The Ocean Economy 2030

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Presentation overview

1. Relationship between and value of ocean industries and marine ecosystems
2. Potential ocean economy growth and its industries
3. Role and drivers of innovation in sustainable development of the ocean economy
4. Funding innovation & outlook
OECD Report

http://www.oecd.org/futures/oceaneconomy.htm
The Concept of the Ocean Economy: an interactive, interdependent system

1. Industries & Ecosystems

Global environmental change: impacts on ocean health and economy

- Increasing acidification
  - Habitat degradation, Coral decline, Food web disruption
- Increases in sea temperature and sea levels
  - Coastal flooding, distribution and abundance of biota, changes in biodiversity
- Marine Pollution
  - Habitat loss, biodiversity decline, changes to ecosystem structure and function
- Impacts
  - on coastal tourism, reduced marine food production, coastal infrastructure, ports and harbours, ship routing

1. Industries & Ecosystems
Examples of marine ecosystem services and scale

<table>
<thead>
<tr>
<th>Category (examples)</th>
<th>Geographic scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food (e.g. fisheries and aquaculture)</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Fuel (e.g. mangrove wood)</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Water</td>
<td>Local/Regional</td>
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<tr>
<td>Natural products (e.g. sand, pearls, diatomaceous earth)</td>
<td>Local/Regional/Global</td>
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<tr>
<td>Genetic and pharmaceutical products</td>
<td>Local/Regional</td>
</tr>
<tr>
<td>Lifecycle maintenance, habitat and gene pool protection</td>
<td>Local/Regional/Global</td>
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<tr>
<td>Atmospheric composition, carbon sequestration and climate regulation</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Shoreline stabilization/erosion control</td>
<td>Local/Regional</td>
</tr>
<tr>
<td>Natural hazard protection (e.g. from storms, hurricanes and floods)</td>
<td>Local/Regional</td>
</tr>
<tr>
<td>Pollution buffering and water quality</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Soil, sediment, and sand formation and composition</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Tourism</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Recreation</td>
<td>Local/Regional</td>
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<tr>
<td>Spiritual values</td>
<td>Local/Regional/Global</td>
</tr>
<tr>
<td>Education and research</td>
<td>Local/Regional</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Local/Regional</td>
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</table>
2. Potential ocean economy growth and its industries

https://www.marinelink.com/images/maritime/Ocean-58606.jpg
Estimate of economic value of world marine ecosystems

- Ecosystem services provided by one “average” hectare of open seas = USD 490 per year (De Groot, 2012)
- Ecosystem services provided by one “average” hectare of coral reef = USD 300,000 per year (De Groot 2012)
- Global carbon sequestration through absorption by ocean and seas ranges between USD 74bn and USD 222bn per year (GOC, 2014)
- Direct value of output for coral reefs, sea-grass, mangroves and marine fisheries = USD 6.9 trillion (WWF, 2015)
- (note much uncertainty in these figures!)
Ocean industries and their net contribution to world economy in 2010

1.5 trillion USD in 2010

2.5% of World GVA

< 3% of World GDP

5-6% of "real economy"

Operational Oceanography for Blue Growth
Gross value-added of ocean-based industries in 2010 by industry
Marine industries with prospects for high long-term growth of business and employment

- Shipping
- Shipbuilding
- Marine equipment and supplies
- Offshore wind
- Marine aquaculture
- Maritime tourism, cruise industry
- Port activities
Role of innovation in sustainable development of the ocean economy
A KEY CONCLUSION OF THE OECD OCEAN ECONOMY 2030 REPORT: IN BALANCING OCEAN BUSINESS GROWTH WITH THE NEED FOR SUSTAINABLE USE OF THE OCEAN, INNOVATION HAS A PRE-EMINENT ROLE TO PLAY
4. Drivers of innovation (a non-exhaustive list)

- Market development: growing existing markets, new & emerging markets
- Market forces: competition, cost efficiencies.....
- Disaster response, risk mitigation......
- Political peer pressure
- Regulation
- Opportunism – capitalising on necessity
New markets: potential business opportunities

Carbon capture & storage
- Saline aquifers
- Public support
- Up front costs
Multi-purpose marine infrastructures

3. Innovation drivers

Operational Oceanography for Blue Growth
Emerging markets: Ocean Renewable Energy

• tidal, wave, current, osmosis, ocean thermal energy, conversion (OTEC)
• 337 GW of wave and tidal energy by 2050 (Nuclear 383 GW 2015)
• Decarbonising national economies (e.g. 8% UK needs from tides)
• 1.2 million direct jobs by 2050 – in deprived coastal communities
• Challenge: from demonstration to operational scale
Minesto – Underwater Kite

**Deep Green**

- Underwater kite and turbine (0.5-2.5 m/s)
- Holyhead Deep Project 0.5 MW full scale pilot
- Installation of a 10 MW marine energy array in 2017

**Why Holyhead?**

“Unique collaborative research opportunities offered by Bangor University and SEACAMS”

“Vision - the Holyhead Deep project is to be a part of the transition from fossil fuels to renewable energy, making the UK and Wales a global leader for a sustainable future”
3. Innovation drivers

Risk Management (expanding economic Arctic activity)
3. Innovation drivers

Operational Oceanography for Blue Growth

Repeated pollution

East China Sea Oil
Tanker Sanchi Fire
3. Innovation drivers

Operational Oceanography for Blue Growth
UNDP Sustainable Development Goals (SDG)

Goal 14 – Life Below Water

• 14.1 – By 2025, reduction of marine pollution of all kinds
• 14.2 – By 2020, sustainable management and protection of marine and coastal ecosystems
• 14.3 – Addressing impacts of ocean acidification through enhanced scientific cooperation
• 14.4 – By 2020, end overfishing and illegal, unreported and unregulated fishing and implement science-based management plans
• 14.5 – By 2020, conserve at least 10% of coastal and marine areas
Innovation in shipbuilding for climate change mitigation:
• hull design,
• propulsion,
• emission technology
• new fuels.....
Capitalising on necessity – Rigs to Reef

- 600 rigs decommissioning planned within 5y
- 6000 decommissioned by 2040
4. Funding innovation and outlook
Public Research and Development Funding Decline

R&D expenditures over the business cycle by source of financing, OECD area, 1995-2016

4. Funding innovation

Source: OECD Main Science and Technology Indicators Database (http://oe.cd/msti).
Long term global economic output

% average annual rate

Trend productivity to 2030 vs 2060
Source OECD 2014

Trade increasing but at slower rates

Projected average growth of seaborne trade:
- 2017-19: 4.1%
- 2020-29: 4.0%
- 2030-40: 3.3%

Source: OECD Long-Term Economic Outlook, 2014

4. Funding innovation
“Sustainable scenario” assumes high economic growth & low environmental deterioration due to the development of resource-efficient and climate-friendly technologies combined with a supportive governmental framework that provides the right incentives to allow the ocean economy to thrive economically while meeting environmental standards.

“Unsustainable scenario” assumes low economic growth and serious environmental deterioration. Coupled with faster than expected climate change and environmental damage and low rates of technological innovation, the ocean economy experiences a challenging outlook beyond 2030.

<table>
<thead>
<tr>
<th>Year</th>
<th>Business-as-usual scenario</th>
<th>Sustainable Scenario</th>
<th>Unsustainable scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1000</td>
<td>3000</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>Value added by scenario</td>
<td>USD billion</td>
<td></td>
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</tbody>
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Overview

• Public spending on R&D not keeping pace with economic growth
• Anticipated further reductions in R&D due to other pressures
• How will R&D offset loss of public investment in science and technology?
  • Collaboration
• Likely increase in expectations for investments in science and technology to create impact – demonstrable economic growth & other societal benefits