EO4OG PROJECT

Roadmap for Developing Earth Observation in the Offshore Oil and Gas Sector

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esa

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1 Introduction

Over the past two decades, Earth Observation (EO) technologies have shown considerable potential for application across the entire life cycle of oil and gas (O&G) projects. The European Space Agency (ESA) has been progressively working with O&G stakeholders to demonstrate new developments in EO capabilities and enhance the industry's understanding of the benefits of EO for O&G operations.

In March 2014, ESA established the Earth Observation for Oil & Gas (EO4OG) initiative. EO4OG aims to provide a base for the development of EO within the oil and gas sector, emphasizing both onshore and offshore perspectives and considering all stages throughout the life cycle of typical O&G projects. Four consortia were established to identify geo-information requirements of the O&G industry, examine the ability of current and emerging EO technologies to address these requirements and analyze gaps in the utilization and capabilities of EO. Two consortia focusing on onshore operations were led by Hatfield Consultants and OTM Consulting, while C-CORE and CLS led the two EO4OG offshore project teams. The work of the EO4OG technical teams was organized around the following major tasks:

- Task 1: identify geo-information requirements throughout the O&G project lifecycle
- Task 2: assess current and emerging EO capabilities and gaps in relation to O&G industry needs
- Task 3: develop a roadmap for the further utilization and advancement of EO within the O&G sector

Task 1 was carried out independently by each of the four technical teams. In order to present a comprehensive and coherent assessment of the offshore context, Task 2 was executed as a close collaboration of both EO4OG offshore consortia. This included the planning and execution of the EO4OG stakeholder workshop held on November 18, 2014 in London. The workshop allowed attending EO experts and O&G industry representatives to review the key project findings and discuss potential opportunities for adopting EO technologies in support of O&G operations. All relevant documentation and presentation material is accessible via the OGEO portal (www.ogeo-portal.eu).

Building on the results of the previous tasks, this document represents the principal outcome of Task 3. It was prepared as a collaborative effort of the EO4OG offshore consortia to present a common perspective on the future development and implementation of EO technologies within the offshore oil and gas sector.

2 Recommendations

The following sections summarize a number of guiding principles that should be observed in continuing the momentum built by EO4OG. Specific elements addressed include industry buy-in and ownership, adherence to user requirements and compliance with efforts to establish a common operating picture.

2.1 Industry Buy-In and Ownership

In order to foster the use and application of EO technologies, effective buy-in and support from the industry is critical. The EO Subcommittee of the International Oil and Gas Producers Association's (IOGP) Geomatics Committee was set up to support IOGP members using and maximizing the benefit of EO technologies. Accordingly, a temporary task force could be set up within the Subcommittee to consider specifically lessons learned from EO4OG and their translation to a broader operational context within the industry. The task force could have strictly constrained terms and focused effort to provide a critical recognition of the value of EO from an O&G industry perspective. Initially emphasis could be placed on pilot projects that address critical industry challenges. These projects should take advantage of the information generated during Task 1 and focus on one or more key challenges faced by the offshore O&G sector. Table 1 shows offshore challenges ranked by cumulative importance in each of the project life cycle stages of pre-license acquisition (Pre), exploration (Exp), Development (Dev), production (Prod) and decommissioning (Decom).

Table 1: Prioritized Offshore Challenges

PRIORITIZED OFFSHORE CHALLENGES		IMPORTANCE IN LIFE CYCLE STAGE[1]				
Rank	**Challenge**	**Pre**	**Exp**	**Dev**	**Prod**	**Decom**
1	Distribution and abundance of marine mammals	4	4	4	4	4
	Fish and fish habitat	4	4	4	4	4
2	Historic records for winds	3	3	4	4	4
3	Historic records for waves	3	4	4	3	3
	Historic records for surface currents	3	4	4	3	3
	Monitoring of sea surface height	3	4	4	3	3
4	Wind observations	2	4	3	4	3
	Wave observations	2	4	3	4	3
	Surface current observations	2	4	3	4	3
	Historical Tropical Storm/Tropical Cyclone probability and tracks	2	4	3	4	3
	Tropical Storm/Tropical Cyclone Observations	2	4	3	4	3
	Natural and other existing oil seeps	3	3	3	4	3
5	Sea level	1	3	4	4	3
	Distribution and abundance of seabirds	3	3	3	3	3
	Monitoring of chlorophyll-a	3	3[2]	3[2]	3[2]	3

[1] Impact factors: 4 = critical; 3 = significant; 2 = important; 1 = of interest; 0 = not relevant

[2] Impact factor is 4 in the event of an oil spill

The task force would also be instrumental in facilitating the transition of ownership of EO4OG outcomes to the O&G industry. In this context, it will be critical to demonstrate the ability of EO to generate value to the industry. This may involve the participation of other industry associations, such as the American Petroleum Institute (API) and IPIECA, the global oil and gas industry association for environmental and social issues.

2.2 Adherence to User Requirements

In order for EO technologies to be adopted by the O&G industry and firmly integrated into operations and processes, the utilization of EO must translate into tangible benefits for users. The EO4OG initiative has demonstrated the capabilities and gaps of EO for the offshore oil and gas sector. Moving forward, the top-down mechanism employed in EO4OG should be replaced by a bottom-up approach driven from within the O&G industry while maintaining links to external EO experts, suppliers of services, image providers and space agencies. In this context, the execution of pilot projects that comprise, but are not limited to, EO technologies to address industry-wide issues in one or two key areas may be instrumental. The IOGP EO Subcommittee and its proposed task force will be instrumental in ensuring that any activities building on EO4OG emphasize problem-solving and value-generation for O&G users, rather than technology promotion.

Where applicable, effort should be directed towards the development and implementation of industry-wide standards, guidelines and best practices related to EO. However, in order to be adopted by the O&G sector, the benefit to users has to be clear, and existing guidelines should be used and linked to as appropriate. Although there is considerable EO expertise resident within oil and gas companies, there is potential to expand the understanding of EO capabilities and benefits to technical units and decision-making levels within companies not traditionally concerned with EO. Training and capacity building will also be important in ensuring continuity of EO expertise within companies and managing the transition of knowledge to new generations of technical experts. Efforts to build awareness of EO capabilities should also encompass other relevant stakeholders, such as providers of environmental and geosciences services to the O&G sector.

The use of EO technologies for O&G applications should be mission-agnostic and consider the full range of current and emerging sensors operated by government and commercial missions and exploiting the full range of spectral characteristics, spatial resolutions and temporal revisit frequencies available. The timeline of new innovative EO observations coming online should be shown in parallel to the further development and novel use of existing capabilities.

2.3 Compliance with the Common Operating Picture (COP)

The COP comprises an industry-wide initiative driven by the need for effective collaboration across many organizations in responding to oil spills. A draft version of the COP is currently being refined and is expected to be publically released in the first quarter of 2015. Although rooted in the need for effective spill response, the COP concept has the potential to become applicable to other elements of O&G operations beyond the narrow focus on emergency response, many of which will depend on the availability of earth observation. As the COP has a strong focus on data integration and interoperability, any of the EO products identified in EO4OG will likely be required to fit into the COP framework in order to be considered for adoption by the O&G industry. The EO sector as a whole can therefore benefit in terms of integration of products and services into the industry by supporting compliance to evolving (and influencing) COP standards.

Within the scope of oil spill response, it is likely that there will be a greater involvement of EO in exercises with real data acquisition and delivery scenarios benchmarked against critical turn-around times, along with regularly updated surveys of emerging and future EO technologies. The adoption of new technologies is expected to involve appropriate strategies for training and capacity building in key areas within the industry. Initiatives such as these can be leveraged by other applications of earth observation within the industry.

The ability to archive observations, assessments, value-added products and decision-making tools is critical for operational needs, efficacy, post-event assessment and ongoing monitoring and assessment of change against a baseline. This will require industry to work closely with suppliers through working groups, joint industry projects (JIPs) or similar mechanisms. Suppliers must understand the needs and requirements of industry and ensure the technologies they provide address these needs. The growth of EO should be achieved through user needs met partially or wholly by EO technologies, rather than employing a technology-push approach.

3 Roadmap

Based on the outcomes of EO4OG Tasks 1 and 2, a preliminary roadmap for the further development of EO within the offshore oil and gas sector can be formulated. This process must be driven by user requirements to ensure the long-term uptake of EO within the O&G industry. Figure 1 provides an overview of the roadmap's major elements and corresponding time horizons for execution.

Action	Description	Timeline
Establish task force	• Set up via IOGP EO-Subcommittee • Define process	Within 6 months
Implement pilot studies	• Select geospatial products and services that could benefit from EO • Plan and execute studies • Disseminate lessons learned to O&G stakeholders	Within 12 months
Engage O&G stakeholders	• Establish continued mechanism for feedback, validation and utility • Establish appropriate mechanism to allow EO services industry to provide input to process driven by O&G user communities	Within 12 months
Outreach and awareness building	• Design and deliver targeted training for O&G project managers and for field personnel • Focus on applicability and limitations for O&G user needs and operations	Within 18 months
Align with existing and emerging practices	• Ensure compatibility of selected EO-derived products and services with the COP • Alignment with other guidelines and standards as applicable	Within 24 months (first draft and review at 12 months)

Figure 1: Roadmap for Developing EO in the Offshore O&G Sector

A task force should be set up within the IOGP EO Sub-Committee to review EO4OG project output and confirm approach for developing EO within the industry driven by user needs. The activity of the task force will be closely linked to the mandate and objectives of the EO Sub-Committee.

The task force will be instrumental in selecting candidate geospatial products and services that would benefit from enhanced EO to be considered for further evaluation during pilot studies. This selection should be based on the outcomes, documentation and products generated by the EO4OG consortia. The task force will also facilitate the application of an appropriate funding mechanism for pilot studies. Initial pilot studies should be planned and executed within 12 months. The pilot study results and applicable lessons learned should be widely disseminated within the offshore O&G user communities.

The continued active engagement of O&G stakeholders is considered critical. To this end, the task force can help identify and establish appropriate mechanisms to collect feedback from the O&G user communities of EO (e.g. via OGEO portal). Similarly, appropriate mechanisms are required to allow the EO services industry to provide input into the process driven by O&G user communities.

Building awareness of EO capacity within O&G industry will be an ongoing activity. This will comprise tailored training and outreach activities for both technical staff and higher-level decision-makers. These activities will focus on developing an understanding of EO techniques, capabilities and limitations in light of O&G information requirements and operational needs.

The overall process must ensure that EO-based products and services are compatible with existing and emerging standards, guidelines and best practices within the O&G industry. Of particular relevance in this context is the COP. Due to a strong emphasis on geo-information data and interoperability, it is anticipated that COP specifications will become the principal reference for all geospatial data within the offshore O&G sector.