New developments in Blue growth deep subsea activities

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**Key figures**

**First supplier of French Defence in 2014**
Industrial actor in the French deterrent force and primary contractor of the French Navy

**50 Navy clients worldwide**

**Naval sector jobs** 40,000

**Shareholding**
- Government Shareholding Agency 63.58%
- Thales 35%
- DCNS staff members 1.02%
- DCNS 0.40%

**2014 figures**

- **Revenues** €3.1 billion
- **International share** 33%
- **Order intake** €3.6 billion
- **Order book** €13.2 billion
- **Investments in R&D** ≈ €100 million or 3% of income
- **Group staff** (including subsidiaries) 13,130
Overview of our on going development on subsea activities
Energy infrastructure for offshore deep sea
Energy infrastructure for offshore deep sea

Subsea power plant

Supply of full integrated modules from engineering to commissioning
- stand alone watertight capacity
- watertight capacity with integration of process
- full integrated modules with:
  - Switchboards
  - Uninterruptible power Supply
  - Variable speed drive
  - Energy generation
- Subsea power grid

Range of solution based on known technologies

Energy storage, watertight capacity, integration
Docking station for UUV
World’s first multiple sea trials on dynamic docking

AsterX, 800 kg, 4.5 m

TRL 7/8
Adaptation of docking systems for deep subsea permanent monitoring

- Contact less data transfer system
- Contact less energy reloading system
- Long and short range Homing system
- Underwater long range communication & positionning (up to 10km)

Compatibility with different types of UUVs (shape, size, power …)
Environnemental and assets Monitoring System
SUBSEA WATCHER- Real time, Autonomous and Intelligent - Area and Environmental Monitoring System
SUBSEA WATCHER : Monitoring

✓ Meteo / Flow / Wave
✓ Physical parameters (°C, Salinity, PH, Conductivity…)
✓ Anthropogenic and biological noise ;
✓ Turbidity
✓ Biocénosis and cetacean detection
✓ Oil
✓ Chemical products
✓ All others parameters with existing sensors or new one
For Deep ecosystem observatories and For providing EIA and risk management complete solutions for Deep projects

EIA process
Source: DNV

Monitore / Detect a change / Confirm / Classify / Locate / Simulate the impact
SUBSEA Watcher: a multifunction software

- Drones and sensors sizing
- Optimised Man/machine interface (IHM)
- Self Learning system
- Drones Swarm control and gestion
- Area and Impact simulation modele
- Impact discovery and mitigation strategies

DCNS for Japan / 02/09/2016 / 14

Crédits photos: DCNS, Marine nationale
Observatoires autonomes et persistant en mer avec option d’extension du périmètre par AUV

Discussion en cours pour un FUI
Noise and turbidity mitigation
Overview on Deep Sea Mining potential impacts

- High **salinity water** discharged from fresh water production
- Vessel’s **potential leak** : Oil, fuel, ore from unloading or riser
- Vessel’s **noise and vibration** : DP2, Propulsion, diesel generator, riser, mining tools and sizer
- Material’s impact and Habitat’s impact : tailing and rocks to be moved
- **Turbidity** : plume from mining and from dewatering system discharge
- Vessel’s and mining tool’s **Light**

*Source: «Offshore Production System Definition and Cost Study – Nautilus Minerals»*
### Focus on noise impacts

![Diagram](image)

**Indicative idea about noise impact on cetaceans**

*Source: The convention of Biological Diversity (CBD 2012)*

<table>
<thead>
<tr>
<th>EFFECT TYPE</th>
<th>IMPACT ON INDIVIDUALS AND GROUPS</th>
<th>POTENTIAL IMPACT ON POPULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NONE</strong></td>
<td>Perturbation under ambient noise level or under detection threshold of species</td>
<td>None</td>
</tr>
<tr>
<td><strong>BEHAVIOURAL</strong></td>
<td>Perturbations are detected but individuals/groups show no reactions</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Perturbations are detected and animals show slight response</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Individuals modify their behaviour but normal activities are not affected</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Individuals modify their behaviour and stop their normal activities</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>PHYSIOLOGICAL</strong></td>
<td>Hearing is temporarily altered</td>
<td>Medium/High</td>
</tr>
<tr>
<td></td>
<td>Hearing is permanently damaged</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Tissue damages, haemorrhages</td>
<td>Very high</td>
</tr>
<tr>
<td></td>
<td>Injuries leading directly to animal death</td>
<td>Very high</td>
</tr>
</tbody>
</table>

**Communication range's predicted decrease for baleen whales, owing to increases in ambient noise due to shipping**

*Source: Okeanos Foundation 2008*
Focus on noise impacts

Anthropogenic and natural noises
Source: Boyd and Al. (2008)

No reliable datas on the future DSM real noise emission characteristics
→ Estimated at mainly 1H-1kH and 180/190 Db?

Anthropogenic noises compared to fish and mammal’s hearing
Source: Slabbekoorn et al. (2010)
Focus on suspended particles impacts

According to current, soil morphology and sediment types and sizes, suspending particles carried from decade up to thousand km$^2$ from the mining area.

Impacts are still globally unknown and contradictory: Photosynthesis, PH, O$_2$, T$^\circ$C and nutrients, biodiversity, enter of heavy metals in the food chain, benthic animals burying ...
Our conviction for DSM

4 main issues are the prerequisites to allow DSM development

➢ Developing Deep Ecosystem scientific knowledge

➢ Lowering DSM impacts, especially for noise and turbidity, by using an environmentally friendly mining design and mitigation shield equipments

➢ Monitoring DSM complete impacts in real time

➢ Promote transparency

DCNS’s aims at providing solutions for these issues
SubSea Quieter: our global solution to reduce underwater noises

R&D on a « shield » system to mitigate noises and to create a turbidity containment for a 3000m depth deep sea exploitation

→ First results: more than 10db Mitigation for low frequency noises
→ >120db area reduction with a 10 factor
→ On going SPECFEM Simulation on a real case
→ On going development to TRL 7/8 in 2020

2000m depth SSQ mitigation result (simulation)  
Source: DCNS

Estimate of 500Hz- 180-190DB noise impact in a virtual open sea with a 10 Db mitigation  
Source: DCNS
Drilling-Coring ROV solutions
SISCA: Innovating System for deep sea drilling and Core-Sampling