A BOOST FOR SUSTAINABLE SEA AND OCEAN SOLUTIONS

»Sustainable Sea and Ocean Solutions ISSS«
Intelligent Technologies for the Blue Economy

#EMDInMyCountry
September 23, 2021 | 10:00 – 15:00 CEST | MS Teams
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td>Welcome</td>
</tr>
<tr>
<td>10:05</td>
<td>Key note</td>
</tr>
<tr>
<td></td>
<td>Saving life in the ocean – from curiosity to understanding to solutions</td>
</tr>
<tr>
<td></td>
<td>Nina Jensen, CEO REV Ocean</td>
</tr>
<tr>
<td>10:20</td>
<td>»Sustainable Sea and Ocean Solutions ISSS« Innovation Platform</td>
</tr>
<tr>
<td></td>
<td>Memorandum of Understanding signing and greetings from the CEOs of ISSS partners</td>
</tr>
<tr>
<td>10:35</td>
<td>Panel Discussion</td>
</tr>
<tr>
<td></td>
<td>How can we provide reliable and accurate data and information on the ocean for better-informed decision-making by policy makers, businesses and investors?</td>
</tr>
<tr>
<td>11:30</td>
<td>Session I – Project pitches</td>
</tr>
<tr>
<td></td>
<td>How can zero-polluted seas and oceans be achieved and their health and productivity restored?</td>
</tr>
<tr>
<td>12:15</td>
<td>Break</td>
</tr>
<tr>
<td>13:00</td>
<td>Session II – Project pitches</td>
</tr>
<tr>
<td></td>
<td>How can the oceans be secured as a food source in harmony with its ecosystem?</td>
</tr>
<tr>
<td>13:45</td>
<td>Session III – Project pitches</td>
</tr>
<tr>
<td></td>
<td>How can offshore energy be developed and marine resources responsibly harvested?</td>
</tr>
<tr>
<td>14:30</td>
<td>Nominate the best ocean project pitch!</td>
</tr>
<tr>
<td>14:45</td>
<td>Closing and outlook</td>
</tr>
</tbody>
</table>
KEY NOTE

Nina Jensen, CEO REV Ocean

»Sustainable Sea and Ocean Solutions ISSS«
Intelligent Technologies for the Blue Economy

#EMDInMyCountry

- See recording on website -
LAUNCH: »SUSTAINABLE SEA AND OCEAN SOLUTIONS ISSS« INNOVATION PLATFORM

Memorandum of Understanding signing and greetings from the CEOs of ISSS partners

»Sustainable Sea and Ocean Solutions ISSS«
Intelligent Technologies for the Blue Economy

#EMDInMyCountry

- See video on website -
PANEL DISCUSSION

How can we provide reliable and accurate data and information on the ocean for better-informed decision-making by policy makers, businesses and investors?

Bård Wathne Tveiten (Sintef Ocean)
Alexandra Neyts (EATIP)
Anssi Mikola (RiverRecycle)
Szilvia Nemeth (EU-Commission)
Antonio Sarmento (WavEC Offshore Renewables)
1. Oihane Cabezas - “Solutions to local challenges on marine litter” LIFE-LEMA & BLUENET_EUproject from AZTI
2. Hans-Christoph Burmeister - “SEACLEAR – Cleaning the ocean floor with Autonomous Robots” from FRAUNHOFER
3. Damien Sallé - “MAELSTROM project Marine litter removal” from TECNALIA
4. Julien Legrand - “Macrocosm - an innovative buoy for ocean health monitoring” from IFREMER
5. Jukka Sassi - “Multisensor option for floating waste monitoring” from VTT
6. Chiara Lombardi - “Smart Bay S. Teresa - A platform of cooperation towards carbon neutrality” from ENEA
7. Emily Cowan - “Paving the road towards a comprehensive global plastic agreement” from SINTEF
SOLUTIONS TO LOCAL CHALLENGES ON MARINE LITTER

Oihane C. Basurko, Irene Ruiz, Anna Rubio, Irati Epelde, Pedro Liria, Leire Arantzamendi, Marga Andrés, Matthias Delpy, Julien Mader

#EMDInMyCountry
MARINE LITTER IN THE SE BAY OF BISCAY

- SE Bay of Biscay is a dead-end for plastic
- Floating litter tends to accumulate in ‘marine litter windrows’ in coastal waters of the SE Bay of Biscay
- The 35% of the litter by number (55% by weight) of floating marine litter has a sea-based origin (mainly fishing & aquaculture)

SOLUTIONS FOR MARINE LITTER

Videometry system for riverine floating litter detection, monitoring

Collection at sea

Longlin ropes for mussel aquaculture made of recycled old fishing nets

From recycled POLYAMIDE fishing nets

From recycled POLYOLEFIN fishing nets
CONCLUSION & OUTLOOK

- Stakeholders involved in the solutions need to be identified and engaged from the very beginning; they should be part of the solution.

- Ocean literacy should be promoted together with the technical development of the solution.

Funding organizations

Life LEMA Project
- www.lifelemadeu
- @Life_LEMA

BLUENET Project
- https://www.bluenetproject.eu/
- #BLUENET_EUproject

Industrial partners

CONTACT

OIHANE C. BASURKO
ocabezas@azti.es
@iohanecb

BLUENET Project
- https://www.bluenetproject.eu/
- #BLUENET_EUproject
SEACLEAR – CLEANING THE OCEAN FLOOR WITH AUTONOMOUS ROBOTS

Hans-Christoph Burmeister

#EMDInMyCountry
INTRODUCTION

- Past collection efforts have focused mostly on surface waste
- only a few local efforts to gather underwater waste, always using human divers
- Seaclear = SEarch, identificAtion and Collection of marine Litter with Autonomous Robots
THE SEACLEAR PROJECT

- Cooperative control of the robotic team
- Integrated underwater and surface mapping
- Differentiation of debris vs marine life
- Underwater collection of litter
- Disposal of litter in the collection basket
When fully operational, the SeaClear system aims to detect and classify underwater litter with 80% success rate, collect it with a 90% success rate; This equals to 70% reduced cost compared to divers.

CONCLUSION

A cost-effective, fast and safe way to clean up seafloors, making our world a cleaner place.

Special thanks to the European Union and their Horizon 2020 research and innovative programme, who funded this project under grant agreement No. 871295.
MAELSTROM PROJECT
MARINE LITTER REMOVAL

Damien SALLÉ
Transversal coordinator for Robotics
TECNALIA

#EMDInMyCountry
MAELSTROM IN A NUTSHELL

For this reason, we have designed MAELSTROM,
A ROBOTIC FLOATING PLATFORM FOR EFFICIENT AND SELECTIVE ML REMOVAL FROM WATER COLUMN & SEABED

MAELSTROM Solution: a cable robot suspended from a floating platform with different tools: dredge, grab, hook & gripper
CONCLUSION & OUTLOOK

• The final design of the robot is ongoing before patenting, manufacturing and testing

• First cleaning campaign in Venice during the summer of 2022!

→ Keep tuned!

www.maelstrom-h2020.eu

https://www.youtube.com/channel/UCwGpE7VUFUsoiKdgFuZUvUQ  ;
https://www.facebook.com/MaelstromH2020
MACROCOSME, AN INNOVATIVE BUOY TO ASSESS MARINE ENVIRONMENT ECOLOGICAL HEALTH

Julien LEGRAND - IFREMER
Fréderic PERIE - Total Energies
Aurore BARBERO – IFREMER
Marc BOUCHOUCHA – IFREMER
Jean-François BOURILLET – IFREMER
Jean-Romain LAGADEC - IFREMER

#EMDInMyCountry
Needs
• Determine the true impacts of O&G produced water on the whole marine ecosystems functioning

Challenges
• Better control of environmental and societal risks
• Assess a global impact (indicators in terms of physico-chemical parameters, biomass and biodiversity)
• Correlate the responses of organisms to environmental changes to assess the functional quality of an environment

Finality
• Optimize the production tool to limit effects on the Ecosystem
• Use this ecosystem health evaluation tool to others sectors
• Exposure of large ecosystems (macrocosm) at the surface and subsurface
• Natural bio-colonization on 1 buoy in the plume and 1 reference buoy outside the plume
• Comparison of the long-term (seasons) evolution of the effects of discharges in surface waters for different trophic levels (plankton, filter feeders, fish, MM), noise, contamination, etc.
• Integration of high TRL bricks
• From sensor data to indicators
PILOT EXPERIMENT

- To achieve the stated targets in terms of:
  - sensors integration and acquisition frequency
  - energy autonomy
  - communication needs
  - surface excursion and seafloor footprint diameters
  - environmental conditions resistance.

- This pilot phase will validate the technical, scientific and economical options and will give exposure to the MACROCOSME.

PERSPECTIVES

- To address other environmental Monitoring needs
  - Marine Renewables
  - Aquaculture
  - Port Infrastructures

- Adaptation of Macrocosme buoy to fit with the requirements of these applications
  - Adaptation of the power production unit
  - Adaptation of the payload with pertinent sensors (LIDAR, …)
MULTI-SENSOR OPTION FOR FLOATING WASTE MONITORING

Jukka Sassi
VTT Technical Research Centre of Finland Ltd
23 September 2021

#EMDInMyCountry
WHAT IS MULTI-SENSOR MONITORING?

Combination of selected optical sensors, which collect data simultaneously from the same target area:

- Data is collected from predefined area (e.g., river or other waters) using drones or from fixed installation.

- Data will be analysed to enable detection of floating debris and differentiation of plastic objects from organic material.

- Target objects: PET and HDPE bottles, LDPE wrap, PS cans and organic material (pieces of wood and branches)
CONCLUSION

• Multi-sensor imaging is promising method for separating floating plastic waste from organic material.

• Drones offer excellent platform for sensors in cases where aerial investigation of larger areas is needed.

• Further efforts will be targeted in possibility to distinguish different plastic types from each other and how this process could be applied by utilising machine learning methods.
THANK YOU FOR YOUR INTEREST

Contact: jukka.sassi@vtt.fi
SMART BAY SANTA TERESA - A PLATFORM OF COOPERATION TOWARDS CARBON NEUTRALITY

Chiara Lombardi (ENEA)

#EMDInMyCountry
Over three billion of people depend on marine and coastal biodiversity for their livelihoods. Still, the most of the services provided by ecosystems is poorly known by scientists and accepted by decision makers and stakeholders. To reduce pollution and preserve health in the ocean we have to make people aware of marine ecosystems potential to integrate them in sustainable and climate-resilient actions.
What is SMART BAY Santa Teresa? A *cooperation platform*, among public and private entities (research institutes, municipality) and local stakeholders whose aim is to build common projects, *ecosystem-based* for climate change adaptation, mitigation, and water quality improvement.
How the Nature Capital of a territory might help the ecological transition of the area?

**Local actors** (municipality, stakeholders) have to become the drivers of the change: less polluted ocean, more sustainable management

**Methods:**

- **Understanding and sharing needs**
  - **Municipality** - Scientific support for innovative and sustainable actions for coastal management (e.g. sea level rise, coastal erosion, port area regeneration, biodiversity promotion…)
  - **Aquaculture** - Data provisioning and interpretation for production threaten by climate change and direct anthropogenic impacts
  - **Sustainable tourism** - Dissemination actions to engage citizens in more sustainable behaviours
  - **Research** - The use of marine and terrestrial ecosystems – still neglected- in NBS
  - **Jobs** - opportunities for local traditional business; circular economy

**Actions:** Small cooperative projects

- To calculate the contribution of local aquaculture as blue carbon sink by measuring CO₂ fixation and production (via fuel, energy, plastic pollution) of local activities
- To test and validate innovative monitoring network in aquaculture fields to improve environmental monitoring (Internet of Underwater Things-IoUT)
- To measure ES (biodiversity promotion, CO₂ storage) by local ecosystems and model their functions under climate change threats for local management interventions
- To promote citizen engagement via dissemination actions and questionnaires valuating the social perception of the nature capital

**Final goal**

The first carbon-neutral bay regenerated on common shared Nature Based Solutions
A community led-approach is the key to drive actions aiming to reduce pollution and preserve the ocean health.

To overcome these challenges it is necessary to design solution nature based who are helping the communities to become resilient.

Research has an extremely important part in this plan by monitoring the ocean (big data production) and providing knowledge on the environment and ecosystems, with related functions and services.
PAVING THE ROAD TOWARDS A COMPREHENSIVE GLOBAL PLASTIC AGREEMENT

Emily Cowan – SINTEF Ocean
Department of Climate and Environment

#EMDInMyCountry

How can zero-polluted seas and oceans be achieved and their health and productivity restored?
1. Oihane Cabezas - “Solutions to local challenges on marine litter” LIFE-LEMA & BLUENET_EUp project from AZTI
2. Hans-Christoph Burmeister - “SEACLEAR – Cleaning the ocean floor with Autonomous Robots” from FRAUNHOFER
3. Damien Sallé - “MAELSTROM project Marine litter removal” from TECNALIA
4. Julien Legrand - “Macrocsm - an innovative buoy for ocean health monitoring” from IFREMER
5. Jukka Sassi - “Multisensor option for floating waste monitoring” from VTT
6. Chiara Lombardi - “Smart Bay S. Teresa - A platform of cooperation towards carbon neutrality” from ENEA
7. Emily Cowan - “Paving the road towards a comprehensive global plastic agreement” from SINTEF
1. **Izaskun Zorita** - “Towards sustainable offshore aquaculture in the Basque coast (SE Bay of Biscay)” from AZTI
2. **Cristian Chiavetta** - “The B-Blue project: blue biotechnologies to support the transition to a circular management of the...
3. **Friederike Ziegler** - “The role of blue food in future sustainable diets” from RISE
4. **Bas Binnerts** - “AUVs for aquaculture monitoring” from TNO
5. **Christian Schlechtriem** - “Fish metabolism studies for safe food” from FRAUNHOFER
6. **Herman Amundsen** - “Autonomous robotic operations in aquaculture” from SINTEF
TOWARDS A SUSTAINABLE OFFSHORE AQUACULTURE IN THE BASQUE COAST (SE BAY OF BISCAY)

Izaskun Zorita, Manuel González, Leire Arantzamendi, Oihana Solaun, J. Germán Rodríguez, Marta Revilla, Joxemi Garmendia, Iñigo Muxika, Oihane Cabezas, Joana Larreta, Yolanda Sagarminaga, Luis Ferrer, Almudena Fontán, Juan Bald.

#EMDInMyCountry
OFFSHORE AQUACULTURE FACILITIES

Decline of fishing activity

Longline in offshore waters

Raft in sheltered waters

Ofshore aquaculture: sustainable food system
OFFSHORE AQUACULTURE TRAJECTORY


Marine Spatial Planning
Environmental Impact Studies
Authorizations
Longline installation

Feasibility of mussel farming
Creation of a mussel company

Monitoring: biotoxins, pathogens, microbiological contamination, MPs
Species diversification (IMTA)
Development of environmentally friendly materials

Recycled ropes (marine litter) Biobased materials
CONCLUSION & OUTLOOK

- Offshore aquaculture can become an opportunity to obtain sustainable protein in the Basque Country. However, more efforts are needed to consolidate the value chain of aquaculture products.

- The declaration of a Mollusc Production Zone in offshore waters by the Basque Government is a key 'push' to attract new investors to bet on the production of low trophic level species.

- Funding organizations:

  Thank you!!!
B-BLUE: A STRATEGIC PROJECT

Cristian Chiavetta

#EMDInMyCountry
Main Project’s Goal:

To build the Med Blue Biotechnology community and activate a coordination mechanism in the Blue Biotechnology sector at Mediterranean level (including Med Southern Shore countries)
Innovation to Market. How?

the multilayers integrated structure of B-Blue:

- activation of the digital Blue Biotechnology (BBt) community (exploiting the Marina Platform)
- development and release of a digital matchmaking tool
- activation of 5 BBt Hubs at territorial level on specific value chain and connection with existing network of territorial multistakeholders labs
BBt HUB: a model to be adapted & replicated

- Knowledge Development and Transferring
- Networking
- Promoting New Collaboration
- Advocacy

Algae production for high-value compounds

Green/blue

Aquaculture/fisheries discard valorization in added value sectors

Cristian Chiavetta
cristian.chiavetta@enea.it
+39 329 3077350
THE ROLE OF BLUE FOODS IN FUTURE SUSTAINABLE DIETS

Friederike Ziegler

#EMDInMyCountry
BLUE FOODS

- Are (often) healthy and sustainable - we should eat more, of the right types
- Demand and production is growing rapidly
- Tools, metrics and data needed to assess sustainability- for improvement and communication

Data from FishStatJ
Costello et al. 2019 The future of food from the sea https://oceanpanel.org/blue-papers/future-food-sea
Costello et al. 2020 The future of food from the sea https://www.nature.com/articles/s41586-020-2616-y
FROM CARBON FOOTPRINT OF NORWEGIAN SEAFOOD…
…TO DEVELOPMENT OF NOVEL AQUAFEEDS

Ziegler et al. 2021  Greenhouse gas emissions of Norwegian seafoods J Ind Ecol
CONCLUSION & OUTLOOK

• Take home: Seafood is a both healthy and sustainable food option, with the right guidance

• Challenge mitigation: Standardised databases, motivate industry partners to initiate continuous data collection and contribute their data

• Projects funded by: FHF (Norwegian Seafood Research Fund), Mistra and the Norwegian Research Council

• Seafood group at RISE spans consumer science, nutrition, processing techniques and product design, we collaborate internally, nationally and internationally

Thanks!

Friederike Ziegler, +46 704 205609, friederike.ziegler@ri.se

Swedish interdisciplinary research center for Blue Food: bluefood.se

International collaboration on Blue Food potential: bluefood.earth
**AUVS FOR AQUACULTURE MONITORING**

WHY AUVS AND OPEN CHALLENGES

- **Why AUVs:**
  - 3D remote monitoring of environment (e.g. sampling, and habitat mapping) and seaweed growth + health.
  - Inspect seaweed and seabed at closer distance w.r.t. ASVs and more robust navigation underwater then ROV (supported by ASV).

- **Open challenges:**
  - **Connectivity:** No radio connectivity
  - **Navigation:** No GPS underwater, waves + currents, dead reckoning, acoustic ranging limited by seaweed
  - **Perception:** poor optical visibility
  - **Endurance:** coop with entanglement/ collision, limited battery life

ALGAEDEMO PROJECT
TNO WORK SCOPE

- **Goal:** Investigate opportunities for Autonomous Underwater Vehicles (AUV) for monitoring the growth of seaweed and the condition of critical structures such as substrates, mooring and anchoring.

- **Approach:** Experimental performance validation of AUV navigation and sensor performance in a seaweed farm in the Schelphoek sanctuary.

- **Results:** Demonstrations and publication on the value and limitations of using AUVs for aquaculture based on experimental validation.
ALGAEDEMO PROJECT

VEHICLES

Interferometric SSS Navigation sensors Camera(s) Turbidity sensors Acoustic communication
ALGAEDEMO PROJECT

LAUV inspection seabed

ROV inspection seabed

Portside Image Track 3

Portside Image Track 18
FISH METABOLISM STUDIES FOR SAFE FOOD

Christian Schlechtriem (Fraunhofer IME)

#EMDInMyCountry
Future growth of world aquaculture production strongly depends on the use of plant derived feed commodities.
FISH METABOLISM STUDIES

Metabolite characterization

Residue quantification

Fraunhofer IME –
Test facility for fish metabolism studies
CONCLUSION & OUTLOOK

EU Commission Working Documents:

Nature of pesticide residues in fish (fish metabolism)  SANTE/10254/2021
Dietary burden calculations for fish  SANTE/10250/2021
Magnitude of residues in fish  SANTE/10252/2021

What’s next?
• Investigations on further fish species
• Establishment of in vitro methods for metabolism studies
• Metabolism studies in recirculated aquaculture systems (RAS)
AUTONOMOUS ROBOTIC OPERATIONS IN AQUACULTURE

Herman Biørn Amundsen,
Dept. of Aquaculture Technology, SINTEF Ocean
PhD candidate, Dept. of Engineering Cybernetics, NTNU
herman.biorn.amundsen@sintef.no

#EMDInMyCountry
Precision fish farming (PFF)

Examples of autonomous UUV operations

CageReporter (Research Council of Norway project no. 269087)
Examples of autonomous UUV operations

Amundsen et.al. (2021) Autonomous ROV inspections of aquaculture net pens using DVL, *IEEE Journal of Oceanic Engineering*
Conclusions and outlook

• Closer to realizing autonomous operations in aquaculture

• Further need for knowledge about how underwater robots impact fish

• We are grateful for the funding from the Research Council of Norway and for the collaborative efforts from our project partners
  • CageReporter: Water Linked, Sealab, NTNU, Norsk Havservice, HES-SO
  • Artifex: Maritime Robotics, Argus Remote Systems, WavEC, NTNU
  • CHANGE: NTNU, MIT
PROJECT PITCHES II - AQUACULTURE

1. Izaskun Zorita - “Towards sustainable offshore aquaculture in the Basque coast (SE Bay of Biscay)” from AZTI
2. Cristian Chiavetta - “The B-Blue project: blue biotechnologies to support the transition to a circular management of the
3. Friederike Ziegler - "The role of blue food in future sustainable diets” from RISE
4. Bas Binnerts - “AUVs for aquaculture monitoring” from TNO
5. Christian Schlechtriem - “Fish metabolism studies for safe food” from FRAUNHOFER
6. Herman Amundsen - “Autonomous robotic operations in aquaculture” from SINTEF
PROJECT PITCHES III - ENERGY AND RAW MATERIALS HARVESTING

1. **Mário Vieira** - “OceanACT - A Portuguese Atlantic lab for future ocean technologies” from +Colab Atlantic

2. **Massimiliano Palma** - “Forecasting Ocean energy in the Mediterranean Sea” from ENEA

3. **Gabriela Sierra** - “Geophysical site characterization: Ultra-high resolution multichannel seismics” from FRAUNHOFER

4. **Yago Torre-Enciso** - “Learning by doing?” from Tecnalia

5. **Alan Tassin** - “Wave impacts: science advances and applications” from IFREMER

6. **Pauliina Rajala** - “Material challenges from surface to deep sea– advanced monitoring and material solutions” from VTT
OCEANACT - A Portuguese Atlantic Lab for Future Ocean Technologies

Mário Alberto Vieira

#EMDInMyCountry
THE NEED BEHIND OCEANACT

1. The Energy Transition is an unstoppable trend
2. Marine Energy will play a major role in the new energy paradigm
3. There are still challenges for blue economy innovative technologies
4. The latest stages of development require real offshore demonstration

Portugal has been the testbed of several ocean energy devices…

…but lacks entity responsible for the promotion and management of existing infrastructures
OUR VISION

OceanACT aims at fostering the development of innovative offshore technologies by reducing their time to market.

How?

- Providing access to STATE-OF-ART offshore testing infrastructure
- Offering SUPPORT SERVICES for implementation of devices offshore
- Boosting the maturity of the SUPPLY CHAIN

OceanACT is committed to explore synergies with other test sites and R&D entities towards the development of innovative subsea solutions
NEXT STEPS

Overcome implementation **CHALLENGES** by:

- **ADAPTING EXISTING INFRASTRUCTURES** to the needs of technology developers
- Attracting **TECHNOLOGY DEVELOPERS** and **DEMONSTRATION PROJECTS**
- Cooperating with **NATIONAL, REGIONAL** and **INTERNATIONAL AUTHORITIES** to **SIMPLIFY** the demonstration of innovative offshore technologies

Support the generation of an **Atlantic R&D Centre** within the Innovation Platform for **Sustainable Subsea Solutions (ISSS)**

Thank you for your attention 😊
mario.vieira@colabatlantic.com
FORECASTING OCEAN ENERGY IN THE MEDITERRANEAN SEA

Massimiliano Palma

#EMDInMyCountry
CAN WE HARVEST ENERGY FROM THE SEA?
MEDITERRANEAN WAVE ENERGY FORECAST

- Model implemented: WAM (Wave prediction Model)
- Resolution 1/32° x 1/32° (about 3.5Km)
- Forced by SKIRON data
- Five days forecast
- 10 higher resolution basins

- Model implemented SWAN
- Resolution 800m
- Forced by SKIRON data

OPERATIONAL CIRCULATION MODEL (MITO)

- MITgcm – Explicit Tides (M2, S2, K1, O1)
- Lateral Tide + Tidal Potential
- Average resolution 1/48° (2.3 Km)
- Minimum resolution 230m (Gibraltar and Turkish Straits)
- 100 Vertical Levels
- Initialized with Copernicus data

- Gibraltar Strait
- Significant wave height and wave power
- Velocity
- Messina Strait
PEWEC (PENDULUM ENERGY CONVERTER)

Designed to exploit to the maximum all the components of the wave motion affecting a hull that contains within it the device that extracts the energy.

OIL SPILL TRAJECTORY

Example of oil spill released in the Strait of Gibraltar (4 days simulation)
Pollutants type: Non-weathering.
Spill size: 30000 barrels (10000 barrel each point).

This trajectory has been produced by GNOME (General NOAA Oil Modeling Environment). The model is driven by velocity field and wind stress provided by MITO.

References:

Palma et al (2020): “Short-term, linear, and non-linear effects of the tides on the surface dynamics in a new, high-resolution model of the Mediterranean Sea circulation”.


Liberti et al (2013): “WAM energy assessment in the Mediterranean, the Italian perspective”.

Geophysical site characterization: Ultra-high resolution multichannel seismics

Gabriela Sierra Lombera
gabriela.sierra@iwes.fraunhofer.de

If you are interested in this presentation, please contact Gabriela Sierra Lombera directly
¿LEARNING BY DOING?

Yago Torre-Enciso

#EMDInMyCountry
INTRODUCTION

Barriers for offshore energy development

- Administrative
- Environmental
- Economic
- Technological
- Social acceptance
- ...

Technological Barriers

- Technology diversity
- Technological risks
  - Functionality
  - Survivability
- Site selection
  - Adequacy of sea conditions
  - Seabed characteristics
  - Logistics and accessibility
- Risk management
  - Risk assessment
  - Risk sharing
- Lack of funds
Biscay Marine Energy Platform

BiMEP is an open sea full scale grid connected test centre managing two sites:

**Mutriku site**

Wave power generation plant upgraded to house tests
- Two chambers ready to host OWC turbines
- Control & measurement PLC
- Air Valve (Damper)
- Pressure sensor and water level radar
- Incoming waves measurement

**Armintza site**

- 4 Cables, 5MW each, connected to the grid
- Water depth 50-90 m
- 24/7 Surveillance and emergency response
- Close enough for fast access
- Privileged ocean climate

<table>
<thead>
<tr>
<th>Hs</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1m</td>
<td>20%</td>
</tr>
<tr>
<td>1m-5m</td>
<td>78%</td>
</tr>
<tr>
<td>&gt;5m</td>
<td>2%</td>
</tr>
</tbody>
</table>

Suitable wind conditions

[https://trlplus.com](https://trlplus.com)
To boost the technology development it is needed to test and demonstrate the technologies.

...in the last 30 years, more than 50 projects and prototypes have been tested all over the world.

...the majority of them have been developed thanks to public money.

...the sector does not have access to key information explaining what was wrong?

¿LEARNING BY DOING? YES AND LEARNING BY SHARING
WAVE IMPACTS – SCIENCE ADVANCES AND APPLICATION

Alan Tassin – IFREMER
alan.tassin@ifremer.fr

#EMDInMyCountry

If you are interested in this presentation, please contact Alan Tassin directly
MATERIAL CHALLENGES FROM SURFACE TO DEEP SEA – ADVANCED MONITORING AND MATERIAL SOLUTIONS

Dr. Pauliina Rajala
Prof. Elina Huttunen-Saarivirta
Dr. Mikko Vepsäläinen
VTT Technical Research Centre of Finland Ltd.

#EMDInMyCountry
BACKGROUND

• Marine environment is challenging for materials

• Challenging maintenance

• Environmental changes due subsea activities

• Potential for severe consequences
VTT’S WORK

Research topics

- **Corrosion & Material performance**
  - Prevention, novel materials
- **Biofouling & Scaling**
  - Mechanisms, anti-fouling technologies
- **Sensor technologies**
  - *In-situ* monitoring
  - Solid state sensors
CONCLUSION & OUTLOOK

• New material solutions are needed to ensure sustainable sea and ocean infrastructures

• Need for *in situ* monitoring of materials performance and environmental parameters
PROJECT PITCHES III - ENERGY AND RAW MATERIALS HARVESTING

1. **Mário Vieira** - “OceanACT - A Portuguese Atlantic lab for future ocean technologies” from **+Colab Atlantic**

2. **Massimiliano Palma** - “Forecasting Ocean energy in the Mediterranean Sea” from **ENEA**

3. **Gabriela Sierra** - “Geophysical site characterization: Ultra-high resolution multichannel seismics” from **FRAUNHOFER**

4. **Yago Torre-Enciso** - “Learning by doing?” from **Tecnalia**

5. **Alan Tassin** - “Wave impacts: science advances and applications” from **IFREMER**

6. **Pauliina Rajala** - “Material challenges from surface to deep sea– advanced monitoring and material solutions” from **VTT**
THANK YOU FOR YOUR INTEREST AND PARTICIPATION!

For more information: s.fhg.de/ISSS

Contact:
Fraunhofer-Gesellschaft
Katrin Mögele  
katrin.moegele@zv.fraunhofer.de
Michael Thurm  
michael.thurm@zv.fraunhofer.de
Dr. Julia Freis  
jlulia.freis@zv.fraunhofer.de
Dr. Johannes Nowak  
johannes.nowak@zv.fraunhofer.de
www.fraunhofer.de/en