



EMODnet Sea Basin Checkpoints Stakeholder Conference

Importance of data and information for users of
ocean and coastal space and the role of industry of
users and providers of marine data

Dr Valerie Cummins, Feb 2017



Then...

UNITED KINGDOM GENERAL MARINE ATLAS

UKDMAP

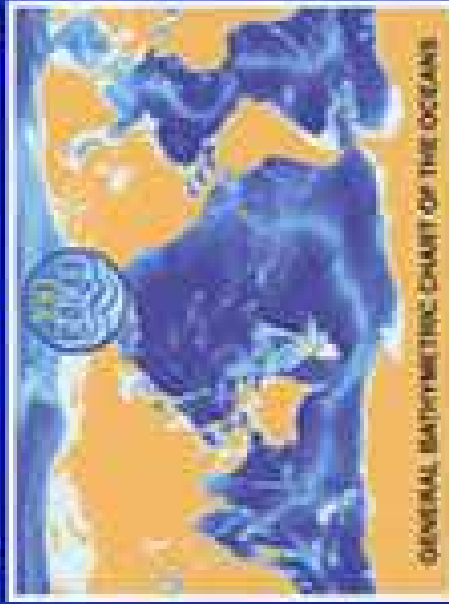
*Third Edition
July 1998*

200 miles of the seas around the British Isles
1900-1998

NATIONAL ENVIRONMENTAL RESEARCH COUNCIL

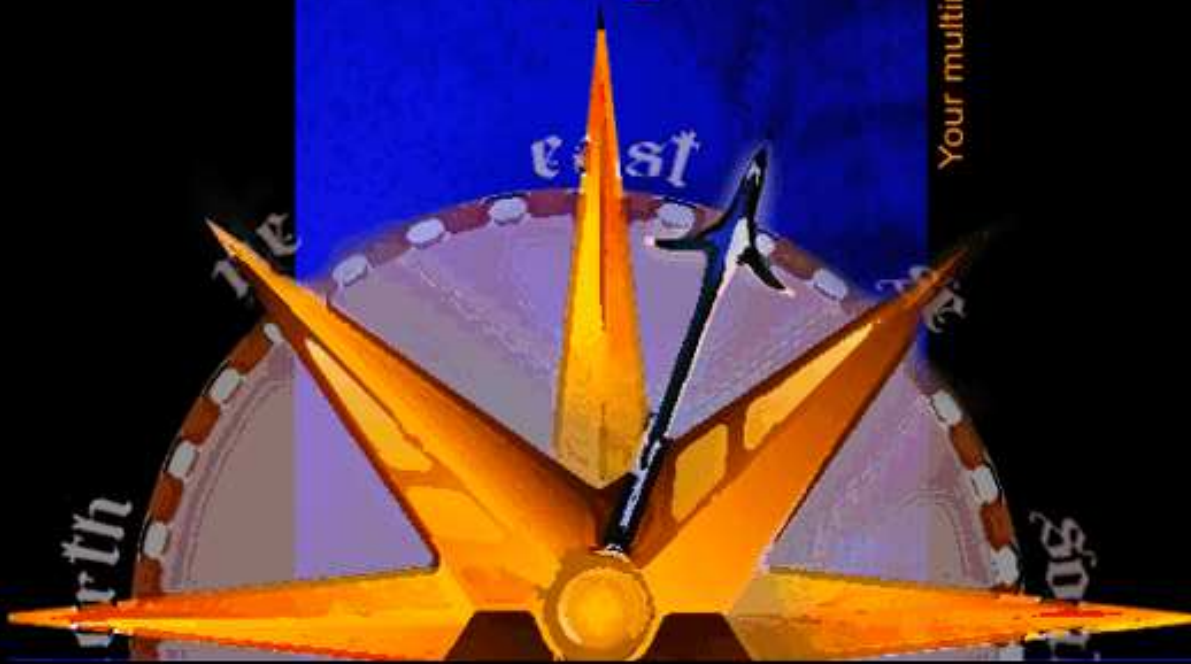


GEBCO DIGITAL ATLAS



DIVIDED, BATHYMETRIC CHART OF THE OCEANS

1903 - CENTENARY EDITION - 2003



MIDA

the marine irish digital atlas

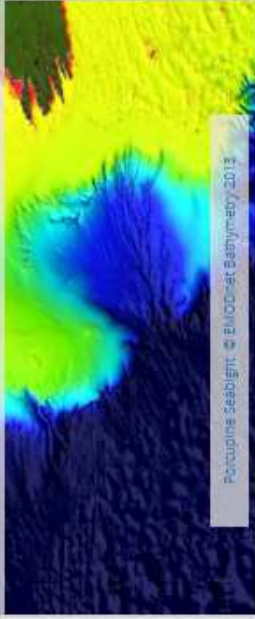
[start navigation here](#)

Your multimedia resource for coastal and marine data in Ireland

Now...



Bathymetry



Porcupine Seablight © EMO-net Bathymetry 2013

Data on bathymetry (water depth), coastlines, and geographical location of underwater features: wrecks.

[Read more](#) [Portal](#)

Geology



Data on seabed substrate, sea-floor geology, coastal behaviour, geological events, and minerals.

[Read more](#) [Portal](#)

Seabed Habitats



Data on modelled seabed habitats based on seabed substrate, energy, biological zone, and salinity.

[Read more](#) [Portal](#)

Chemistry



Data on the concentration of nutrient-organic

Biology

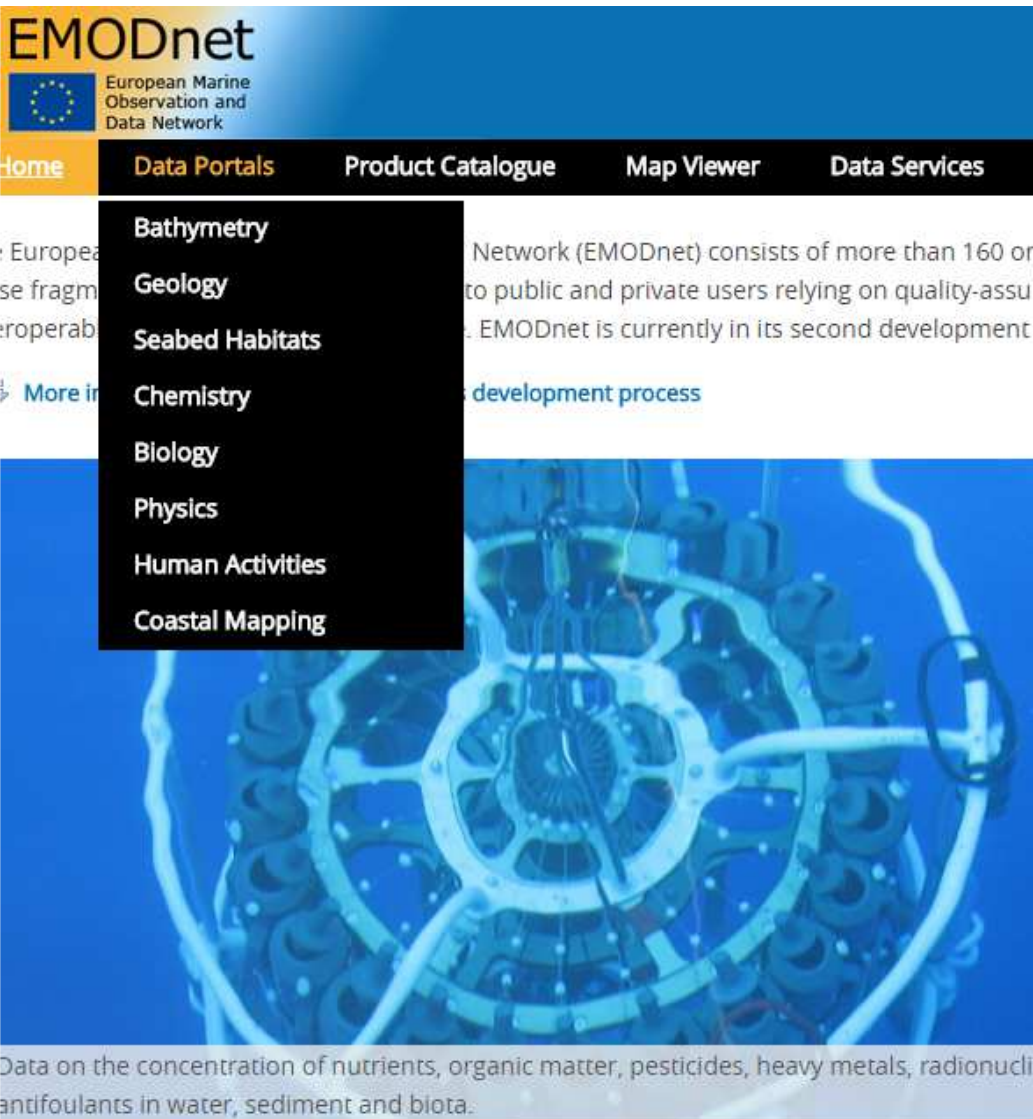


Data on temporal and spatial distribution of species abundance and biomass from several seas

Physics



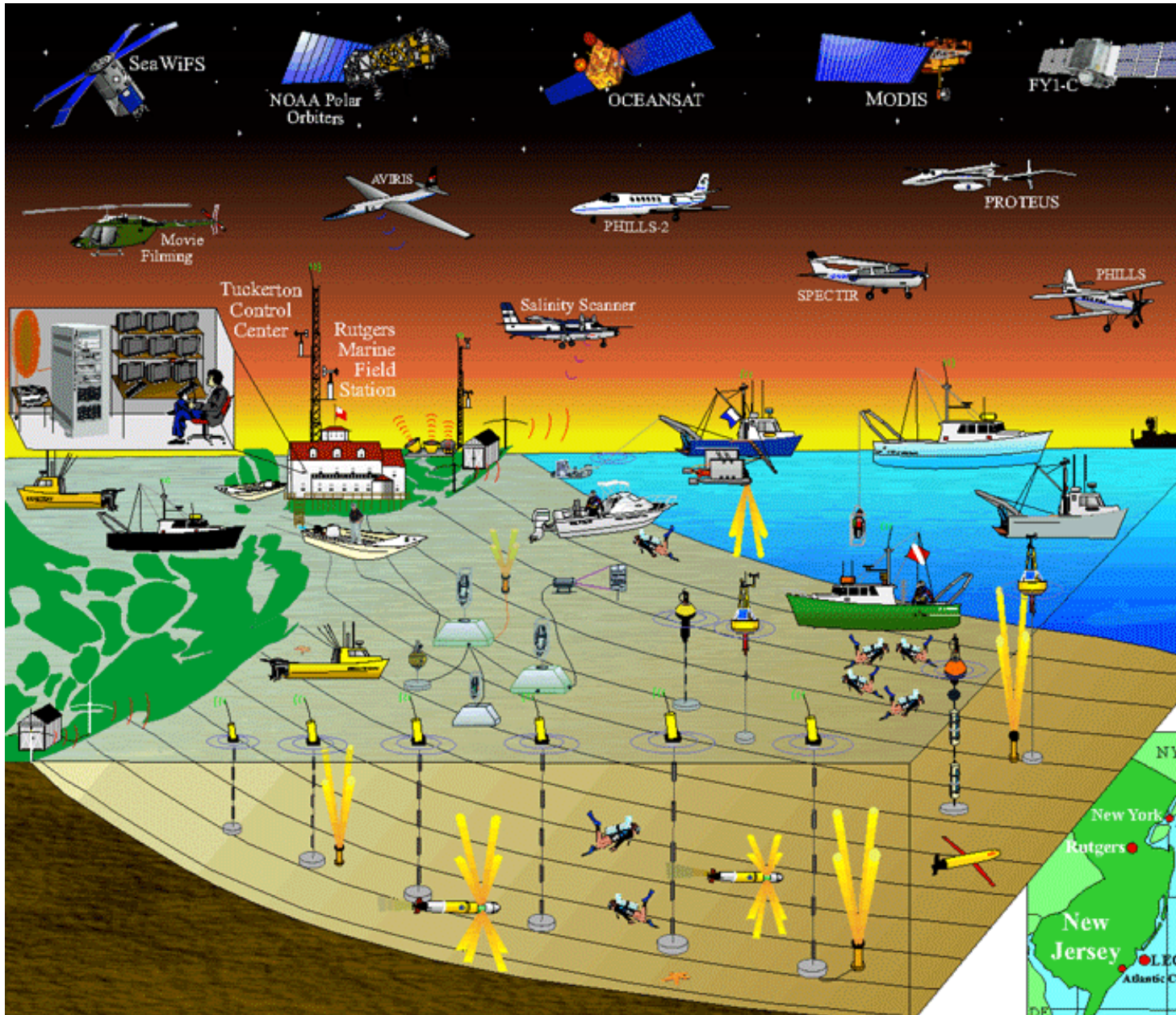
Data on salinity, temperature, waves, currents, sea-level, light attenuation, and fluorescence



- Norms for marine data & information
 - More sophisticated products and information services
 - Implementation of data standards (e.g. Inspire) and greater Interoperability
 - Greater accessibility: Multiple use of marine data; Smart phone Apps
 - Systems thinking*
 - SeaBasins Approach
 - Rapid pace of technological change (i.e. sensors; cloud computing; IOT; marine acoustics; drone technology)...

***Case Study:** 30 years of LOICZ –

1. Modelling of biogeochemical fluxes to determine nutrient loading in estuaries and deltas around the world.
2. The human dimension in the naughties
3. **Future Earth Coast** – integrating Dynamic Coast, Human development at the Coast and Pathways towards Sustainable Development



What is missing?

The Global Ocean Observation System

According to GOOS, the current global ocean observing system is 60% complete:

Tide gauge stations

Drifting buoys

Tropical moored buoys

Profiling floats

Ships of opportunity

Ocean reference stations

Ocean carbon networks

Dedicated ship support

Data and assimilation subsystems

Management and product delivery

Satellites (SST, Surface topography, wind, colour, sea ice)

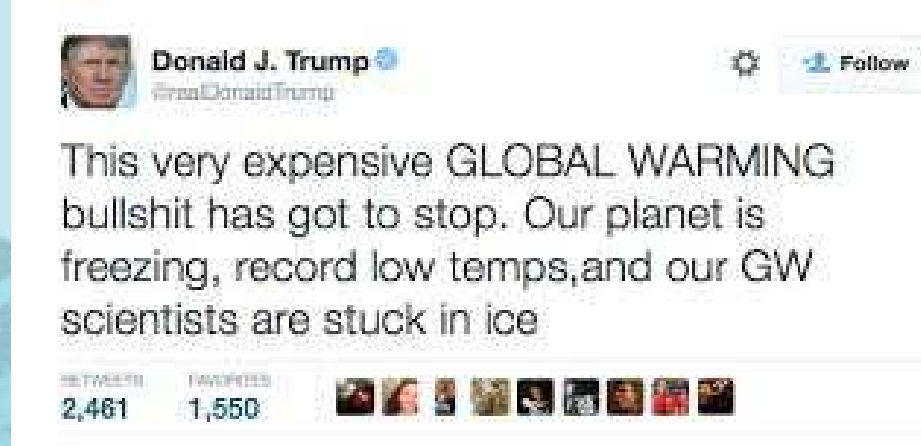
From Visbeck, Karstensen and Reitz (2015)



Towards a European Ocean Observation System..

- More **integrated** – i.e. Systems of systems
- More **efficient** – i.e. Essential Ocean Variables (EOVs), long term monitoring, multiple uses
- More **sustainable** – i.e. Temporal scales from hourly to decadal, and spatial scales from 1km² to planetary system

Drowning in data?



Deficiencies in the political system, *plus* supply and use of scientific data, inhibit effective fisheries management (Daw & Gray, 2005)

Over 6,000 separate bathymetric surveys of all kinds by public authorities in Europe ex Black and Baltic Seas (multibeam, single beam, plummet, unsp).
EMODNet hydrography preparatory action

Importance of data and
information for users of ocean
and coastal space

Importance of data and
information for **users** of ocean
and coastal space

Metocean monitoring ENVIRONMENTAL
Storm surges Water quality MARINE
BIOTECHNOLOGY Wave propagation
Chemical characteristics Biological functioning
Ecosystems goods and services Seabed Mining
Economics Offshore wind Wave Propagation
Predator / Prey interactions Shipping Logistics
Transport MARITIME SURVEILLANCE Security
Ports Human factors Pollution Monitoring
Marine recreation Fisheries Aquaculture
Seaweed Harvesting Social Wellbeing

Why is marine data so important ...?

Mega-trends of the 21st Century

- Growing Population
- Limitations of Neo-Classical Economics
- Energy Scarcity
- Diminished Ecosystem Goods and Services
- Climate Change

• *Day et al., 2012*

THE NEXT GOLDEN STATE: A 16-PAGE SPECIAL REPORT ON AUSTRALIA

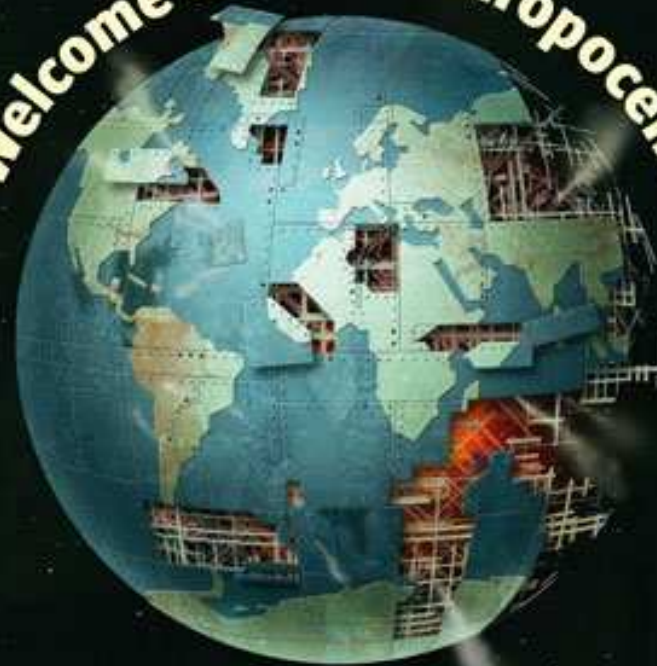
The
Economist

MAY 28TH - JUNE 3RD 2011

Economist.com

Obama, Bibi and peace
Huntsman blows his horn
A soft landing for China
The costly war on cancer
How the brain drain reduces poverty

Welcome to the Anthropocene



Geology's new age

The age of man...

a new geological epoch – in a single lifetime humanity has become the dominant force

There is no precedent for the speed and variety of changes underway today, save perhaps the asteroid impact that ended the reign of dinosaurs 65million years ago. Callum Roberts, 2012

'Wicked' problems in The Anthropocene



'Wicked problems are complex, challenging, with multiple feedbacks, are highly uncertain and have ambiguous solutions'

(Rittel & Weber, 1973).

Coastal Issues:



THE GLOBAL GOALS

For Sustainable Development

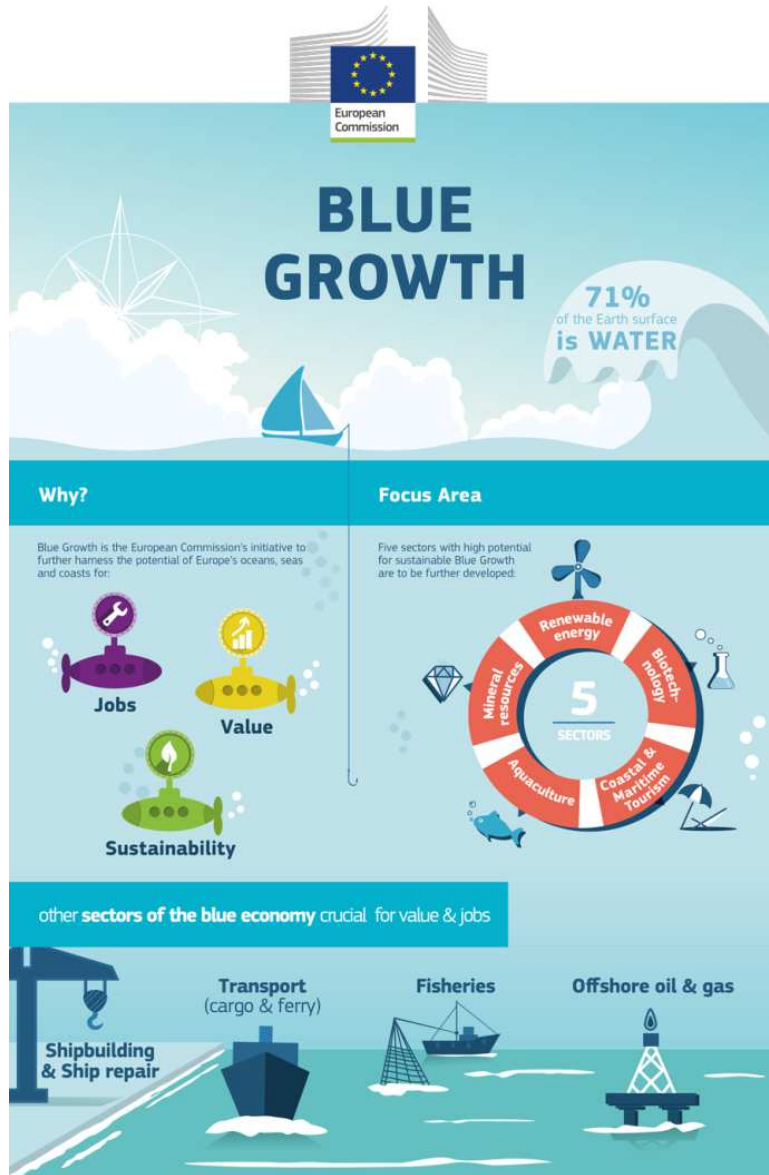


Future...

A close-up portrait of Karmenu Vella, a man with grey hair and glasses, wearing a dark suit, white shirt, and patterned tie. He is looking slightly to the right of the camera with a neutral expression. The background is a solid blue color.

“The Future is
Blue”

Karmenu Vella, Seafest, Cork 2015

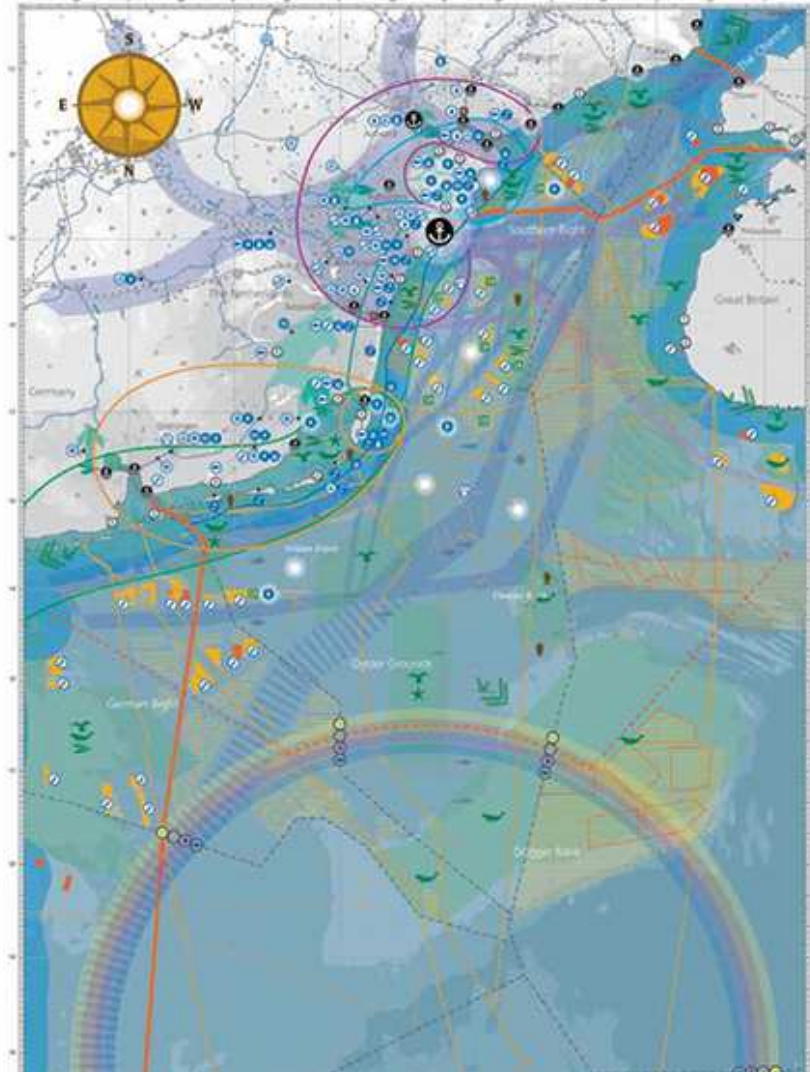
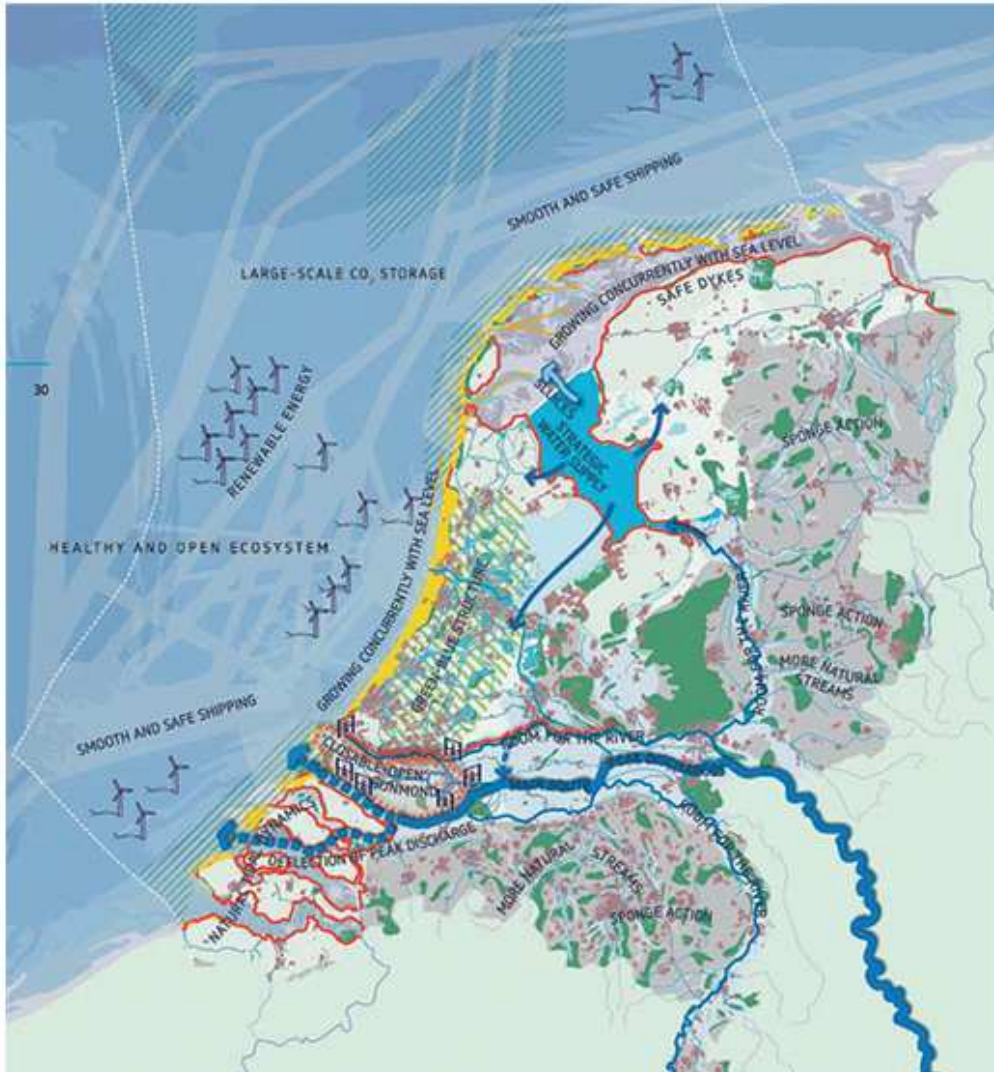


Drivers of Blue Growth:-

- **Technology developments** (offshore into deeper waters)
- **Finite resources** (food and energy scarcity driving exploration in new frontiers – 71% of the planet)
- **Greenhouse Gas emissions** – marine renewables and transport

5.4 million jobs
7 million by 2020

Maritime Spatial Planning Process



The Marine World 2030*

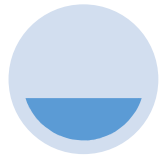
- Strong opportunities for growth
 - Commercial Shipping (people, economy, natural resources)
 - Ocean Space (economy, natural resources)
 - Naval Sectors (driver is economic power)
- Rapid transformation arising from competition & innovation
- Critical need for stability for private sector to invest



Status Quo Scenario, Global Commons Scenario, Competing Nations Scenario

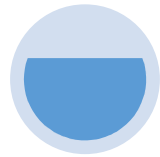
Lloyds, Qinetiq, University of Southampton (2015). Global Marine Technology Trends 2030

What's next...?



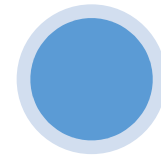
Commercial Shipping

- Advanced materials
- Big data analytics
- Robotics
- Sensors
- Communications
- Shipbuilding
- Propulsion & powering
- Smart ship



Naval

- Advanced materials
- Big data analytics
- Autonomous systems
- Human computer interactions
- Advanced manufacturing
- Energy mgt
- Cyber & electronic warfare
- Human augmentation



Ocean space

- Advanced materials
- Big data analytics
- Autonomous systems
- Sensors & communications
- Carbon capture & storage
- Sustainable energy generation
- Deep ocean mining
- Marine biotechnology

Other new norms...?

Content

- More comprehensive data sets on
 - Plastics in the marine environment
 - Ocean acidification
- The human dimension
 - Social science – understanding attitudes and behaviours
 - Integrating data from social media in the recognised maritime picture

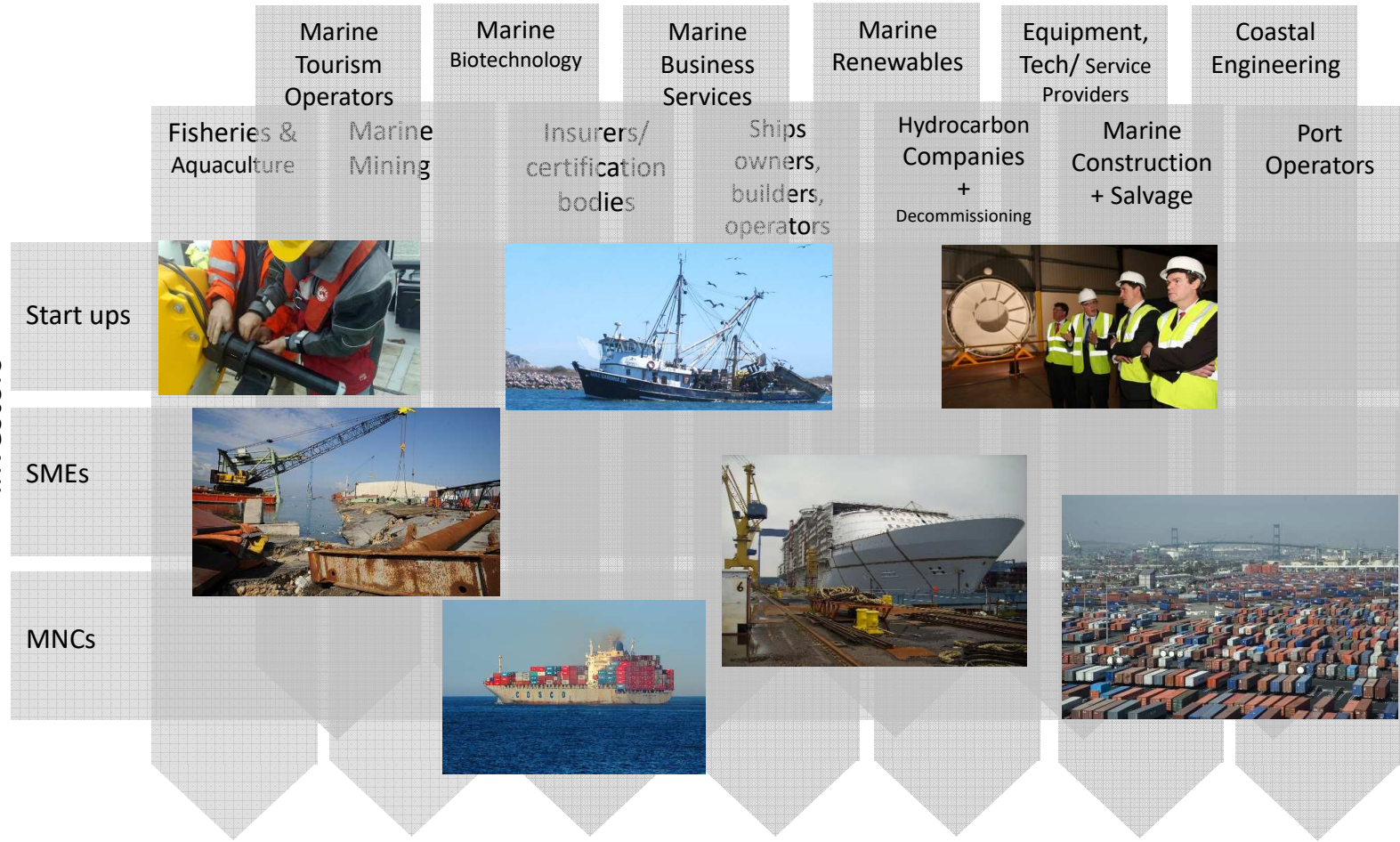
Technology

- IOT (yottabytes of data)
- Communications at sea
- Energy storage as a game changer in
 - Range and scale of activities over the horizon
 - Efficiencies and effectiveness of sensor technology e.g. gliders

Industry as users and providers of marine data

What do we mean by industry...

Industry as Users of Marine Data



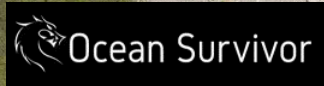
1. Cost saving/ efficiencies passed on to the industry as customer (e.g. survey once; data sharing)

2. Space for added services— entrepreneurship— opportunity for the commercial sector to monetise marine data

Manage expectations around commercial use versus commercialisation of marine data....



imerc



Industry as Producers of Marine Data

- Private companies collect even more data than public authorities, but these are seldom integrated
 - Marine data infrastructure report, (2009).
- Private companies spend €3billion/year on marine data inc. surveys to collect new data, purchasing data from third parties, and processing data until it is fit for purpose
 - European Commission Marine Data Infrastructure Framework Service Contract, No. FISH/2006/09 – Lot 2 Final Report Dec 2009



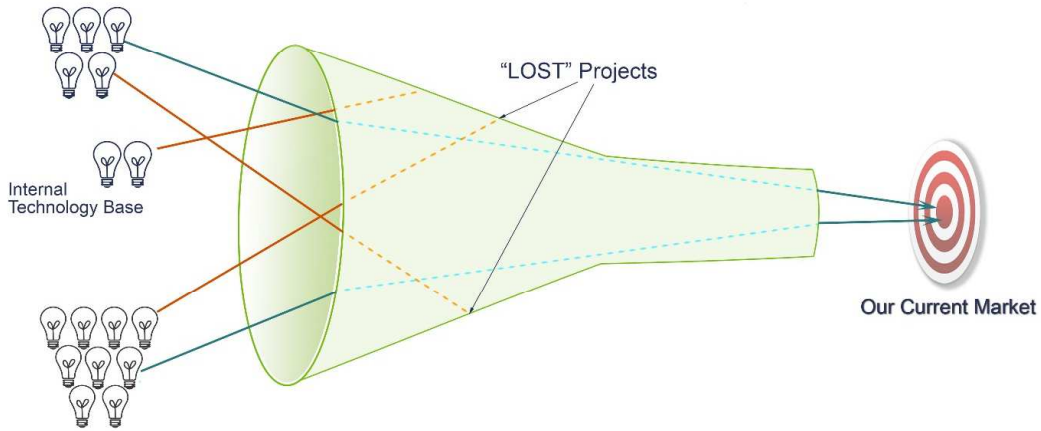
Fuzzy boundaries - Industry as both users and producers of marine data



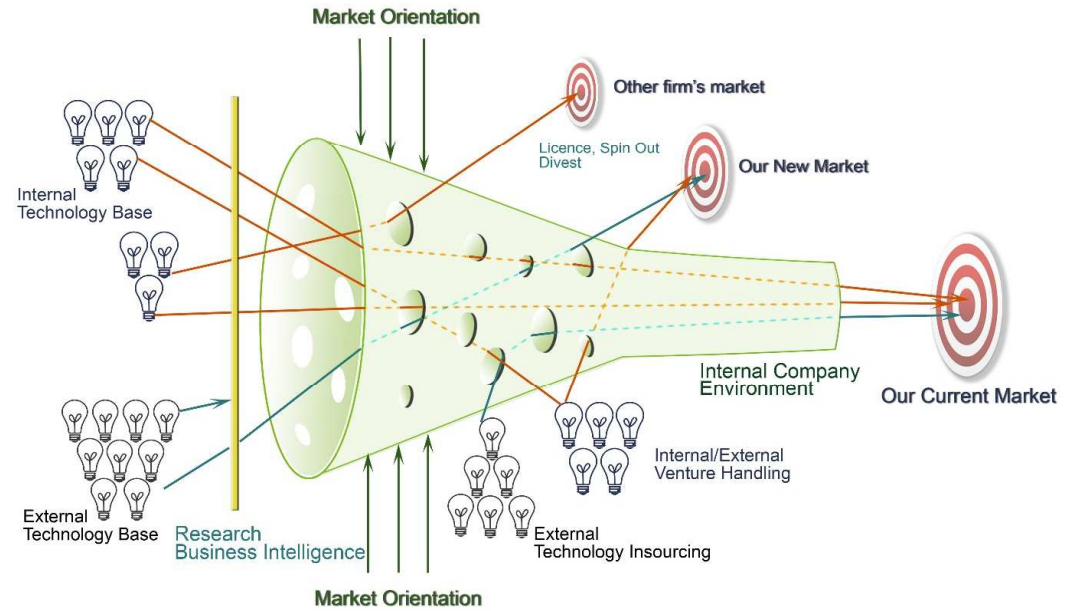
Open Data
and
Innovation



Closed Innovation



EIDON[®] Lab Open Innovation



OPIN Case Study (Ocean Power Innovation Network)

Conclusions

- Ocean observing is a global priority; Europe can demonstrate leadership
- An enhanced European marine monitoring and observation system must meet the requirements of science, policy, civil society *and* industry
- The European opportunity is to build capacity towards *both* physical infrastructure *and* institutional innovation

Recommendation

A key concept that can act as a beacon to guide us along the way is 'interoperability',

Interoperability of technologies (physical and software interoperability)

Interoperability of data (semantic and logical interoperability)

Interoperability of the people involved (human interoperability and integrated institutional arrangements).

(adapted from **McCormack, (2017)** in Bartlett & Celliers, Geoinformatics for Marine & Coastal Management).