Measuring risks and impact – foundation for sustainable management

*Overall **approaches to environmental management within the sector in general**, covering: cruise lines and the vessels themselves, ports and the effects that the development of cruise tourism can have on the destinations visited… in 10 minutes ☺*

Hrvoje Carić, Institute for tourism, Zagreb, Croatia, www.iztzg.hr

Environmental risks

Ocean & Coastal Management 102 (2014) 350–363

Contents lists available at ScienceDirect

Ocean & Coastal Management

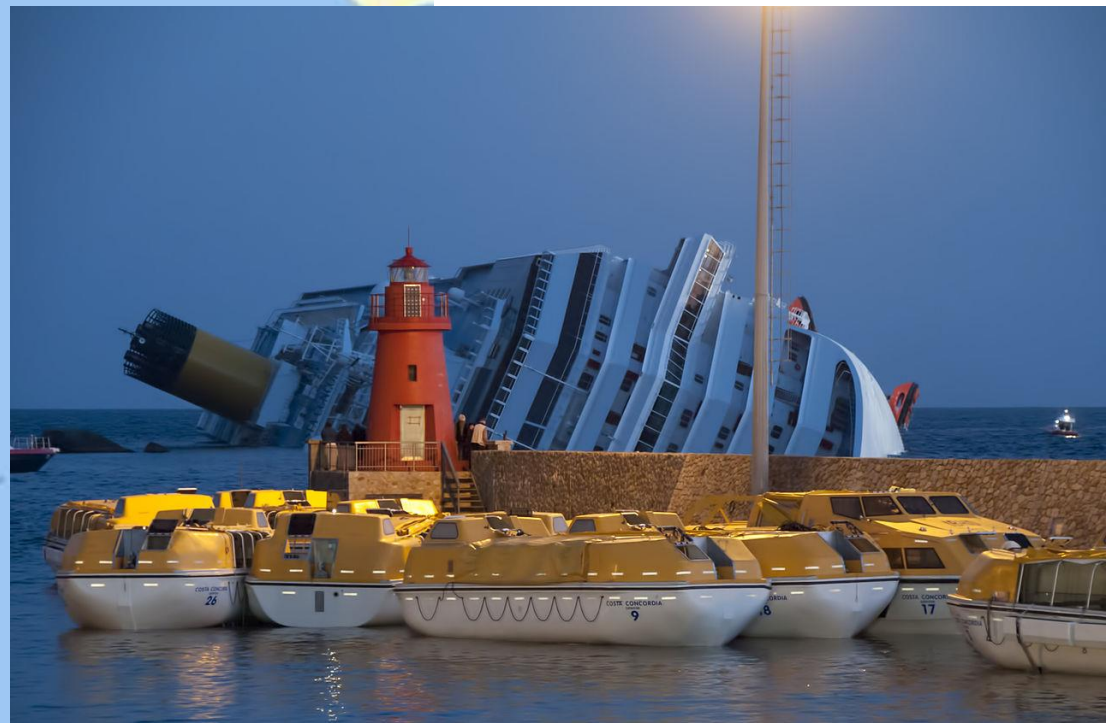
journal homepage: www.elsevier.com/locate/ocecoaman

Review

Cruise tourism environmental impacts – The perspective from the Adriatic Sea

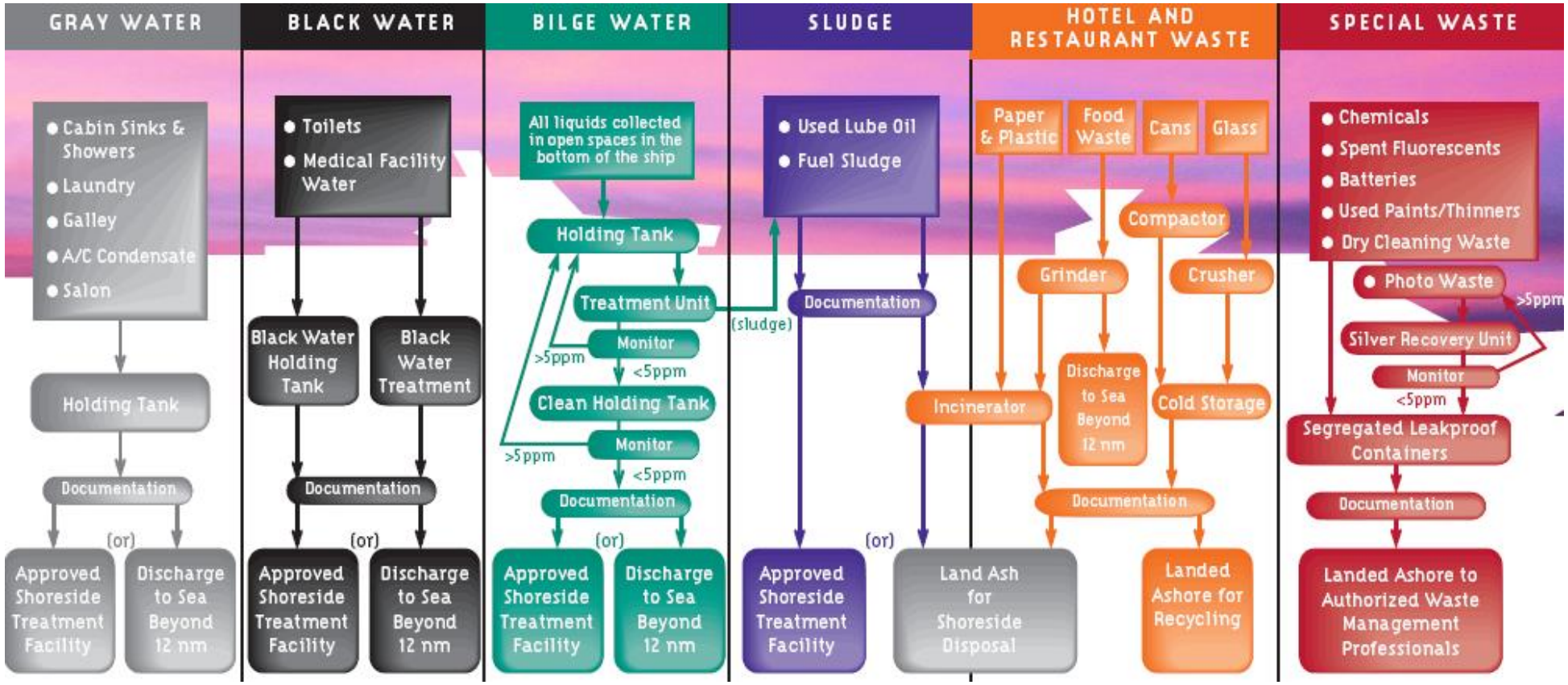
Hrvoje Carić [a, *], Peter Mackelworth [b, c, 1]

[a] Institute for Tourism, Zagreb, Croatia
[b] Department of Conservation, Blue World Institute of Marine Research and Conservation, Veli Lošinj, Croatia
[c] Department for Biodiversity, Faculty of Mathematics, Natural Sciences and Information Technologies, University of Primorska, Koper, Slovenia



Cruising tourism environmental impacts

Waste streams …
What are the practices of cruise co. In obeying laws?
According to US Coast Guard – very poor



(2) EMISSIONS

			Waste: communal, hazardous, floating POP*	Gasses: SOx, NOx, colloidal particles, VOC**	Nutrients	Bacteria, viruses, other pathogens	Antifouling biocides	Oil and derivatives	Allochtone, invasive species	Collisions, phisical disturbance	Noise	Light
(1) ACTIVITIES	At berth	Maneuvering	✓	✓	✓		✓	✓		✓	✓	✓
		Docked	✓				✓	✓				✓
		Electr. generating		✓							✓	
		Embarkment and disembarkment	✓					✓				
		Intake/discharge of ballast waters				✓		✓	✓		✓	
		Wastewater tanks discharge			✓	✓					✓	
		Bilge water tanks discharge	✓		✓			✓			✓	
		Sailing		✓			✓			✓	✓	✓
	At sea	Discharge (garbage, ash, chemicals)	✓		✓	✓		✓	✓			
		Garbage incineration	✓	✓								
		Intake/discharge of ballast waters				✓		✓	✓		✓	
		Wastewater discharge			✓	✓					✓	
		Bilge water discharge			✓			✓			✓	
	Anchoring	Lowering the anchor							✓		✓	
		Raising the anchor							✓		✓	
		Still – on anchor	✓				✓	✓				✓
		Electr. generating		✓							✓	
(3) IMPACTS		Climate change	✓	✓				✓				
		Acidification		✓								
		Air contamination		✓								
		Viruses and bacteria contamination	✓		✓	✓						
		Contamination by metals	✓	✓			✓	✓				
		Eutrophication	✓		✓			✓				
		Reduction of biodiversity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Fragmentation/loss of habitat (biotope)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Name	Sewage Treatment	Air Pollution Reduction	Water Quality Compliance	Transparency	Change from 2013	2014 Final Grade
Holland America Line	B+	C-	A	F	▼	C
Norwegian Cruise Lines	A	D-	A	F	▼	C
Princess Cruises	B-	B	A-	F	▼	C
Disney Cruise Line	A	B-	A	F	▼	C+
Carnival Cruise Lines	F	D	A	F	▼	D
Cunard Cruise Line	A	F	N/A	F	▼	D
Regent Seven Seas Cruises	C+	F	A	F	▼	D
Royal Caribbean Int'l	A	F	N/A	F	▼	D
Seabourn Cruise Line	A	F	N/A	F	▼	D
Celebrity Cruises	A	D	N/A	F	▼	D+
Oceania Cruises	C	F	C+	F	▼	D-
Silversea Cruises	F	F	A	F	▼	D-
Costa Cruises	F	F	N/A	F	▼	F

www.foe.org/cruisereportcard

Monitoring possibilites

EU has available data and intitiatives that can be used to understand risks …

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Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Challenges and prospects of valuation – cruise ship pollution case

Hrvoje Carić

Institute for Tourism, Croatia

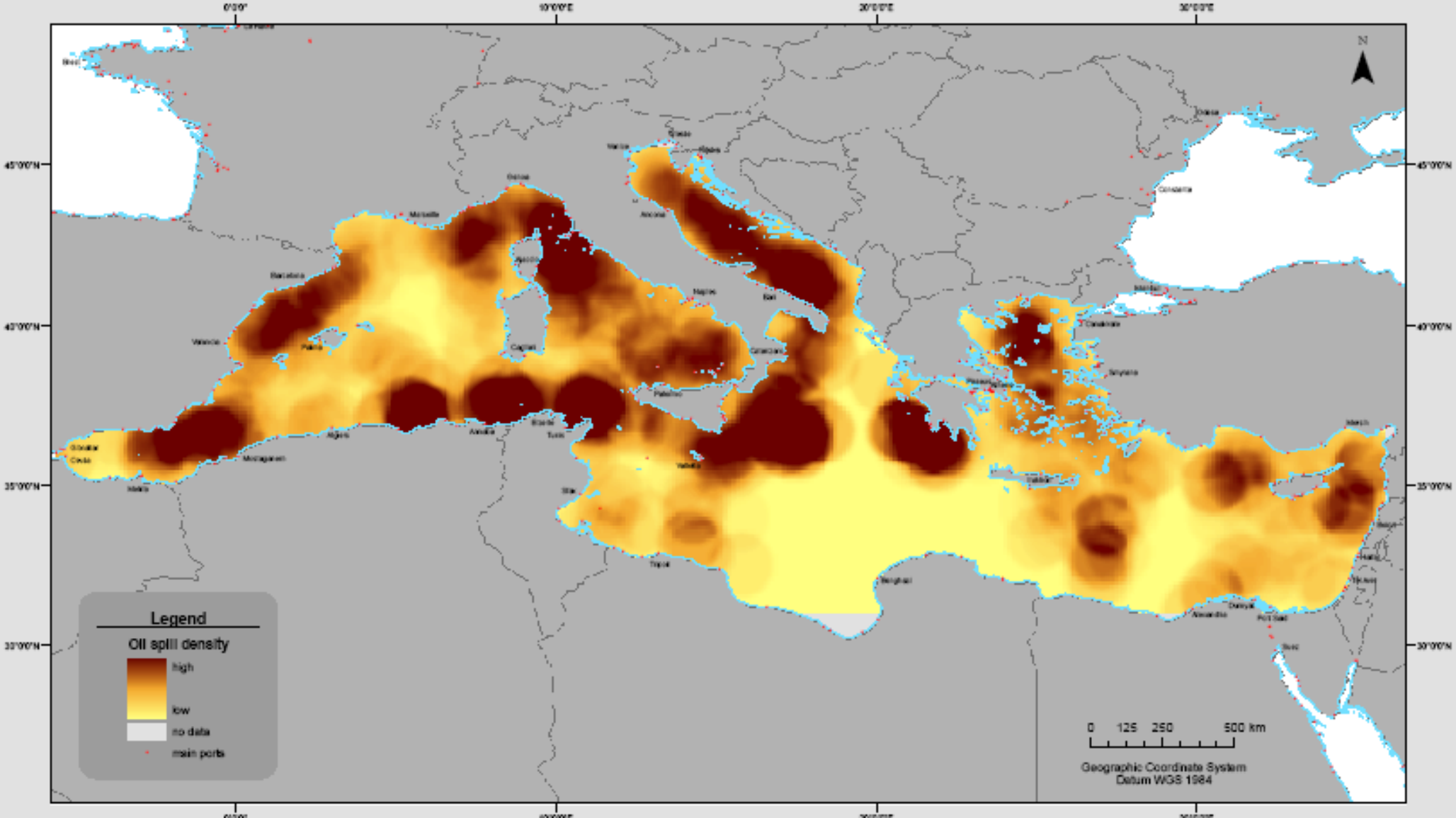
Feasibility Study on the Use of Mobile Positioning Data for Tourism Statistics 2014, mobfs.positium.ee

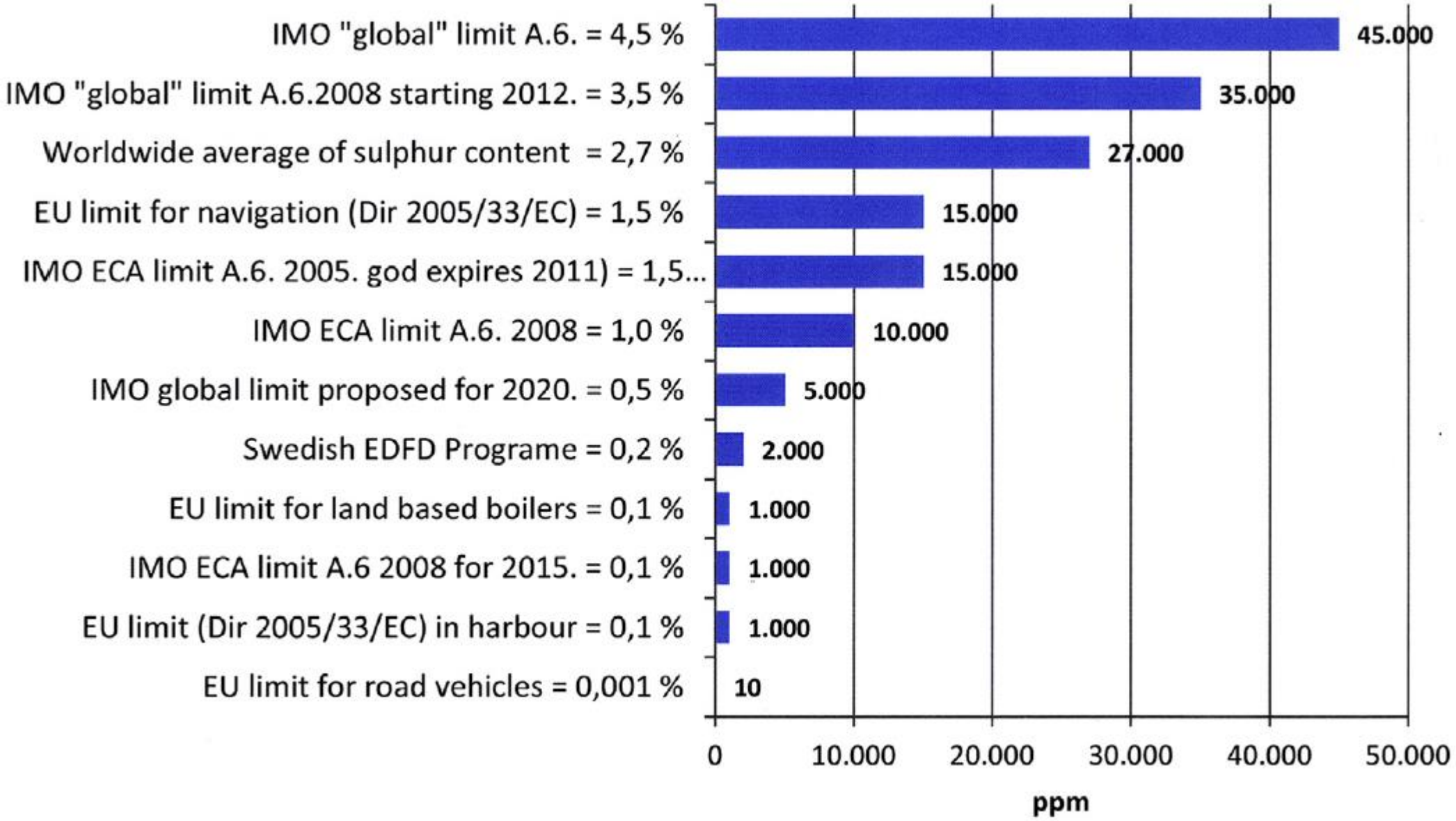
- The aim of this project is to assess the possibilities of enhancing tourism statistics through the integration of poisitioning data from mobile communication networks.
- Overall - great potential to close data gaps
  - Data already exists (at the operators)
  - Data covers whole countries and with local accuracy
  - Counts tourists, locals, transit, with possibility to distinguish
- Follow-up pilots planned by Eurostat Task Force on Big Data

European Commission

Oil spill normalised density - Mediterranean Sea - Year 2002

This map is derived from the oil spills detected from SAR images during the year 2002.
The spill density has been spatially normalised to the spill widths and the number of images available for the detection.
More information can be found on the website of the Joint Research Centre - European Commission at: http://serac.jrc.it/midiv/




IMO "global" limit A.6. = 4,5 %
IMO "global" limit A.6.2008 starting 2012. = 3,5 %
Worldwide average of sulphur content = 2,7 %
EU limit for navigation (Dir 2005/33/EC) = 1,5 %
IMO ECA limit A.6. 2005. god expires 2011) = 1,5...
IMO ECA limit A.6. 2008 = 1,0 %
IMO global limit proposed for 2020. = 0,5 %
Swedish EDFD Programe = 0,2 %
EU limit for land based boilers = 0,1 %
IMO ECA limit A.6 2008 for 2015. = 0,1 %
EU limit (Dir 2005/33/EC) in harbour = 0,1 %
EU limit for road vehicles = 0,001 %
45.000
35.000
27.000
15.000
15.000
10.000
5.000
2.000
1.000
1.000
1.000
10
0
10.000
20.000
30.000
40.000
50.000
ppm

Indicator approach:
knowing the outputs is essential for management and mitigation

Review of daily pollution quantities for a cruiser of 3.000 guest capacity.

Pollution type	Daily pollution per a cruiser	Daily pollution per cruise guest
Solid Waste	*10,5 - 12 tonnes*	*4 kg*
Air pollution CO_2	*1.203 kg/km*	*0,40 kg/km*
Black waters	*60.000-120.000 lit.*	*40 litres*
Gray waters	*1.020.000 litres*	*340 litres*
Bilge water	*30.000 litres*	*10 litres*
Hazardous waste	*390-480 kg*	*0,16 kg*
Eco toxic Cu emission	1,3 kg/day	*0,45 g*

Direct pollution costs approach

2009 EU prices of environmental management charges.

Pollution type	*DPC (EU)*	*Unit*	*DPC for* ***Cro. Adriatic***	*DPC for* ***Dubrovnik***
Solid Waste	0,15	€/kg	997.200	355.153
Air pollution	0,24	€/km/ passenger	379.880.448	324.711.552
Black & gray waste waters	0,0089	€/lit	5.620.884	2.001.880
Bilge water	0,22	€/lit	3.656.400	1.302.228
Hazardous waste	1,53	€/kg	406.858	144.903
			390.561.790	328.515.716

Cost benefit analysis

Total calculated income for Croatian economy from cruising tourism in 2009 was

53 mil. €.

DPC for Cro. Adriatic	*DPC for Dubrovnik*
390 mil €	**328** mil €

Solution:

- **inrease economy multiplyer effect on benefit side**
- **Improve your house-keeping**
- **Mitigate most expensive polluton cost (policy intervention)**

Risk assesment apprach

Heavy metals from antifouoling

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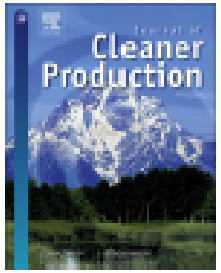


Ecotoxicological risk assessment of antifouling emissions in a cruise ship port

Hrvoje Carić [a], Göran Klobučar [b], Anamaria Štambuk [b, *]

[a] Institute for Tourism, Vrhovec 5, 10000 Zagreb, Croatia
[b] Department of Zoology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, 10000 Zagreb, Croatia

- Cruisers are not the only contributors but are becoming the biggest one.
- Hypothetical calculation of Cu emission from antifouling

Scientific research confirmation

- analysis of the Cu in sea sediment
- imposex change of murex smail *Hexaplex trunculus*
- DNA deformation of common mussel *Mytilus galloprovinvalis*

Holland America Line reports fuel savings with HEMPASIL X3

HEMPASIL X3 meet the needs of the Cruise Industry

After the application of HEMPASIL X3 Holland America Line has reported a remarkably reduction in fuel consumption, saving the company money on the bottom line as well as reducing the emission of CO_2.

A challenge that the cruise industry often faces is that cruise liners operate at a relatively low activity level, which normally makes silicone products less effective. HEMPASIL X3, however, is designed to meet the needs of ship-owners with varying activity level. What's more it's also the only fouling release system effective down to 8 knots. This makes HEMPASIL X3 an excellent choice for Holland America Line

The cruise liners ms Zaandam and ms Prinsendam owned by Seattle based cruiseship owner Holland America Line were applied a full coat of HEMPASIL X3 in April 2007 and December 2007 respectively.

Application in progress

Prinsendam being applied HEMPASIL X3

Comparative per capita calculations
in the context of the “peak day” in Dubrovnik

- **Purpose**: create easy to understand pollution interpretation that can help communication with decision makers and broader public
- **Communication aim**: cruising lifestyle pollute much more than the lifestyle of local people
- **Comparation** of: air emission, waste and waste water

Comparative human impact

Cruise guest pollution in local person equivalents

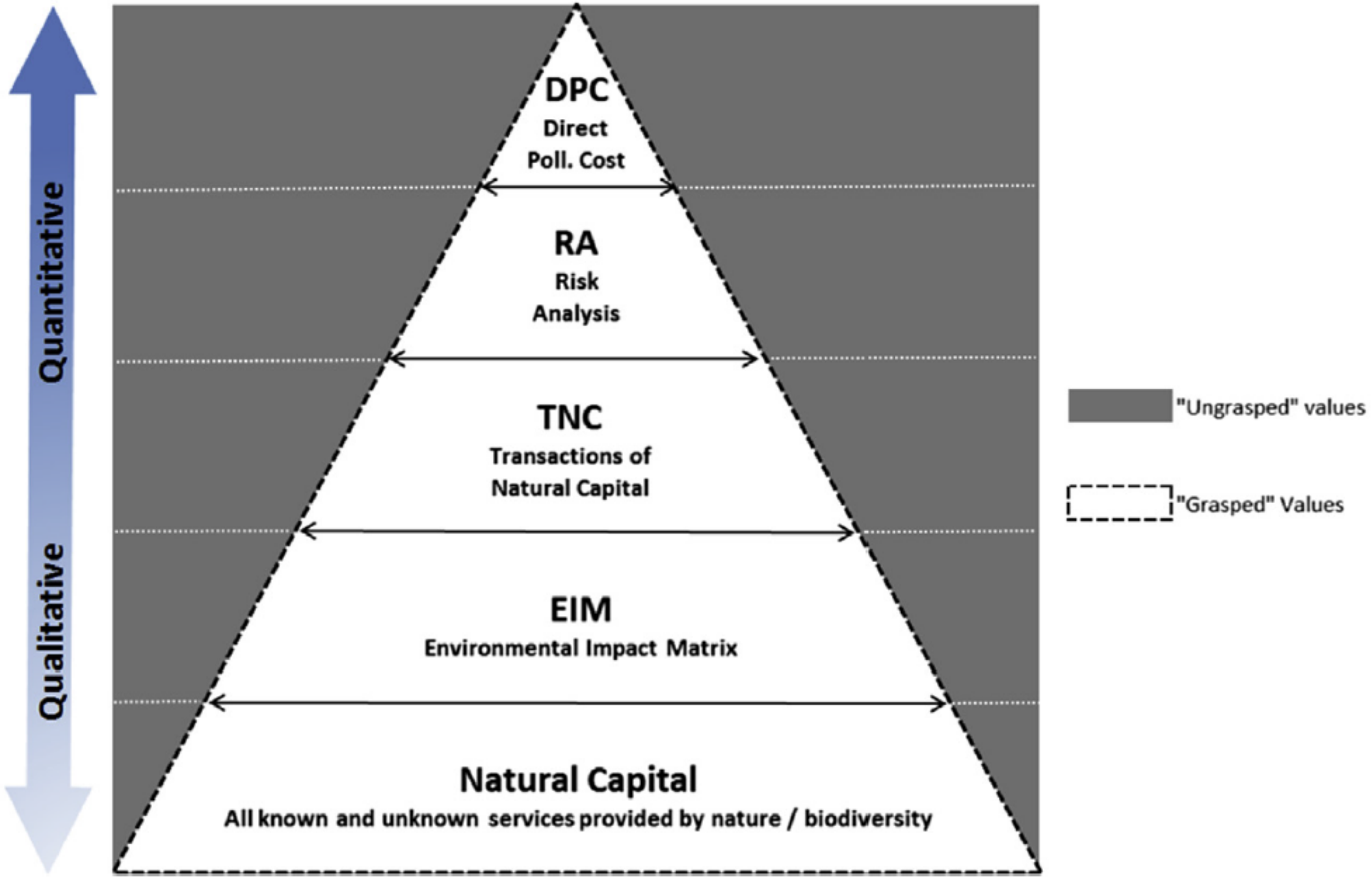
Pollution	Ratios (in local persons)
CO_2 air pollution	7,9
NOx air pollution	11,1
Wastewater	2,9
Waste	4,4

Findings from E. Adriatic experience

1. Management of communal services is key

- cruise ships are separating waste and that this waste is then improperly managed and disposed
- expansion of waste inputs additionally increase risks
- no system available to treat black and gray waters

2. Cruise ships discharge wastewaters according to MARPOL … not always + local monitoring is ???


Quantitative
Qualitative
DPC
Direct
Poll. Cost
RA
Risk
Analysis
TNC
Transactions of
Natural Capital
EIM
Environmental Impact Matrix
Natural Capital
All known and unknown services provided by nature / biodiversity
"Ungrasped" values
"Grasped" Values

Crowding, carrying capacity, people polution, visual pollution

Recently UNESCO (2014) published a report on the status of the World Heritage designation of the two cities of Venice and Dubrovnik highlighting the problems with the management of large cruise ships. The report states that existing practices might lead to '**the possible inscription of the property on the List of World Heritage in Danger** (p 32 and 36)'. The management of over-crowding, environmental and health risks are issues that need to be resolved in both sites.

State of conservation of World Heritage properties inscribed on the World Heritage List. In: Thirty-eighth session of the World Heritage Committee in Doha, Qatar 15e25 June 2014. Doc no. WHC-14/38.COM/7B.Add. Published online in Paris, 16 May 2014. http://whc.unesco.org/en/sessions/38COM/.

Cruise ship in Dubrovnik

Resistance in Dubrovnik through art performace

Resistance in Dubrovnik through art performace

Giant cruise ships that block the Venice views and threaten foundations are to be banned from passing through city's heart

In Venice, cruise ship tourists increased from less than 100,000 people in 1999 to more than 1.6 million in 2010

NO
GRANDI
NAVI

NO
GRANDI
NAVI

Queen Victoria
CUNARD

NO
GRANDI NAVI
FUORI LE GRANDI
NAVI DALLA LAGUNA

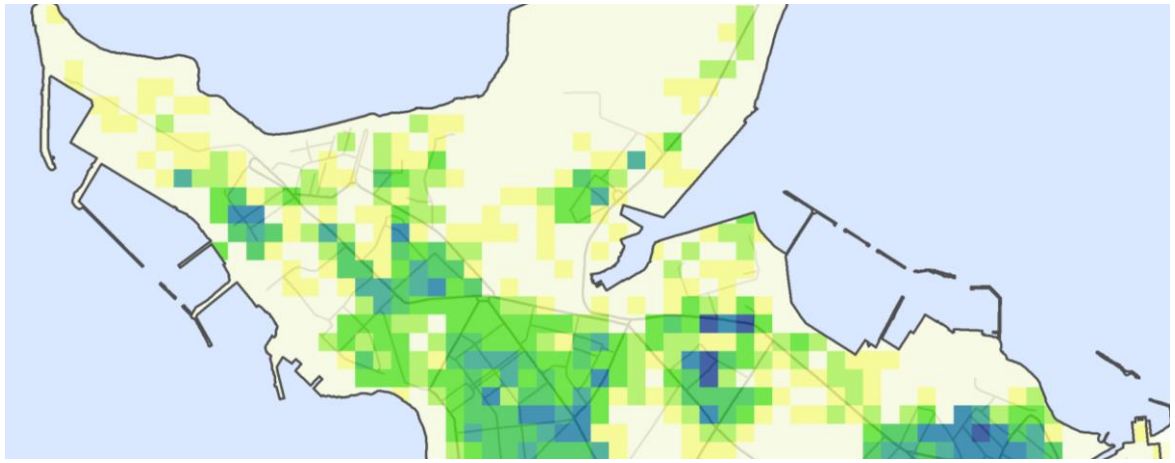
7-8
GIUGNO
NO
GRANDI
NAVI
BIG
SHIPS
ORA
O
MAI

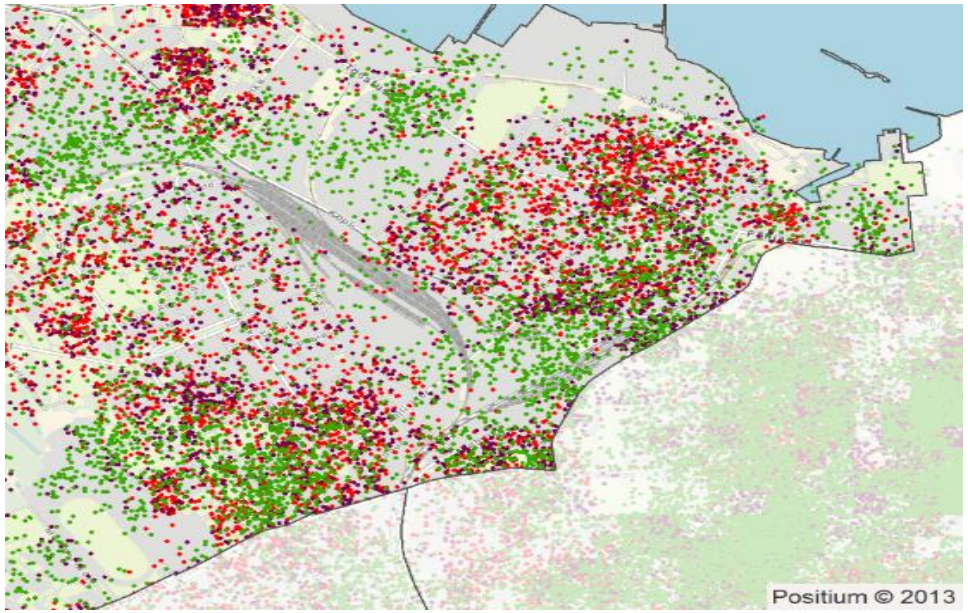
Solving issues of crowding and social/esthetics pollution

positium

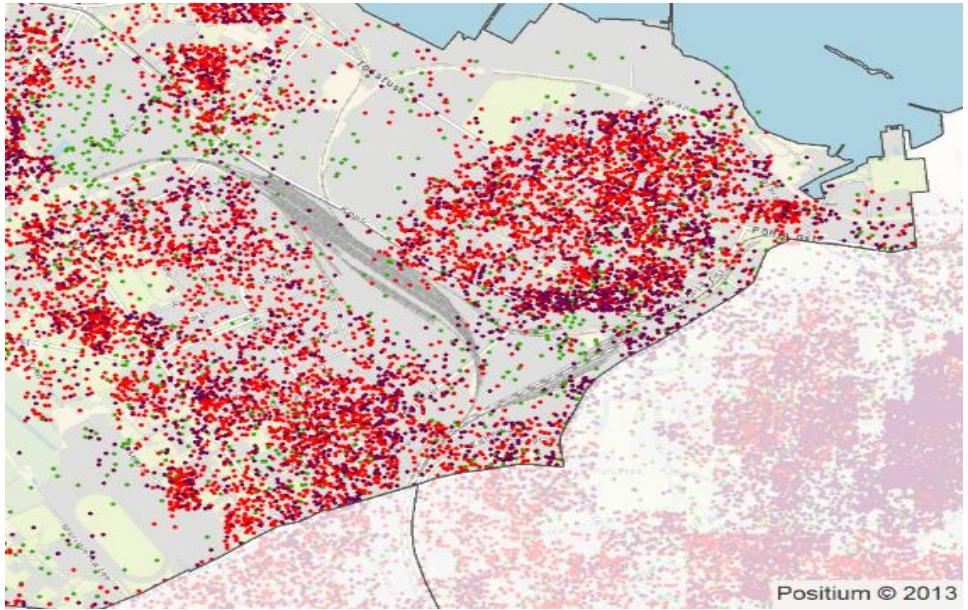
Mobile big data Case of UNESCO site Tallin

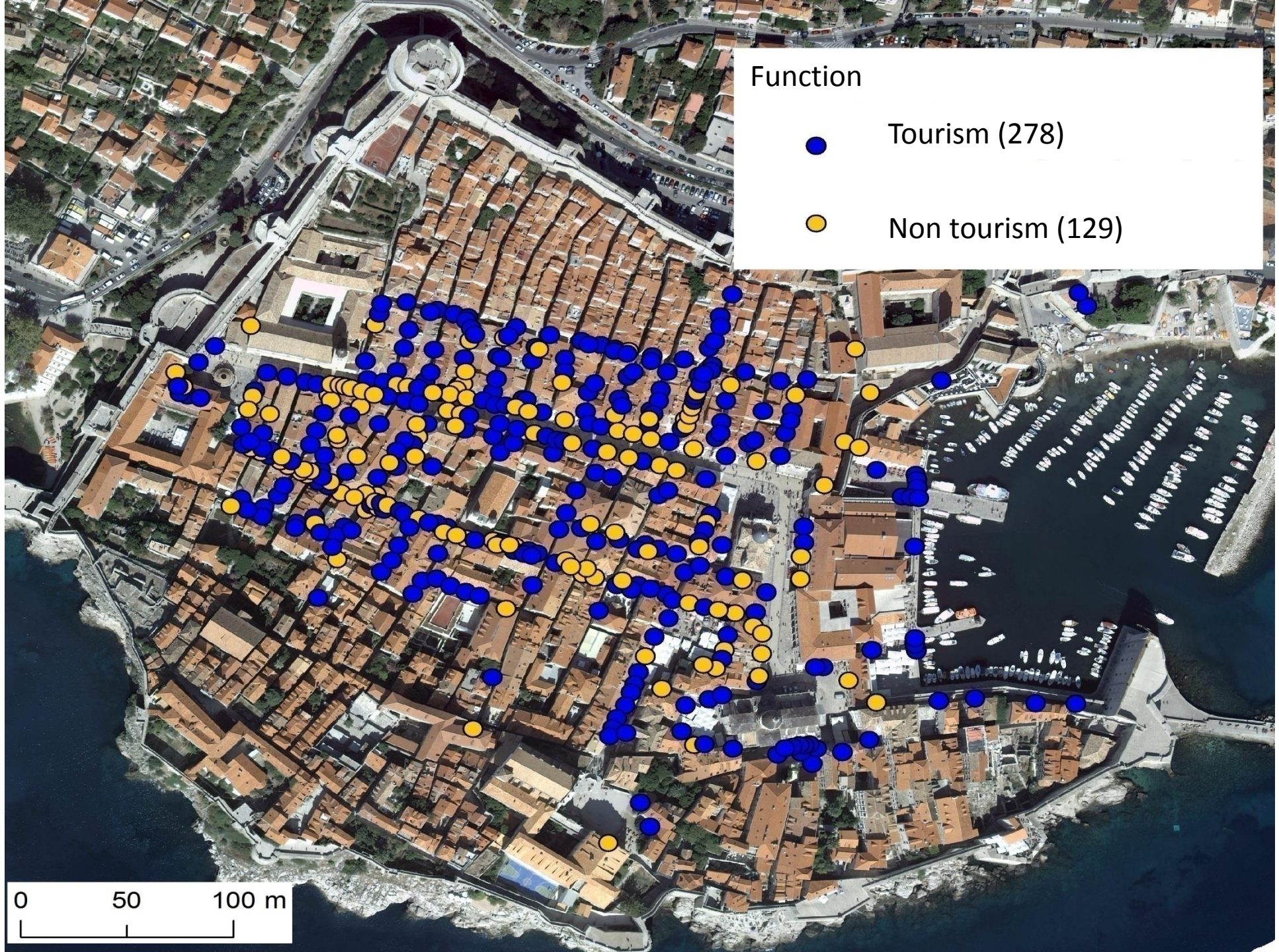
Tallinn, on a satellite image (above)
Grid map of residents in 100x100m resolution (below)





Segmented (employed ; residents)
Working day (above) and Saturday (below)




Function
Tourism (278)
Non tourism (129)
0
50
100 m

N
0
20
40
m
Occupied with T use (150 m²)
Remaining for public use (280²)

Mobile positioninng and GIS analysis
Benchmarking for sustainable management

the goals:

- detect the levels of (un)satisfaction of all users,
- minimize risks and hazards,
- optimize income generation.

Combine big data mobile positioning with other info (surveys, plans, research):

(A) Key stakeholders:

Local residents – wellbeing perception during different levels of saturation

Stationary guests' satisfaction in different usage of the space (crowding / competeing)

Cruise ship visitors – satisfaction with: the attractions, transfer from the ship, offer/spending opportunities, and actual spending in the destination.

(B) Key issues:

Fire hazard – assesment of effectiveness of potential intervention (mobility during high density, panik, emergencay exists, etc…)

Emergency service – ability to react to health emergencies of different types

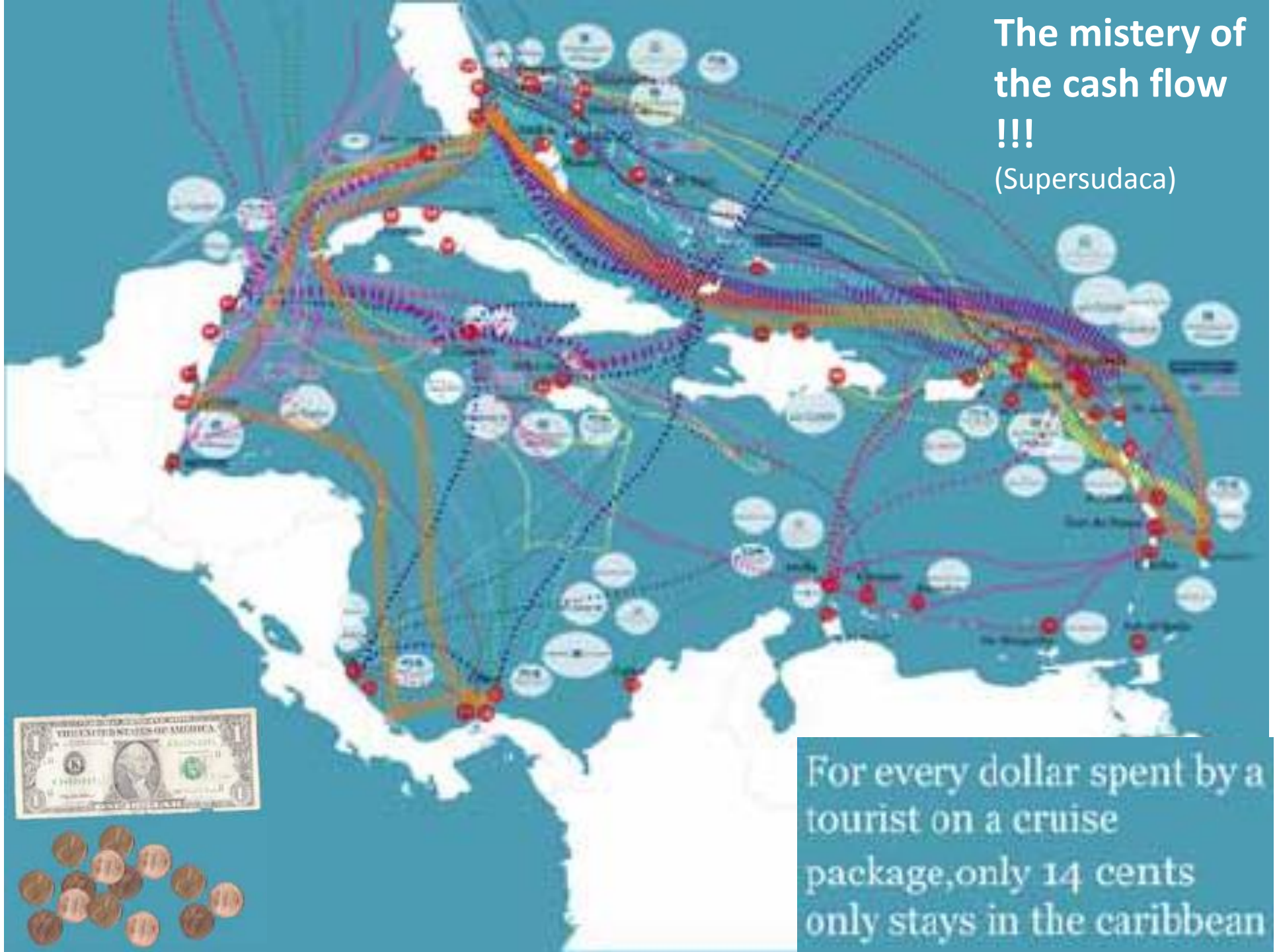
Waste management – quantities and content of waste during cruise ship visits

- Etc.

Business logic of mega cruiseships

In 2 pictures

The increase in ship-based activities means less spending in port communities


The mistery of the cash flow !!!
(Supersudaca)
For every dollar spent by a tourist on a cruise package,only 14 cents only stays in the caribbean

Conclustion

To measure is to know …

There is no sustainable development without monitoring

- Economic contribution to the local / national / EU economy
- Environmental risks and negative externalities on ecosystem services
- Social hazards, well-being of residents
- Competition to other sustainable practices (stationary tourism, fisheries, etc.)