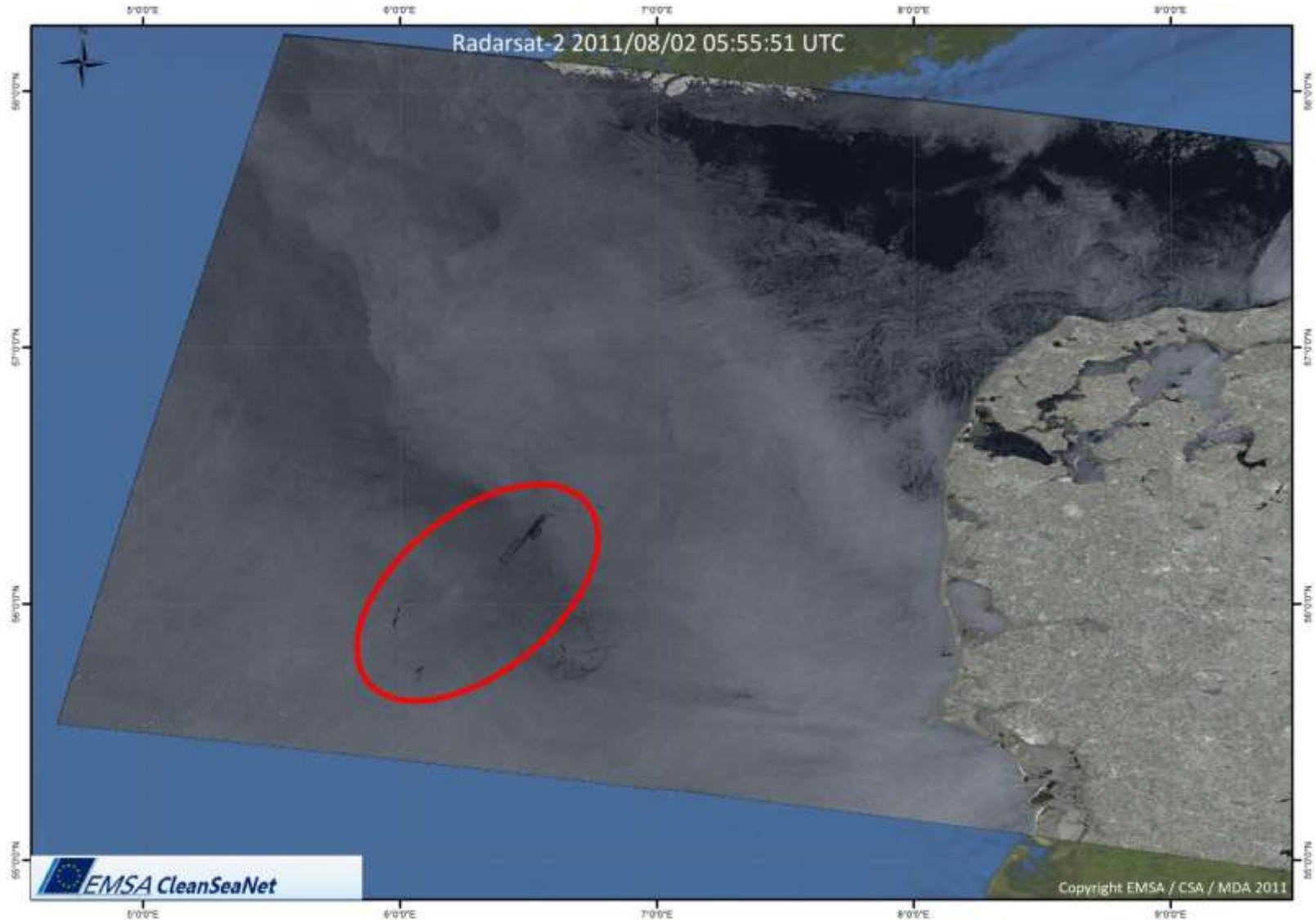
off the Southern Irish coast  
17/02/2009



Satellite image: © ESA (European Space Agency) / EMSA 2009

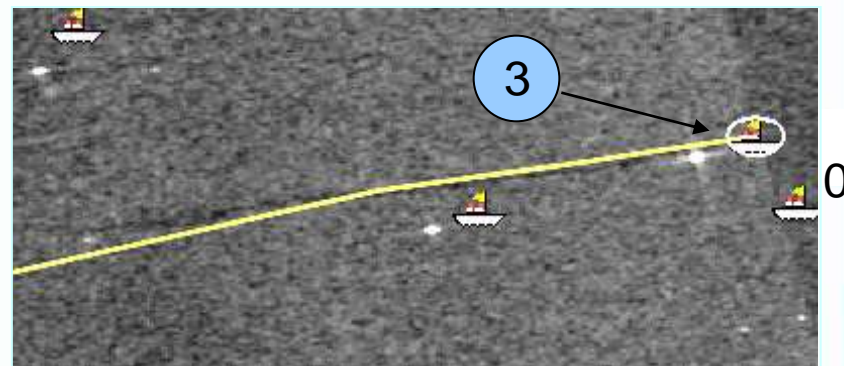
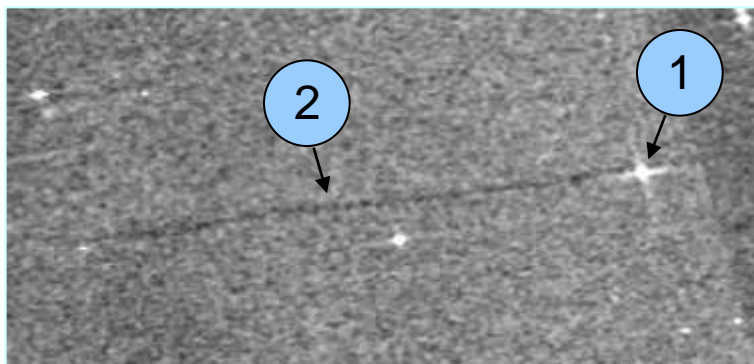
Photo: © MCA/Irish Coast Guard





## Vessel detection - Catching Polluters

- Ship detected on SAR image (Bright Spot) ①
- Long and linear possible spill trailing in the wake ②
- Vessel identified ③



CleanSeaNet is able to:

**DETECT AND IDENTIFY DISCHARGING VESSELS**

Remark: Similar vessels in vicinity at similar course and speed => not a wake

# Enhanced alert reporting

CleanSeaNet Alert Report
SPAIN
Acquisition: 2011-10-05 22:38:46 UTC

Scene ID: 13977      ENVISAT - ASAR/WS      [List of Spills](#)      [GIS Viewer](#)

Details of possible Spill n°1 - OS\_13977\_1

Centre Position		SAR Wind at Center		Area (nm²)	Length (nm)	Width (nm)	Class (A/B)	Alert Level	Number of slicks	Oilspill Warning Issued
Latitude	Longitude	Direction (From)	Speed (m/s)							
43.43787	-0.99482	0	0	1.30	9.996851	0.386560	A	Green	3	Unknown

Meteorological and Ocean Data			
Sea State	N/A	Wave Height	0
Met Wind		Direction (from)	0

Possible source information								
N.	Detected	Dist.(Km)	Identified	Type	IMO	Name	MMSI	CIS

EMSA Maritime Support Services 24/7 - Tel.: +351 21 1209 415 - Fax: +351 21 1209 480

North Sea Impact High	3 nm zone even outside EEZ
North Sea Impact Medium	Spill < 33 nm from coast within EEZ
Baltic Sea Impact High	33 nm < spill < 63 nm within EEZ
Impact low	12 nm zone even outside EEZ
	All other situations



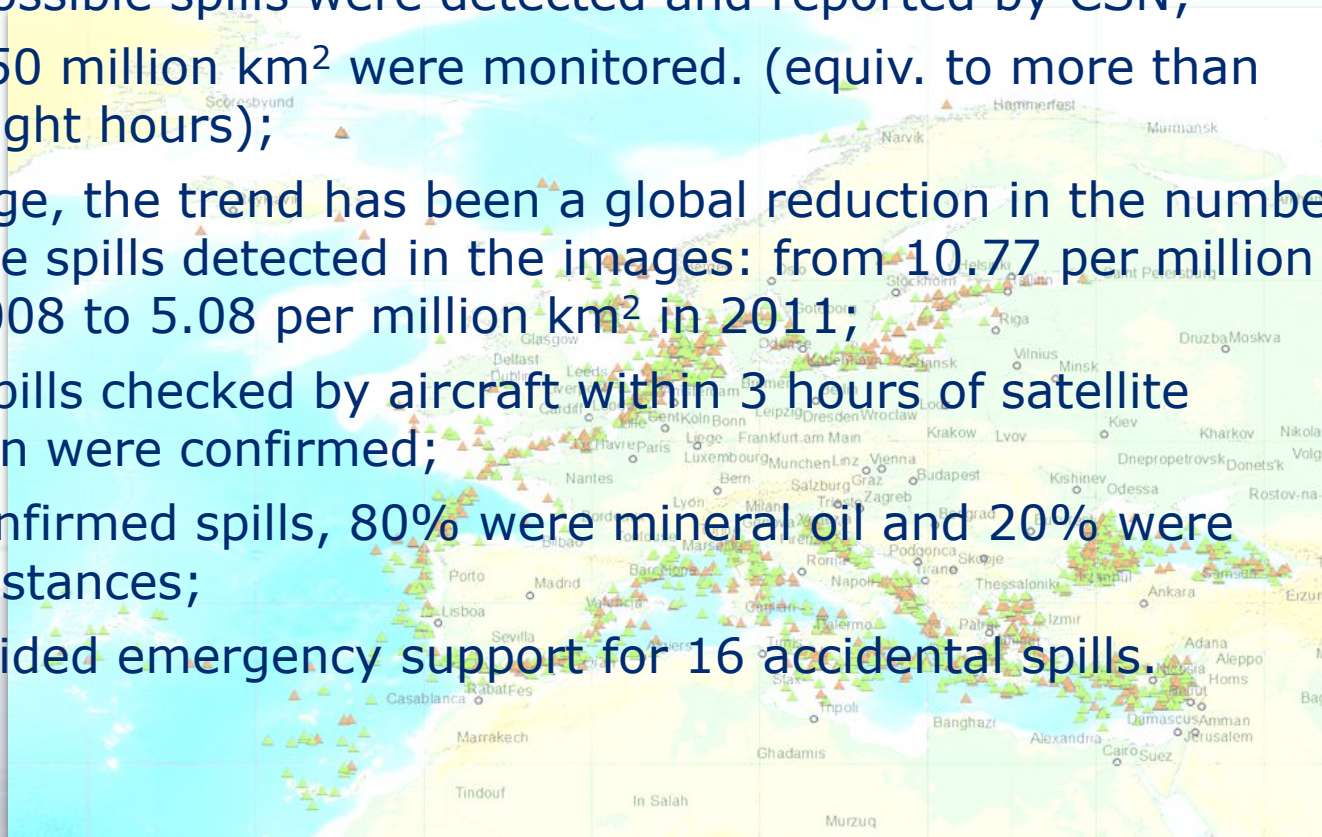
Culprit High	Possible source connected within EEZ
Culprit Medium	Possible source connected outside EEZ

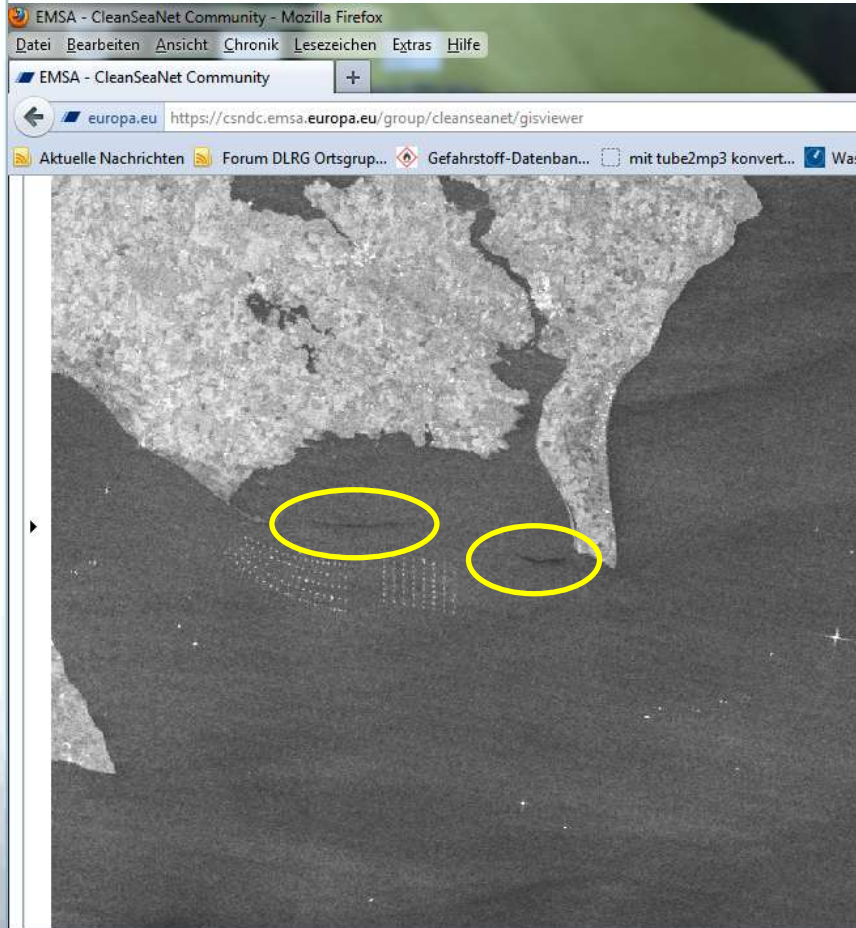
the German configuration ...

# CleanSeaNet Results

See EMSA report summarising operational results of the CleanSeaNet service covering the period between 16/04/2007 and 31/12/2011:

- 10,954 possible spills were detected and reported by CSN;
- Over 1,250 million km<sup>2</sup> were monitored. (equiv. to more than 62,000 flight hours);
- On average, the trend has been a global reduction in the number of possible spills detected in the images: from 10.77 per million km<sup>2</sup> in 2008 to 5.08 per million km<sup>2</sup> in 2011;
- 50% of spills checked by aircraft within 3 hours of satellite acquisition were confirmed;
- Of the confirmed spills, 80% were mineral oil and 20% were other substances;
- CSN provided emergency support for 16 accidental spills.





- Radar detection is a result of reflection or the effect of wave dumping
- Several potential reasons for wave dumping:
  - Current
  - Glassy sea
  - Shallow water, sand banks
  - Algae bloom
  - Fish oil
  - Mineral oil etc
- need of verification by national means, preferable surveillance aircraft or helicopter

# Verification of detection by any national means



# Comparison of the aircraft sensor capabilities

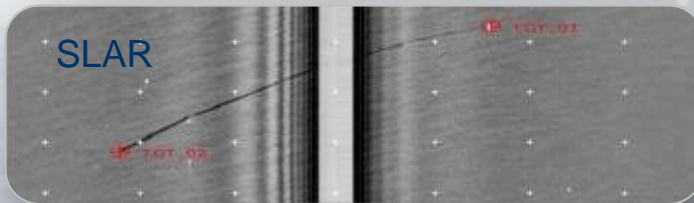
	Visual	SLAR	UV	IR	MWR	LFS	Satellite
Range @ 300m flight altitude	Approx. ± 3km	Wide, ± 30km	Narrow, ± 250m			Narrow, ± 75m	Up to 500x500 km <sup>2</sup>
Classification	No	No				Yes	No
Sensitivity on oil spill thickness	n/a	n/a	>0.1µm	>10µm	50µm to 2.5mm	0.1µm to 20µm	n/a
Spatial resolution	High	60m by 30m (perp.)	3.5m	3.5m	>5m	10m pixel distance	50m
Detection of oil below surface	No	No				Yes	No
Operating at night	No	Yes	No	Yes	Yes	Yes	Yes
Measuring geometry	visual	Line-by-line, 20Hz				Conical, 5Hz	Image
Impaired by	Nothing	Nothing	Clouds		Nothing	Clouds, flight altitude	Nothing



- If a possible polluter is caught red-handed evidence is collected
- Photographs and videos taken by a spotter aircraft proved to be enough evidence in some nations to bring the offence to court (e.g. France)







## “Body of evidence”

- Photographs or videos of possible polluter made by patrol vessel, surveillance aircraft or helicopter
- Radio contact with possible polluter
- Witness report by authority representatives
- Control of logbooks
- Port State Control results
- Matching samples taken at sea and of the possible polluter

## Judgement and penalties

- In some nations focused on the ship crew only (e.g. Germany)
  - sometimes even individual persons must be identified without any doubt
  - problem might be low penalties
- In other nations also the shipping company might be judged (e.g. Norway)
  - Shipping company has an overall duty to ensure that the construction and operation is in accordance with the rules and laws (Act 16, Feb. 2007, No 9)

# Enhancing the effectiveness of the law enforcement chain in combating illegal discharges

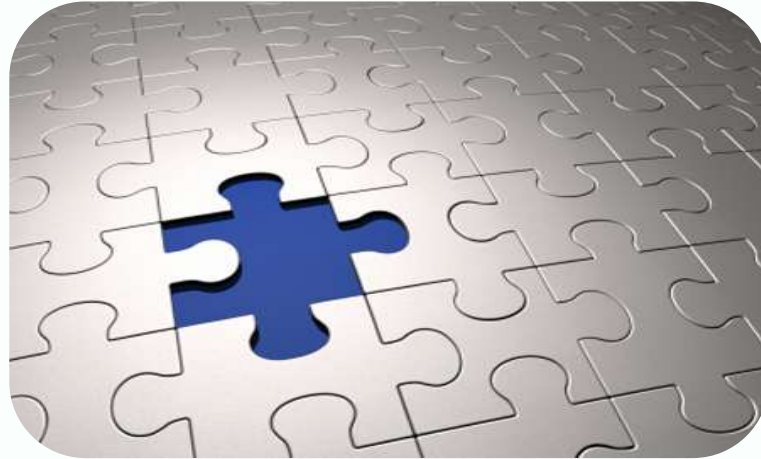
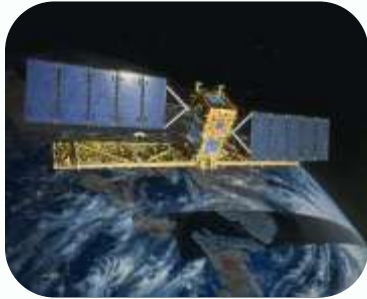
## Improvements needed on

- the overall efficiency of the illegal discharge response chain
- a feedback mechanism on follow-up actions

## Objective

EU Guidelines should complement those established at regional and national level:

- To support the harmonised enforcement of anti-pollution regulations
- To provide non legally binding guidelines mainly for inspectors and investigators
- To provide useful information for effective prosecution of offenders
- To promote the use of existing information systems
- **Working Group to Draft EU Guidelines is established**



# Thank you very much

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