



Royal Netherlands Navy
Hydrographic Service

MSDI in support of the blue economy:

emerging issues on marine geographic information

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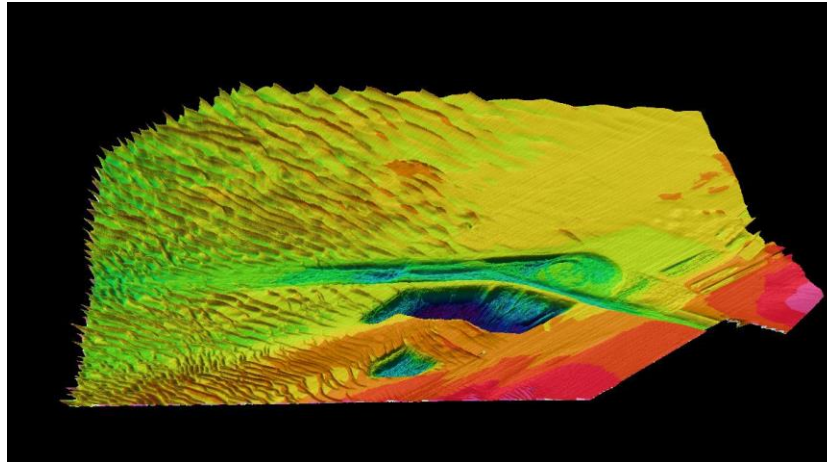




Introduction: supply and demand

Bathymetric data is the crucial contribution of the Hydrographic community to sustainable ocean development.

The Blue Economy: represents data demand side
MSDI: represents data supply side





The Blue Economy: the sea as a resource

The sea is a resource for:

- Energy;
- Food;
- Medicines;
- Minerals;
- Recreation;
- Telecommunications;
- Transportation.

The sea is now the workplace of the *blue economy*.



The Blue Economy: threats

Extreme events:

Disaster Risk Management (DRM)

EMERGING ISSUE

Competition for marine space:

Marine Spatial Planning (MSP)

Law of the Sea (LOS)

Coastal Zone Management (CZM)

EMERGING ISSUE

Healthy oceans:

UN Sustainable Development Goals (SDG)

Common Fishery Policies (CFP)

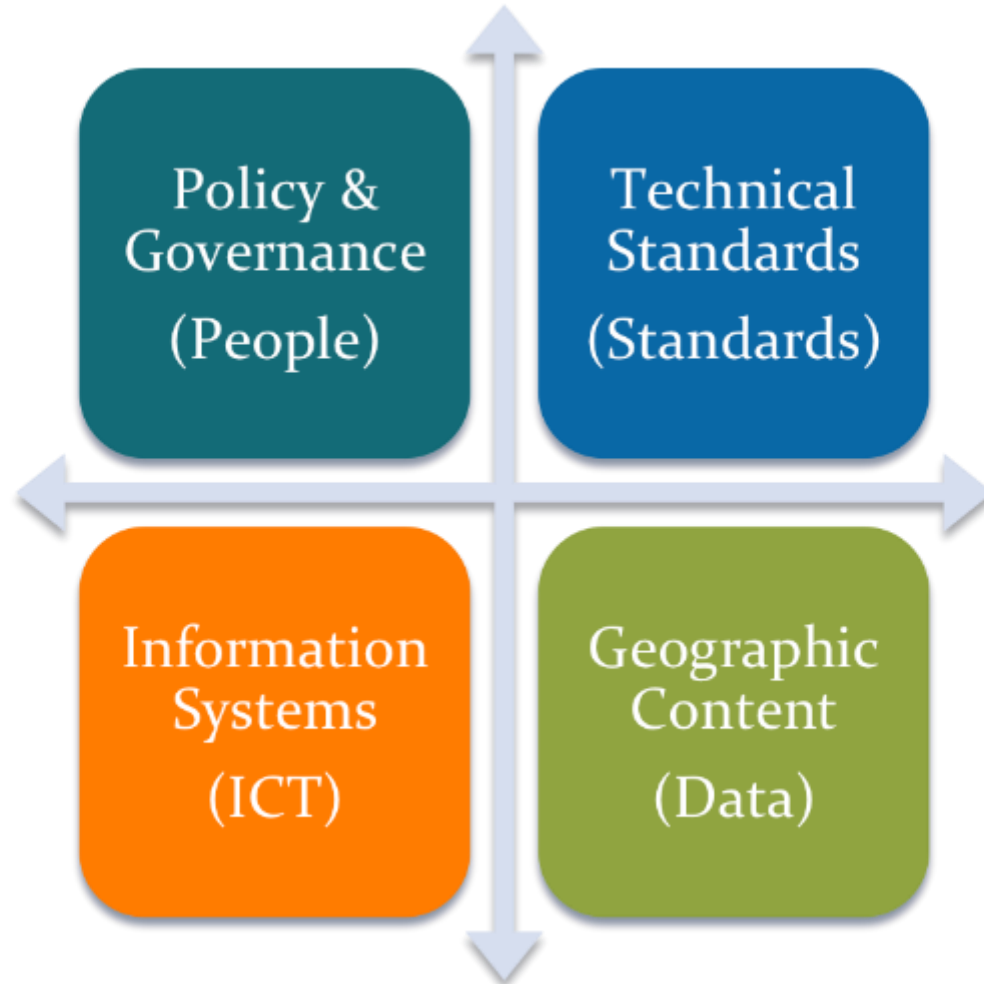
Climate Change (IPCC)

EMERGING ISSUE

=> Spatial data is necessary to reduce the threats.



MSDI: the elements



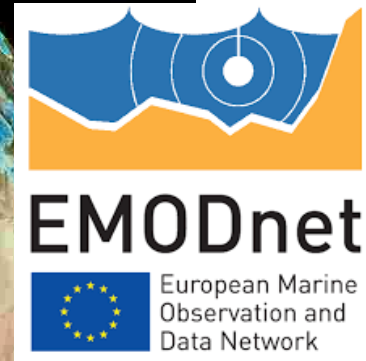
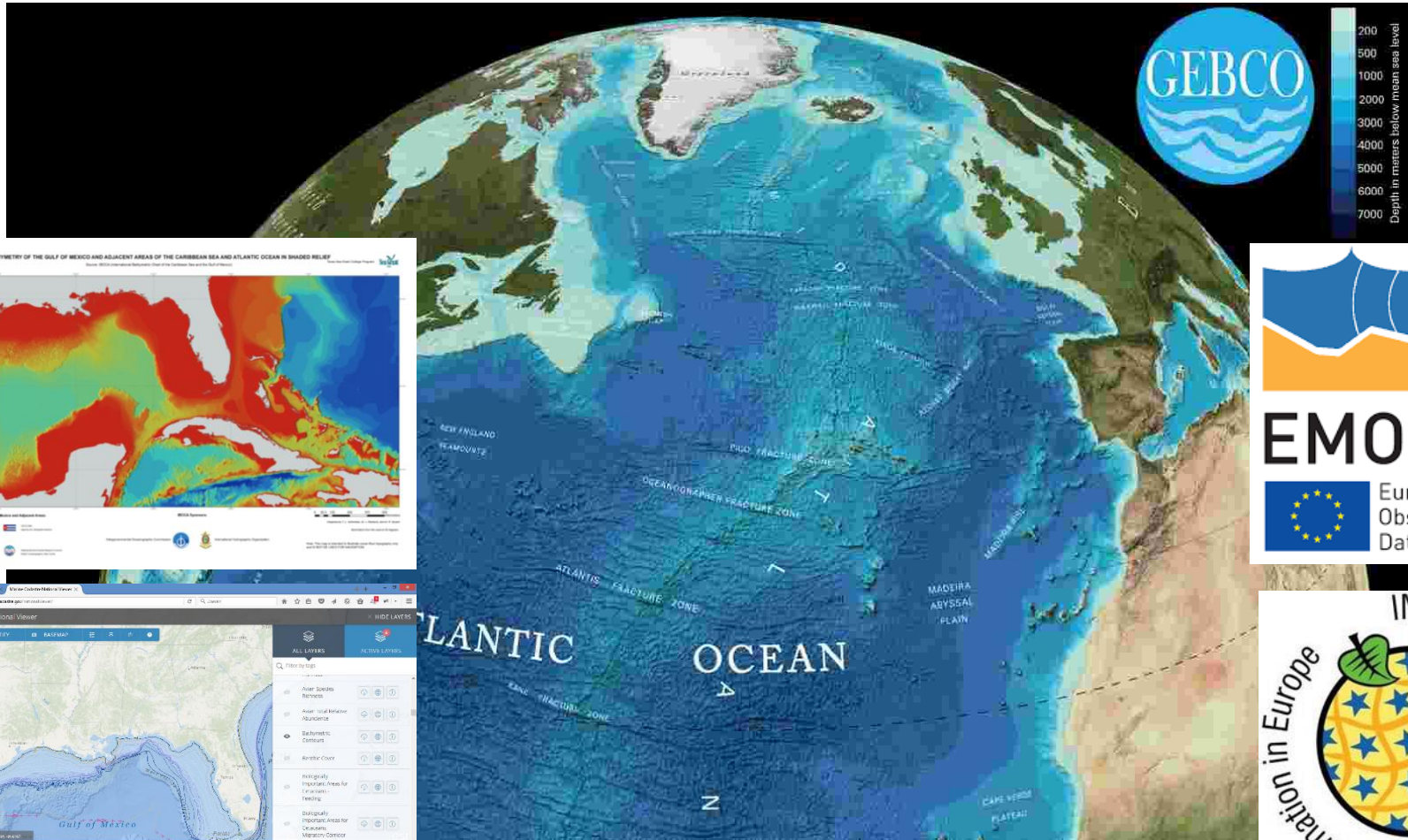


MSDI: the long road

- 1990s: National Oceanographic Data Centers (NODC)
- 1994: Open GIS Consortium (OGC)
- 2000s: NODCs cooperate under SeaDataNet
- 2006: EU Green paper on Future Marine Policy leads to EMODnet
- 2007: INSPIRE Directive
- 2008: IHO Marine SDI WG (MSDIWG)
- 2010: Gunther Pauli, "The Blue Economy" report to the Club of Rome
- 2013: PSI Directive
- 2014: EU Communication Marine Knowledge 2020 "Blue Growth"
- 2015: Sendai Framework for Disaster Risk Reduction
- 2015: Paris Agreement on Climate Change
- 2016: Conference UN Sustainable Development Goal 14 "Oceans"
- 2016: OGC Marine Domain WG (MDWG)
- 2018: UN-GGIM Marine Geospatial Information WG (MGI-WG)



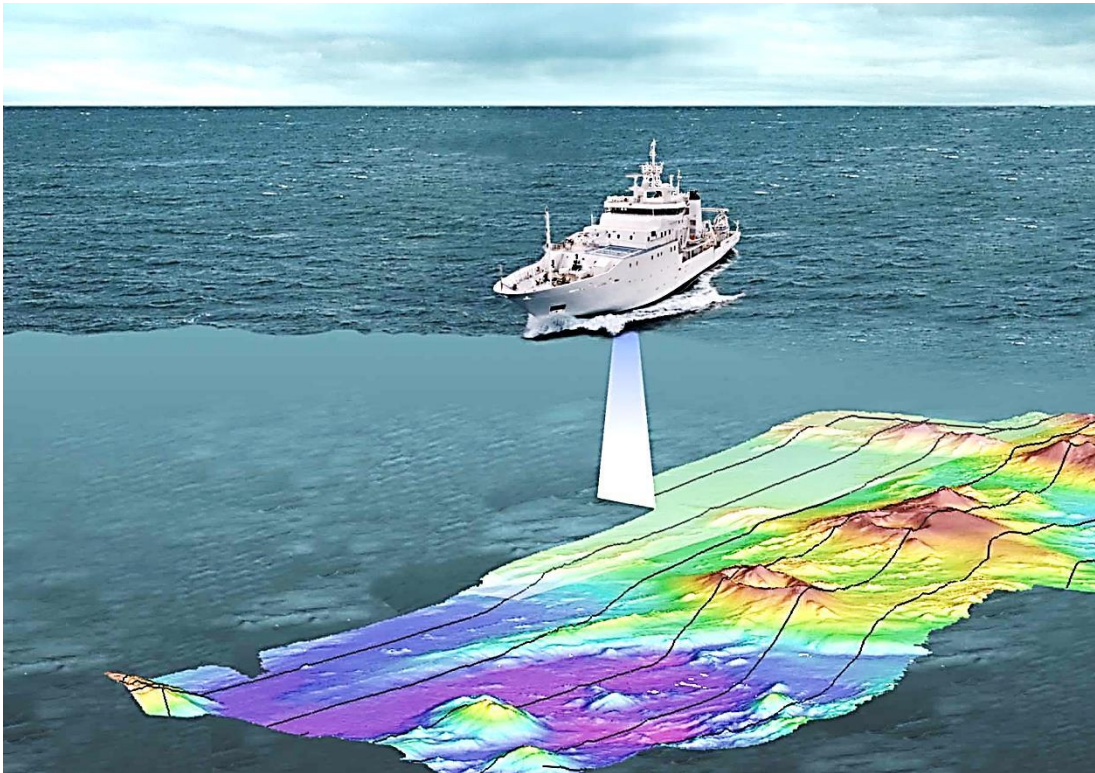
MSDI: examples





Lack of data: the problem

“We have higher resolution maps of the Moon, Mars and Venus than most of the world’s seas and oceans ”



Deep Ocean:
<10% surveyed
Coastal waters:
<50% surveyed

**THE BIG ISSUE
UNDERNEATH**



Lack of data: the problem indeed



Mighty Servant 2, 2 November 1999



USS San Francisco, 8 January 2005



Kea Trader, 12 July 2017



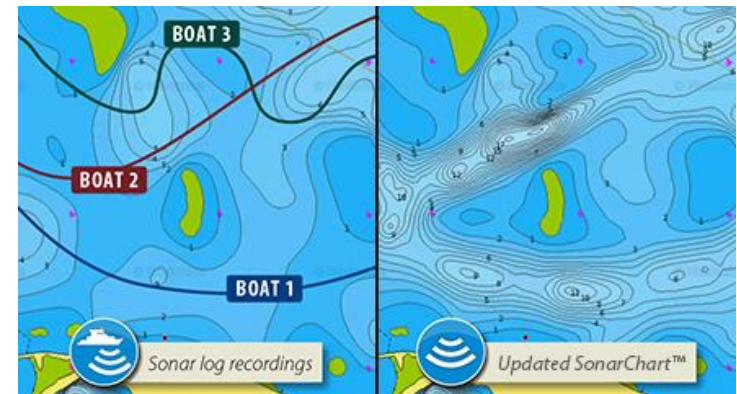
Lack of data: the obvious solution

More surveying power:

- Laser Detection and Ranging (LIDAR)
- Satellite Derived Bathymetry (SDB)
- Unmanned Survey Vehicles (USV)
- Crowd Sourced Bathymetry (CSB)
- Satellite Altimetry (e.g. Jason)
- Gravimetry Missions (e.g. GOCE)



(NOAA Ocean Explorer)



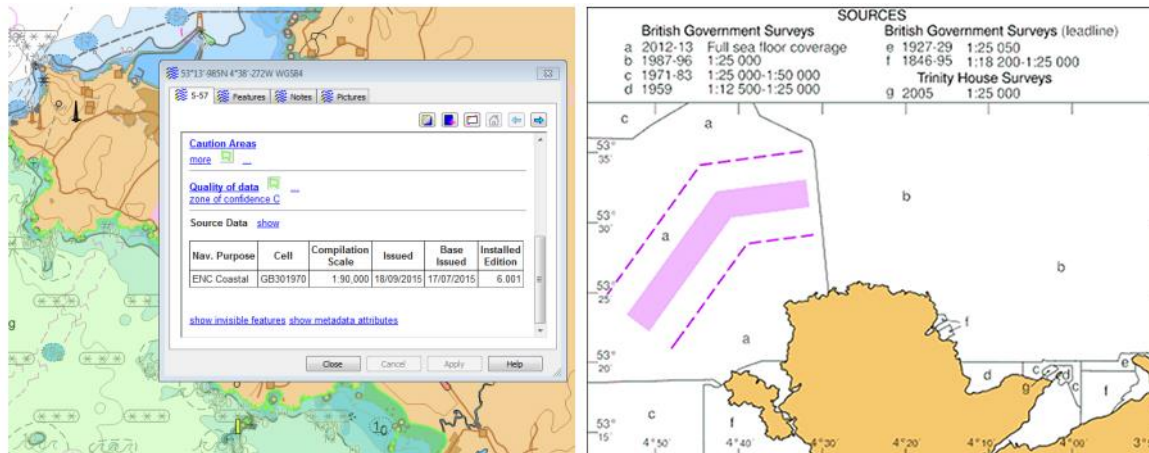
(Navionics SonarChart)



Lack of data: a practical solution

Better quality indicators:

- Source diagram
- S-57 CATZOC
- S-101 QualityOfBathymetricData
- EMODnet Composite Quality Indicator

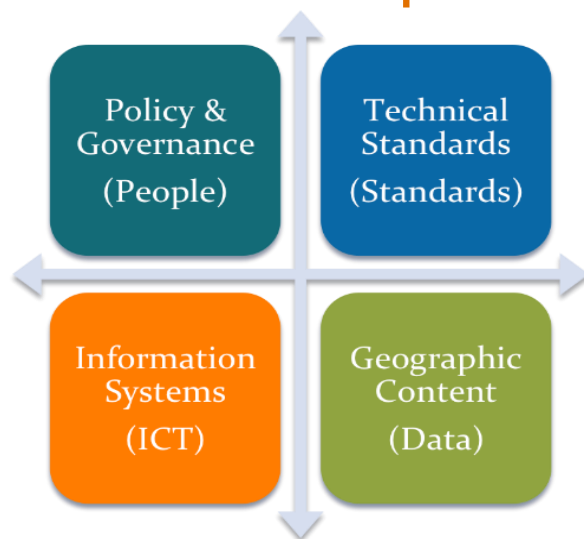


(UKHO)

(UKHO)



Global cooperation: the MSDI elements



IHO HSSC: standards, data

IHO MSDIWG: policy, data

OGC MDWG: standards, ICT

UN-GGIM MGIWG: policy, data



Global cooperation: marine subdomains

IHO: nautical information and its reuse (S-1XX)

IALA: aids to navigation (S-2XX)

IMO: maritime service portfolios (S-100 as CMDS)

UNESCO-IOC: oceanography (S-3XX)

IEHG: inland waters (S-401)

WMO/IOC: meteorology-oceanography (S41X)

ICES: marine biology

OGC: overarching (standards, ICT)

UN-GGIM: overarching (policy, data)