Environmental Impact Assessment Review 34 (2012) 12–21

Contents lists available at SciVerse ScienceDirect

Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar

Advancing strategic environmental assessment in the offshore oil and gas sector: Lessons from Norway, Canada, and the United Kingdom

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ARTICLE INFO

Article history:
Received 27 June 2011
Received in revised form 29 October 2011
Accepted 17 November 2011
Available online 7 January 2012

ABSTRACT

Abstract: Strategic environmental assessment (SEA) for offshore oil and gas planning and development is utilized in select international jurisdictions, but the sector has received limited attention in the SEA literature. While the potential benefits of and rationale for SEA are well argued, there have been few empirical studies of SEA processes for the offshore sector. Hence, little is known about the efficacy of SEA offshore, in particular its influence on planning and development decisions. This paper examines SEA practice and influence in three international offshore systems: Norway, Atlantic Canada and the United Kingdom, with the intent to identify the challenges, lessons and opportunities for advancing SEA in offshore planning and impact assessment. Results demonstrate that SEA can help inform and improve the efficacy and efficiency of project-based assessment in the offshore sector, however weak coordination between higher and lower tiers limit SEA's ability to influence planning and development decisions in a broad regional environmental and socioeconomic context.

1. Introduction

The shift from managing individual projects to more regional and integrative approaches has begun to take root internationally in environmental management. This is also the case in environmental assessment (EA), which has been subject to much criticism for its focus on individual project actions (see Cashmore et al., 2008; Harriman Gunn and Noble, 2009a). The constraints of project-based EA are widely recognized and include inadequate consideration of cumulative effects and development thresholds (Duinker and Greig, 2006); insufficient regional baseline data to detect environmental change (Dubé, 2003); loss of mitigation opportunities because assessment occurred too late in the development sequence (Vicente and Partidário, 2006); and limited public influence over the direction of development activity (O'Faircheallaigh, 2010). As a result, there is now a collective understanding that EA must go beyond the evaluation of site-specific project impacts to consider the broader policy and regional planning context in which development projects operate (Noble and Harriman, 2008; Partidário, 2000).

The need for a strategic approach to EA is especially recognized in the context of offshore hydrocarbon planning and development (see BSStRPA, 2008; Davey et al., 2000; Horvath and Barnes, 2004; Kinn, 1999). Offshore hydrocarbon projects operate in a large network of infrastructure; the risks to marine environments are often high on a global scale (Campagna et al., 2011; Wagner and Armstrong, 2010); and by their very nature such projects require regional and strategic coordination (Salter and Ford, 2001; Spiridonov, 2006; WWF, 2005). Public attention has typically been less concerned with offshore versus onshore energy developments (see Haggett, 2011). But, with recent spill events in the Gulf of Mexico drawing international attention to the offshore sector (see Amos, 2011), there is a growing international debate about the risks and benefits of offshore hydrocarbon activity and the need for improved planning and impact assessment processes.

Recognition of the limits of project-based EA in proactively planning and managing oil and gas activities in offshore environments has been instrumental to the adoption of regional and Strategic Environmental Assessment (SEA) systems (Environment Canada, 2004; Horvath and Barnes, 2004). There are now various forms of SEA for offshore energy planning and impact assessment ongoing internationally (see Hasle et al., 2009; Wagner and Jones, 2004). However, while the potential benefits of and rationale for SEA are well argued (CCME, 2009; Environment Canada, 2004; Harriman Gunn and Noble, 2009a; Johnson et al., 2011), there have been few empirical investigations of SEA in the offshore oil and gas sector with a view to understanding the efficacy of SEA and, in particular, its influence on planning and development. The majority of research on SEA in general, and in the energy sector in particular, has focused on terrestrial systems (see Jackson and Dixon, 2006; Jay, 2010; Marshall and Fischer, 2006; Noble, 2002; Noble, 2008). There has been very little

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0195-9255/$ – see front matter
doi:10.1016/j.eiar.2011.11.004

consolidation of international experiences with SEA offshore, and thus few opportunities for transferable learning.

There is a need for a better understanding of the nature and efficacy of SEA in the offshore energy sector and its role in planning and development decisions. This is particularly important for emerging energy frontiers, such as Canada's western Arctic, where planning for offshore hydrocarbon development continues to occur on a project-by-project basis (Voutier et al., 2008). As international attention turns to the Arctic to meet global energy demands, there is increased recognition of the need to advance upstream impact assessment and decision-making to plan for energy development prior to ramping-up individual energy projects (see Arctic Council, 2009; IGC, 2004; WWF, 2005). However, as Ketilson (2011) explains, both industry and government remain sceptical about SEA offshore, noting its 'unproven benefits'.

This paper examines international experiences with SEA in the offshore oil and gas sector and the lessons emerging from practice. Based on SEA offshore in Norway, Atlantic Canada and the United Kingdom (UK), our objective is to identify common lessons and opportunities to advance the efficacy of SEA as a means to influence offshore hydrocarbon planning and development decisions. We use the term 'SEA' to be inclusive of both legislated and informal SEA, including regional EAs and both single and multi-sector strategic planning and assessment frameworks. In the sections that follow we first introduce SEA in three international offshore systems, followed by an analysis of SEA practice and its influence on offshore oil and gas development decisions. We conclude with a discussion of the lessons emerging and the implications for advancing SEA for offshore planning and assessment.

2. International systems of SEA offshore

We identified three internationally recognized cases that are distinct in both the nature and context in which SEA operates in the offshore environment: Norway, Atlantic Canada and the UK. In doing so, our aim was to derive common lessons and challenges that may transcend regional context. Norway's offshore system provides a circumpolar context, focused on an integrated regional planning model; Atlantic Canada is sector-based, with SEA operating under a non-legislated federal directive; the UK offshore sector is mature, with SEA legislated under the EU Directive (2001/42/EC). Environmental assessment offshore in each of the three jurisdictions is well documented. For example, Hasle et al. (2009), Ottersen et al. (2011), and the Norwegian Petroleum Directorate (NPD, 2009) detail Norway's offshore regulatory framework. In Atlantic Canada and the UK, the offshore system and associated EA and licensing regulations are described on the respective websites of the responsible authorities, including the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) in Atlantic Canada (see http://www.cnlopb.nl.ca/), and the Department of Energy and Climate Change (DECC) in the UK (see http://offshore-sea.org.uk). Below we provide a brief overview of each regulatory system so as to provide context before presenting our analysis of SEA and its role and influence in each of the offshore regions.

2.1. Offshore Norway

Norway's offshore oil and gas reserves are beneath the North, Norwegian and Barents seas. Before offshore areas are made available for licensing preliminary EAs, and in some cases regional EAs (REAs), are carried out by the Ministry of Petroleum and Energy. Regional EAs were introduced under the *Petroleum Act* in 1997 in an effort to move away from piecemeal assessment and obtain timelier, efficient, and comprehensive assessment results (Kinn, 1999; Salter and Ford, 2001). Regional EAs have been completed in both the North Sea and Norwegian Sea. Companies proposing to operate in an offshore area also required to conduct a Plan for Development and Operation (PDO), which includes a site specific EA (see Bjørnbom et al., 2010). In 2006, Norwegian Parliament introduced an additional framework, an Integrated Management Plan (IMP), to capture all sectors in the offshore environment including oil and gas, fisheries, and shipping. Introduced first to the Barents Sea, similar plans for the Norwegian Sea commenced in 2009, with an IMP for the North Sea in the development phase (NPD, 2009). Several sector-specific assessments in the Barents Sea were completed between 2002 and 2005, led by the relevant ministries responsible for oil and gas, shipping, and fisheries. Aggregate results have been used to inform IMP development by assessing total impact, identifying knowledge gaps and conflict areas, and establishing ecosystem-based management for existing and new activities in the region. The Goliat project, discovered in 2000, approximately 50 km southeast of Snøhvit, was the first oil development project approved in the Barents Sea in the area subject to the IMP.

2.2. Offshore Atlantic Canada

In Atlantic Canada, oil and gas activity occurs offshore the provinces of Newfoundland and Labrador, and Nova Scotia. An independent joint federal-provincial petroleum board has been established in each province to manage hydrocarbon activity. The C-NLOPB, for example, is responsible for oil and gas activity offshore Newfoundland and Labrador and reports to both the federal and provincial governments. Offshore petroleum activities that require authorization by the C-NLOPB are also subject to EA pursuant to the federal *Canadian Environmental Assessment Act*. For proposed petroleum exploration and production, the C-NLOPB is designated as the federal authority and typically the lead responsible authority for EA authorization. In 2002, the C-NLOPB adopted a policy decision to start conducting SEAs to assess offshore regions prior to opening areas for development. This policy decision eventually became a requirement under the federal Cabinet Directive on SEA. The objectives of SEA under the C-NLOPB are to inform licensing in prospective offshore areas

Table 1
Criteria for international reviews of SEA offshore.

Criteria	Description
Structural Requirements	Institutional Foundation for SEA
1. Objectives and purpose	• Clear provisions or requirements to undertake SEA; clear purposes and objectives
Procedure	*Process components concerning the various methodological and process elements of SEA, i.e. the practice*
2. Timing	• Early enough to address deliberations on purposes and guide initial review of plans, policies or programs
3. Participation	• Opportunity for meaningful participation and deliberations; ability to influence decision making
4. Tiering and coordination	• Assessment undertaken within a tiered system of EA, planning and decision making; defined linkages between subsequent activities
5. Alternatives	• Comparative evaluation of potentially reasonable alternatives or scenarios
6. Cumulative effects	• Consideration of cumulative effects
Output and Results	*Influence SEA has on decision making and project-based EA, including learning and process improvement*
7. System-wide learning	• Opportunity for learning and system improvement through review framework; monitoring and adaptation; cyclical feedback
8. Influence on decision making	• Demonstrate influence to downstream initiatives and activities

and to help streamline issues and considerations for subsequent project EAs. To date, six SEAs have been completed by the C-NLOPB, but the three major production facilities currently operating offshore Newfoundland and Labrador all exist in a 'non-SEA' region.

2.3. Offshore United Kingdom

The DECC is the principal regulator of the offshore oil and gas industry in the UK. In 1999, in anticipation of the EU Directive (2001/42/EC), the then Department of Trade and Industry instituted SEA as part of the offshore licensing process to determine which areas should be offered for licensing. Although SEA was only incorporated into law through the Directive in 2004, it was being carried out offshore through less formal arrangements. The intent of the Directive (Article 1) is to "provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes…" including offshore oil and gas plans and programs. Licensing for oil and gas offshore UK is based on quadrants; there are eight in total, each with a corresponding SEA. At the project tier, an environmental study must still be carried out for developments to assess the likely impacts of proposed offshore activity, which is then submitted to the DECC for authorization. The Laggan-Tormore project is one such example of a recently sanctioned offshore gas project in the area of SEA 4 and 5, approximately 140 km northwest of the Shetland Islands. The project will involve construction of an offshore subsea production system, more than 140 km of pipeline, and an onshore gas terminal (see http://www.laggan-tormore.com/).

3. Examining international practice

Following the lead of previous reviews of SEA (see Dalal-Clayton and Sadler, 2005; Jones et al., 2005; Noble, 2009), each offshore system was reviewed based on a set of normative criteria derived from the SEA evaluation literature (see Fischer and Gazzola, 2006; Gibson et al., 2005; Gunn and Noble, 2011; Jones et al., 2005; Noble, 2009) (Table 1). There is no universal set of criteria that is equally applicable to all SEAs (Fischer, 2002; Partidário, 2005); however, adopting a normative approach does provide a common framework to analyze SEA practices across different contexts (Noble, 2009). This was important to our study as the focus was on identifying common lessons, opportunities and constraints that may transcend regional or regulatory context. Our list of criteria was simplified in comparison to many of the above mentioned reviews of SEA performance. Our objective was not to 'score and compare' performance across the three international SEA offshore systems per se; rather, our objective was to examine the nature and efficacy of SEA as a means to influence offshore planning and development decisions and to identify and explain common opportunities and constraints across the three cases.

The three systems were reviewed using regulations and impact assessment and planning reports, complemented by semi-structured interviews. A total of 45 practitioners, regulators, industry representatives, and environmental and other non-government organizations (NGOs) directly involved in SEA offshore in the respective regions were contacted for an interview. A total of 20 interviews were conducted: 9 in Norway, 7 in Atlantic Canada, and 4 in the UK. No UK regulators were willing to participate, thus potentially influencing the nature of our results in the UK context. Our continued efforts to secure UK regulator participation also influenced our response rate: of the 25 non-respondents, 10 were UK regulators. The balance was industry and environmental and other non-government organizations distributed equally across the three cases. All participants were asked a series of semi-structured questions based on the criteria identified in Table 1. In each jurisdiction an offshore development project was identified to examine how SEA had influenced offshore activities at an operational level, and to understand better the specific regulatory system. Interview results were organized, coded thematically and analyzed using QSR NVivo© v.9, a software designed to classify and manage qualitative information. Results are presented in the sections below on the basis of each criterion.

3.1. SEA objectives and purpose

Norway's multi-sectoral IMP is intended to provide a sustainability framework to ensure the co-existence of different industries within an offshore area. All interviewees said that the objectives and role of the IMP process offshore were clear. As described by one government participant, offshore energy planning and assessment represents "two kinds of systems coming together – the IMP is strategic in nature, providing authorities with a holistic framework to base decisions on, whereas the regional EAs are spatially organized, and informed, in part, by the management plan."

In the case of Atlantic Canada, SEA is undertaken at the program level under the authority of the C-NLOPB prior to issuing bids for exploration. One NGO participant described SEA offshore as a "complicated process to navigate," but in terms of the mandate and structure of SEA "the drivers are clear." An industry participant similarly noted that the objectives of SEA are well defined, but cautioned that "those in the public domain may not fully appreciate the process or understand its benefits." As one regulator explained, SEA offshore is different in depth and content to those performed at the federal level under the Cabinet Directive, which were described as "policy instruments." SEA offshore was said to not fully conform to the view of SEA under the Cabinet Directive; not fitting "the pure SEA definition", but reflecting the C-NLOPB's function as an oil and gas regulator who makes decisions on the issuance of licences rather than policy options.

Though in the UK the mandate and purpose for SEA are laid out in legislation, one SEA consultant explained that "there is some flexibility in terms of objectives; you can approach it from a mechanistic manner, or set the objective of ensuring the plan or program being assessed does not link to environmental degradation." There is a prescribed mandate and regulations to guide SEA, but one academic participant noted "it is just a long approval process, and the higher level components get lost." This is consistent with the views of an industry participant who, based on direct involvement with the DECC for offshore licensing and environmental permitting, said that the experience was such that "SEA's intent is unclear and expectations on what it will deliver, nominal." Another academic participant summed-up, when it comes to the purpose and mandate of SEA at the level at which decisions are made about specific developments, "SEA is not as significant a tool as you think."

3.2. Timing

Industry characterized Norway's IMP as allowing regulators to ask, early on, "do we know enough, do we have enough knowledge in these areas to approve further activity?" One industry participant identified the IMP as a valuable process to collect information to aid with early decision making concerning a policy, plan or program. A regulator explained that the process is about determining how to move forward and, in the context of offshore hydrocarbon development, to determine where future leasing could occur. The participant went on to explain that timing was much different between the Barents Sea and Norwegian Sea, as much petroleum activity has already occurred in the Norwegian Sea, adding that "the IMP does not have the same function in the Norwegian Sea as the Barents Sea when it comes to creating a framework and conditions for planning." The Barents Sea IMP occurred early enough to provide substantial input and informed policy and subsequent programs and, as a result set out stringent environmental requirements for projects such as the Goliat development (see Knol, 2011).

Informing offshore planning and the issuance of rights was identified as one of the major intents and benefits of SEA offshore Atlantic Canada. SEAs are initiated only in areas where no offshore oil and gas operations currently exist. As such, SEA is intended to establish a baseline condition for a potential licensing area and the results used by the C-NLOPB for licensing decisions and, in principle, by industry to augment their baseline assessment in subsequent project EAs. In practice, however, whether this early baseline assessment is useful to project EA is unknown. There are no projects operating in SEA areas. In the Jeanne d'Arc Basin, for example, Canada's most active offshore oil field, there are several operating projects but without the guidance of SEA. Projects in the area have already been subject to federal EA, and industry and regulators alike noted that there existed a sufficient information base. As one industry participant explained, we are "unsure if a SEA could create a greater understanding of new issues."

Under the UK system, SEA is intended to inform decisions being taken about a plan or program – whether to proceed, modify it, or abandon it altogether. One consultant explained that SEAs occur sufficiently early, illustrating that "there are instances where we recommend holding off on blocks to offer." An industry participant, however, currently operating in SEA areas 4 and 5, noted that if the SEA was not complete before the Laggan-Tormore project it would have not made an operational difference, since studies performed for the project would have been derived from source data regardless. Evidently, in this case, a license had already been granted to the proponent in an earlier round. The mature nature of UK offshore sector means that SEA is used to inform decisions for subsequent licensing rounds, but frequently in areas where activity already exists and licenses are already let.

3.3. Participation

Industry described Norway's IMP process as "an effective approach to bring aboard stakeholders", while "complying with principles of democracy and stakeholder engagement." The consultation process for offshore development has evolved since the first IMP, after industry "criticized authorities that the consultations performed were not as open as the ones the oil and gas industry had to follow in EA." The process was modified with a stronger emphasis on engagement and, in 2006, a working group with representatives from relevant authorities, sectors and research institutions was established to facilitate more direct communication between stakeholders (OSPAR, 2010). This level of IMP engagement and consultation, however, does not eliminate conflict over project developments. The Goliat project, for example, was subject to significant controversy (see Bjørnbom et al., 2010) due to it being the first oil project scheduled for the Barents Sea. But, the proponent identified considerable value from the IMP, particularly during project consultations, because there was an opportunity to demonstrate how project design and mitigation measures were linked to strategic government-led plans and policies.

In Atlantic Canada, a regulator explained that "the absence of SEA was the 'hole' in the regulatory process prior – there were mechanisms for participation in project-EA, but the licenses have already been issued." A C-NLOPB participant further noted that it just "makes sense as an initial engagement measure…to be involved in the SEA to get in on the ground to help inform what might come later." In the case of the Labrador Shelf SEA (L.G.L. Ltd, 2003), for example, the local Nunatsiavut Aboriginal government jointly determined with the C-NLOPB what mitigation measures and restrictions should be applied within the offshore area for future developments. SEA provided an opportunity for stakeholders to contribute early in offshore planning and assessment. However, because the focus was at the pre-licensing stage, there was limited industry involvement. A C-NLOPB participant noted "industry has on rare occasions provided comments to SEAs, through the public process, but have tended not to be represented…and instead have been interested bystanders from a SEA front."

Under the UK system, the Directive requires public consultation – emphasizing consultation with inter-alia, environmental authorities and public participants. Consultation meetings are open to all public, and when a SEA report is released public notifications are issued. However, an industry participant maintained that those who show up to meetings and provide input, particularly at the SEA scoping stage, are typically government departments, advisors, and environmental interest groups. One academic participant explained that engaging with the public becomes more difficult as development moves offshore, maintaining that this challenge "seems to be as a result of impacts being less direct and tangible at an individual level." Further, the scope of SEA offshore is limited to plans and programs, which may reduce the capacity to publically debate policy alternatives (see Bina, 2008). As a result, one academic participant suggested that the public view of SEA is one of a formality and a process conducted in support of offshore development.

3.4. Tiering and coordination

Norway's IMP was described by a government participant as providing "the big picture" of where activity can occur and what conditions must be placed on petroleum development (e.g., discharge, drilling, and exploration restrictions), which are enforced by the Ministry of Petroleum and Energy. Companies then perform a detailed EA, referring back to the IMP conditions. Before amendments to the *Petroleum Act* (1997), PDO applications and EAs were prepared on an individual project basis, receiving much criticism from industry due to the duplication of work for companies, resulting also in narrowly scoped and redundant EAs. That said, the Barents Sea IMP is not tiered toward individual field developments and is not necessary for the approval of new developments; it focuses holistically on all activities, and not specific offshore oil and gas development operations. In the Norwegian Sea, REAs fulfill a similar role to help guide project activities and avoid duplication and redundancy of assessments, but are tiered specifically toward offshore petroleum activities. As such, there has emerged new debate as to whether there should be two regional-type impact assessments for all offshore regions, with one geared specifically toward petroleum activities.

In Atlantic Canada, tiering can only be described in terms of intent, as no projects are operating in areas where SEAs have been completed. One regulator contended that SEAs tend to focus on sensitive areas, noting that not only is that important information for the C-NLOPB but also "from a procedural fairness point of view, it describes the sensitivities in the wider area for any company that wants to bid on a parcel." The C-NLOPB's perspective on tiering is related to its purpose for conducting SEA, being an early assessment that can inform subsequent permitting and the issuance of licences. Using seismic surveying as an example, if there are ecologically sensitive areas identified through SEA, the intent is that an EA would focus in detail on these areas as opposed to focusing on areas that may not be regionally significant. A consultant to industry noted that SEA could be used as a reference document for industry, adding that "it is a lot easier for industry to use a SEA rather than having to go back to all the original sources to locate information," but at the same time cautioned that from a project permitting perspective "SEA is not an exhaustive compendium." One NGO participant similarly described SEA as a potential "guide for further activities," but noted that this can also be detrimental from a socioeconomic perspective in that the current absence of socioeconomic considerations at the strategic tier can carry forward to the project tier.

SEA at the licensing stage offshore UK is well defined in respect to regulatory requirements to ensure potential environmental implications of proposed activities are properly assessed prior to consent

and permits being granted (see Thérivel and Walsh, 2006). In practice, however, the application of SEA to inform regulatory licensing decisions has been relatively limited and static to this higher tier, with seemingly trivial input to subsequent lower level assessments. From the perspective of one operator, the two SEAs in which the Laggan-Tormore project exists had "no implication or influence on the project or EA." Another industry participant noted that the only way the SEA linked to an offshore project "was as a reference document", adding that, even with nine years of experience in the UK offshore oil and gas industry, (s)he was "unsure how SEA is used by regulators…"

3.5. Alternatives

Alternative scenarios were not explicitly identified in Norway's IMP; however, action thresholds in environmental monitoring programs were present to inform future scenario planning (Massachusetts Ocean Partnership, 2009). The IMP process was based on multiple sector-based EAs to produce a regional picture of existing impacts, intended to inform management plans and courses of action for future development. In principle, the concept of alternatives evaluation is inherent to the IMP as the process is focused on preferable options for development and conservation in the region, including the consideration of future changes or threats to planning, such as climate change.

In Atlantic Canada, the Labrador Shelf Offshore Area SEA contains in its objectives and purpose statement reference to the importance of alternatives in SEA, citing Thérivel et al. (1992); however, the alternatives considered in the SEA are inherently restrictive as the C-NLOPB makes decisions only as to issue licences or not, and does not address broader policy scenarios or offshore development trajectories. One regulator explained that though SEA would conventionally address broad alternatives, the C-NLOPB is "an offshore oil and gas regulatory body, so the only decision we are making, subject to government sanction, is whether or not to issue licences, versus the broader energy questions." 'Alternative means' are identified in offshore SEAs that relate to licence issuing decisions and the potential implications of licensing, including such matters as seismic versus exploratory drilling, conditions on the location and timing of activities and, in the Labrador Shelf SEA, hypothetical development situations and potential outcomes.

Alternatives are considered in UK SEA, as a requirement of the Directive and prescribed in regulation. In practice, however, one consultant explained that "they are generally a simplistic set of alternatives", which commonly include to carry forward the draft plan as proposed; to not proceed with the plan; or to modify the plan with spatial or temporal restrictions. Feedback from NGOs has targeted the restrictive nature of alternatives, and the need to consider broader alternatives, such as more efficient energy options. However, similar to Atlantic Canada, these policy issues are beyond the mandate of the offshore regulator, and are outside the scope of the specific tier at which SEA is applied. The omission of policies from the scope of the EU's SEA Directive is thought to be a serious deficiency by some (Fischer, 2002, cited in Jay, 2010); however, others, including a consultant who was directly involved with SEAs 1–8, said that SEA documents would "become enormous and mechanistic" and would not be as effective if a policy direction was added to decisions.

3.6. Cumulative effects

The various uses of Norway's offshore regions and its resources have traditionally been assessed and managed separately (Ottersen et al., 2011). Under the IMP, there emerged an opportunity to better understand the cumulative effects of the activities of different sectors in the offshore region, and to better assess the effects of new activities and the ability of ecosystems to adapt and respond to change (OSPAR, 2010). During the Barents Sea IMP review, however, challenges arose in the evaluation of cumulative effects as the scale applied to evaluate impacts and enable cross-sector cumulative effects assessment (CEA) turned out to be of little practical value. This was due to the different intents and values imposed by each sector when performing their assessments (Ottersen et al., 2011), and the lack of coordination of common variables and indicators to measure cumulative change.

In Atlantic Canada, CEA does not formally occur until the project EA tier. A consultant to industry acknowledged that it would be "worthwhile if SEA went one step further and did a CEA, it would help streamline the process…rather than each project taking it upon themselves." Interestingly, however, a NGO participant advocated against a more regional approach to CEA maintaining that such an approach is not valuable or practical "unless you have a specific proposed activity in an area and determine what you need to look at." This participant viewed the regional concept of CEA under SEA as too broad, adding that SEAs, when dealing with cumulative effects, never identify a specific activity (e.g. seismic drilling), and without these parameters to inform models and monitoring it remains unclear what cumulative effects are being assessed. An industry participant agreed, adding that "the accuracy of cumulative effects is one thing that varies at the SEA level, but is spoken to more adequately at project level EA."

Offshore UK, SEA Directive 2001/42/EC does provide an opportunity to address cumulative effects at the strategic level. The Directive requires the consideration of "likely significant effects … including cumulative and synergistic effects…" In principle, the UK approach provides a regional context and opportunity to assess the cumulative significance of activities as an integral part of the SEA process (see Cooper, 2004). In the offshore environment, however, one consultant commented that CEA is considerably difficult because there are a lot of unknowns, and went on to explain that at the strategic tier you "can conjecture cumulative impacts as best you can; at the project level, you can consider specifics, but when you extend to national or regional level it is a challenge, an imperfect science."

3.7. System-wide learning

Both government and industry participants indicated that Norway's IMP has helped inform the public and alleviate misperception about oil and gas industry impacts to the marine environment, and that a significant amount of learning has occurred as a result of actors sharing expertise and knowledge. One consultant considered learning a defining feature of the IMP, with an opportunity to revisit policy through regulator-based performance monitoring and the deployment of new assessments every five years. Ongoing marine research and mapping efforts to identify data gaps and integrate new data on long-term effects with risk assessment tools was identified as core to ongoing IMP improvement. Described by Knol (2010: 8) as a "learning process," the IMP incorporates ongoing and *ex post* evaluation through adaptive management strategies in environmental monitoring programs, and the sharing of information between sectors and through the inclusion of external scientific advisory committees (see Massachusetts Ocean Partnership, 2009). A participant from Norway's offshore industry noted that one of the most important elements resulting from the IMP in recent years has been that each industry is treated equally and there is now an ability to apply similar assessment methods across sectors to identify impacts to the offshore environment.

System learning and improvements in Atlantic Canada have occurred through increased efforts to engage the public and interest groups, and were identified by the C-NLOPB as important to the evolution of SEA. The first two offshore SEAs conducted, for example, were performed with limited engagement of the public. The C-NLOPB recognized the need and value to ensure a more objective

and participatory analysis and created working groups, with external stakeholder representation, to contribute to scoping and technical reviews. Multiple participants concurred that by involving interested or affected actors the SEA process has been enhanced and better informed as decision making is now subject to greater deliberation. Improved participation was said to have led to the inclusion and consideration of new information raised through dialogue between regulators and fishers who have specific local knowledge of the marine environment. Others noted improvements in the spatial boundaries of SEAs. Based on lessons from the first SEA in the Laurentian sub-basin, a C-NLOPB participant explained that the spatial boundary was too small and did not align with SEA's intent. The C-NLOPB subsequently broadened the areas of its offshore SEAs to avoid "creating patchwork assessments."

Similar learning was identified by UK participants. The UK's first offshore SEA, for example, was limited in opportunity for public input – it was described by one consultant as an "internal exercise". Comparable to Atlantic Canada, subsequent SEAs have evolved to include more opportunities for participation (see ODPM, 2005). The creation of a steering group, noted one consultant, "has helped draw in a fairly wide range of stakeholders with interest in the area." Feedback through monitoring and evaluation was also identified as an important opportunity to provide information that can be used to identify specific performance issues, and inform subsequent decision actions. The Directive itself was also reported to have modified certain aspects of SEA practice, with more tailored requirements, specifically adding indicators to objectives to establish stronger links with monitoring and the evaluation of predicted effects. Similar to Atlantic Canada, however, socioeconomic assessment was identified as an area where little learning and improvement seems to have occurred. One consultant noted that SEA could "fulfil the Directive without going into socioeconomic impacts."

3.8. Influence on decision making

The IMP approach offshore Norway helped authorities create an intra-directorate plan to inform future development. Based on the IMP's results, measures and requirements to prevent and reduce negative impacts have influenced decisions made by the Ministry of Petroleum and Energy, such as restrictions or conditions for industry operations. In the case of the Goliat project, for example, an industry participant maintained that the IMP and requirements from authorities have made it easier to focus on project-specific issues and has heightened the need to take a precautionary approach to operations. For industry, an important outcome of the IMP has been continuous research and development to find technical solutions that are economically feasible to comply with strict environmental regulation (see Hasle et al., 2009). Already, industry has started collecting information requested in the IMP's environmental baseline and monitoring programs to help address knowledge gaps. Other industry proponents perceived the IMP as having a positive influence on project operations, indicating that regulatory authorities have a better basis for decisions, which leads to greater predictability for industry. Coordination between REA and project EA in the Norwegian and North seas were reported to have also resulted in improvements in the efficiency and effectiveness of the overall review process (see Hasle et al., 2009; Kinn, 1999).

In Atlantic Canada, SEA has enabled early-stage decision making for offshore regulators. For proponents, SEA is promoted as supporting investment decisions, and providing a reference point for baseline knowledge. For example, through the identification of sensitive fish spawning areas in an SEA, requirements would be set for project-specific EAs concerning the timing and location of drilling operations. The Orphan Basin SEA (LGL, 2003) findings, for example, demonstrate how SEA was designed to inform prospective activity in the study region, whereby special, non-standard or strict mitigation measures have been identified to be applied to future developments because of the need for special planning around sensitive marine habitats. Based on the views of participants, SEA in Atlantic Canada, at least in principle, offers a valuable framework to inform downstream planning and mitigation activity; however, the demonstrated influence could not be verified in absence of offshore operations in the SEA areas.

Under the UK system, SEA assists responsible authorities to determine what areas may be subject to activity (i.e., exploration licensing), and places certain spatial or temporal conditions upon activities in those areas. One consultant explained that SEA has "undoubtedly had an influence upon offshore oil and gas decision making", referencing the identification of exclusion areas when blocks are determined inappropriate for petroleum development. The downstream influence of SEA on project EA, however, appears weak with real SEA influence restricted largely to higher level decision making. The decisions made by responsible authorities have some bearing on offshore operations; however, this influence was not apparent at the operational level given industry participants' experience and view that "SEA has had no influence on planning or project-based EA." Industry participants maintained that there is no expectation of what SEA is expected to deliver, and "unless the project is going against the SEA report, then SEA has no real influence on decision making." This disconnect was further compounded by a view held by one academic participant, "that developers and consultants have not caught on to the idea or notion of strategic", and industry's viewpoint that the "system in place for offshore oil and gas regulation is spread thin on government capacity terms, which impedes implementation and operations." The most obvious limitation we identified was the lack of a tiered system and decision making that carried forward to lower level EAs, owing perhaps to a range of interlinked factors, including: the DECC is said to be doing a poor job of communicating the purpose of SEA; operators are said to be missing the potential value and application of SEA; and SEA is understood to be confined to strategic planning decisions.

4. Lessons and implications for advancing SEA offshore

The goal of this paper was not to 'test' the performance of SEA offshore across jurisdictions, as the institutional context of SEA varies considerably (see Hilding-Rydevik and Bjarnadóttir, 2007). Rather, the goal was to facilitate a better understanding about the roles and constraints of SEA in the offshore sector, and to identify common lessons, challenges, and opportunities that may transcend context in order to advance SEA as a tool for the planning and development of offshore oil and gas. In the sections that follow we venture a number of observations and lessons concerning the general practice of SEA in offshore environments that emerged from our three cases.

4.1. Normative versus applied SEA

First, the purpose and deliverables of SEA in the offshore environment often differ from the ambitious expectations about SEA identified in the academic literature, and by project proponents and other stakeholders. In the UK, for example, SEA offshore is restricted to the higher tier of identifying areas for licensing. Though requirements for SEA are set out in regulation, industry still perceived a lack of clarity as to the purpose of SEA and how it informed or improved decisions at the project level. In Atlantic Canada, the regulator's view and application of SEA as a tool for licensing decisions was in contrast to the academic view of SEA, and also in contrast to SEA as described under the Canadian federal SEA directive. Such differences lead to false expectations about what SEA is intended to deliver offshore, and to whom, and dismay with the overall process.

Our results suggest that what SEA can and should deliver in the context of the offshore oil and gas sector may not be consistent

with the expectations of SEA that have been developed based largely on land use planning and 'on-shore' policy and good-practice frameworks. The objectives, constraints, and intent of SEA in the offshore sector need to be made clear for all interested parties if the results of the process are to be a demonstrated, accepted and worthwhile part of planning and development (see Dalal-Clayton and Sadler, 2005). For emerging offshore energy frontiers, such as Canada's western Arctic, there is a need to clearly establish the scope and intent of SEA prior to ramping-up individual energy projects. In this way, the relationship between strategic approaches and the intended contribution to project-based actions can be articulated at the outset. The pre-existence of project operations, EA and prior licensing approvals in Atlantic Canada and the UK appeared to be a constraint to stakeholder's understanding of the actual role and added benefits of SEA.

4.2. Timing, role and influence

Related to the above, the benefits of SEA in the offshore environment hinge not only on connecting results to operational decisions and activities, but also on ensuring that SEA is conducted early enough to effect change and influence development actions (see Harriman Gunn and Noble, 2009b). Though in each of the cases reviewed the timing of SEA was, in part, dependent on the regulatory context and purpose of the assessment, timing proved to be critical in all three cases in ensuring how much influence SEA actually had on downstream decisions. In the Barents Sea, for example, where petroleum activity was the main driver for the IMP, early application allowed authorities to measure existing impacts and identify sensitive areas to inform future planning and decision making in a relatively untouched, yet politically contested and ecologically sensitive region. Alternatively, in the UK, where several project developments had preceded SEA, the merit of its application appeared weaker due to the lack of input to on-going operations. In certain areas offshore Atlantic Canada, namely the Jeanne d'Arc Basin, SEAs have not been conducted specifically because projects have already been initiated and SEA was seen as adding little value in such circumstances.

Though early application is best, before licenses are issued, we argue that there is still merit to SEA coming late in the offshore planning and development process – where licenses or projects already exist. Ketilson (2011) reports stakeholder concerns in Canada's western Arctic that once rights are issued, the window of opportunity for SEA has closed. We agree that SEA late in the decision process is less influential in setting strategic direction; however, we argue that SEA post-rights issuance or post-project approval is important to both industry and regulators for regional monitoring and feedback for improved project performance, risk management, assessing the potential cumulative impacts of future development, and determining the need for policy or planning intervention to adjust the current development trajectory.

4.3. Alternatives consideration versus mandate

Alternative assessment is identified as core to SEA (see Fischer, 2007; Noble and Storey, 2001); however, the nature of alternatives considered in each of the three systems examined was inherently restrictive when compared to the academic expectation, but was consistent with the context and intended purposes of SEA in each offshore system. In the UK and Atlantic Canada, for example, the degree to which alternatives could reasonably be considered was constrained by the tier of application at the plan or program level, the regulator's mandate of issuing rights, and the level of pre-existing offshore development. Those alternatives that were considered were limited to the same types of alternatives often considered at the project tier. The absence of broader policy-level alternatives was a noted deficiency in the SEA process. However, others argued that incorporating policy into SEA offshore may sound reasonable in principle, but in practice would be overly ambitious and regulators, who are responsible largely for rights issuance, have neither the mandate nor capacity to undertake such a broad assessment.

4.4. Participation, interest and influence

Each jurisdiction recognized the importance of public participation, reinforcing SEA's communicative potential as a means to influence decisions (see Runharr and Driessen, 2007). The nature of engagement, however, varied considerably. Participation in SEA is often promoted as providing greater opportunity for stakeholders to inform the direction of decisions about development (see Sinclair et al., 2009). As evidenced by local Aboriginal engagement in setting mitigation standards for the Labrador Shelf SEA, Atlantic Canada, even at the strategic tier local communities can influence decision outcomes. The case of the Goliat project in the Barents Sea illustrated an additional, but indirect benefit of participation with observable benefits accruing to a project proponent. Here, public engagement in the IMP at the strategic tier provided a knowledge base for stakeholders such that the proponent was able to demonstrate to the public, at the project tier, the consistency of project mitigation actions with higher level IMP goals and priorities. The result was increased efficiencies in EA for the proponent. In the UK, however, there has been much less direct public engagement, confirming Sinclair and Diduck's (2009) observation that the lack of participation at the strategic level can result in cynicism and a perception that decisions are foregone conclusions.

The challenge for SEA reflects what Heiland (2007) describes as the participation paradox – there is, in principle, greater opportunity for engagement and influence at the strategic tier, but often less interest in engagement due to the high level and, often abstract nature of decisions. This challenge is exacerbated in the offshore context, where biophysical impacts are often geographically removed from the public and traditionally deemed 'out-of-sight, out-of-mind.' Recent media attention to Arctic energy exploration and to the risks of offshore development following the Gulf of Mexico spill event may heighten, at least in the short term, public interest; however, over the long term, ensuring meaningful participation in SEA offshore will require a much more concerted effort on behalf of regulators than what has traditionally been the case. Early and meaningful participation is needed to determine the acceptable level of public risk associated with the development of offshore hydrocarbon resources, and to prepare communities for the potential onshore socioeconomic impacts of development.

4.5. SEA offshore for onshore impacts

Socio-economic issues received relatively limited attention in each of the three offshore systems reviewed. We found that socioeconomic issues, when considered, focused primarily on fisheries, presumably as the main pathway of socioeconomic impact. Notwithstanding recognition in the US mid-Atlantic offshore industry in the mid-1970s that onshore communities need to be considered part of the planning and assessment process for offshore development (see US Office of Technology Assessment, 1976), the onshore impacts of offshore development, specifically the onshore geography of benefits and risks, is largely absent from offshore SEA systems. For example, directives on SEA can be fulfilled offshore both in Atlantic Canada and the UK with only limited attention to socioeconomic issues.

There is a need and an opportunity for SEA offshore to adopt a much broader approach to socioeconomic issues than solely marine resource use conflicts, to contribute to community planning in advance of offshore development. Norman (2005) argues that the well-being of coastal communities should be paramount in marine resource decision-making, and there is a need to focus on what the socioeconomic implications will be in the region surrounding the

most prospective basins. SEA provides a window to integrate socio-economic considerations early in the planning of offshore oil and gas systems (see Noble and Harriman, 2008) and, as such, there is a need for increased attention in SEA to identifying what "communities…need to be able to do and know when confronting the opportunities, threats and challenges of offshore oil and gas" (Norman, 2005: 108).

4.6. Capacity and for cumulative effects assessment beyond the sector

The potential for SEA as a tool to assess cumulative effects is well argued, but the benefits have not been clearly demonstrated in offshore practice. We found that practitioner and regulator views of the value of SEA as a tool to assess cumulative effects offshore did not align with current academic literature on the subject. Duinker and Greig (2006), for example, amongst others, argue that CEA is ineffective at the project scale and a more regional, strategic approach to CEA is necessary. However, in Atlantic Canada participants argued that the strategic tier is too broad and abstract for CEA, and that the project level, where there is more detail and information available concerning actual offshore operations, is the most appropriate tier for assessing cumulative effects. Perhaps the level of offshore activity in Atlantic Canada influenced participants' views on CEA, as many expressed the challenges of taking a regional approach to CEA in an area where relatively little activity occurs. Norway, on the other hand, offered a more favourable view of CEA beyond the project tier (see Salter and Ford, 2001) - the high level of hydrocarbon activity in the Norwegian and North seas has been the subject of cumulative effects studies through REA for more than a decade. However, the multi-sectoral nature of early assessments under the higher-tiered IMP proved difficult to coordinate cumulative effects understanding.

The dynamics at play across all three jurisdictions appear to be consistent with Creasy's (2000) view that CEA beyond the project tier is difficult to implement because the agencies responsible for development often have neither the authority nor the capacity to address multi-sectoral cumulative effects. We believe that the most significant constraints to CEA in offshore SEA systems are institutional and methodological rather than scientific and technical (see also Noble and Harriman, 2008). Any institution established for SEA offshore must have the mandate and the capacity to assess cumulative effects beyond single-sector initiatives, to direct regional monitoring programs, and to ensure that SEA outputs are implemented in subsequent planning and project actions.

4.7. Tiering in non-tiered planning systems

Finally, although tiering is considered by many to be a major driver and benefit of SEA (see Fischer, 2007; João, 2005), the tiered forward benefits and influence of SEA were not fully realized in all three offshore systems. When realized, the benefits of the trickle-down approach were often subtle, if not indirect. Interestingly, only Norway's IMP process demonstrated a tiered forward planning system, and notably it was the only system that focused on multiple offshore resource activities and is not formally labeled as SEA. The Norwegian case illustrates how SEA can serve to streamline project-specific EA by demonstrating the consistency and compliance of a project's EA with higher-tiered offshore planning and management priorities. In contrast, offshore Atlantic Canada and the UK, though both formal, directive-based SEA systems, we observed much less evidence of tiering and downstream influence. In both jurisdictions, SEA offshore is sector-specific and largely confined to facilitating strategic decisions about licensing offshore areas and, in the case of Atlantic Canada, providing regional baseline information. There were some obvious benefits, such as information being applied to assist regulators with exploration licensing decision making and determining whether certain offshore areas, due to their ecological sensitivity, are suitable for development. However, many of the anticipated benefits associated with SEA were less apparent. In the UK, the SEA Directive assumes tiering of SEAs and EAs at different planning levels, and Article 3(2) of the Directive requires SEA for plans and programs to set the framework for future development and consent of EA projects (see Arts et al., 2005). However, beyond DECC licensing decisions the influence of SEA was less evident with seemingly trivial linkages to subsequent lower level assessments. The UK system, although well established under the SEA Directive proved limited in its ability to tier and influence decision making at an operational level.

The mandate of SEA may simply be too narrow in offshore Atlantic Canada and the UK to have the broad influence and benefits often expected of it. While the true influence and efficacy may be tested best through the adaptation of offshore practices based on lessons emerging, we also recognize that tiering and influence may not be immediate in all cases and results may be long-term and delayed, if not too subtle to measure. International experiences demonstrate that, ultimately, the influence of SEA on subsequent actions and decisions is, to a significant extent, a reflection of the nature of inputs and objectives of the SEA process. It is difficult to realize the benefits of tiering in SEA offshore where the underling planning system itself is either not tiered or non-existent.

5. Conclusion

Strategic environmental assessment for offshore oil and gas planning and development is on-going internationally in select jurisdictions, but the sector has received limited attention in the SEA literature. There have been few empirical studies of SEA processes for the offshore sector, and little is known about how SEA influences and improves planning and development. Based on experiences in Norway, Canada, and the UK we argue that SEA offshore is following in the footsteps of its predecessor, project-based EA. Regardless of SEA context, we found limited ability of SEA offshore to operationalize CEA at a regional level; limited attention to addressing broader socioeconomic concerns though participation and engagement; a process often too narrowly scoped to generate the benefits often expected of SEA; and too little attention to maximizing downstream influence through tiering processes. Context is important to consider when reviewing the nature and efficacy of SEA systems; by applying a set of normative criteria we found that in many respects the limitations to SEA offshore are a direct result of context – specific regulatory or capacity constraints on SEA systems and on its ability to influence decision processes.

In conclusion, the assumption that SEA is a solution to the shortcomings of project-based EA in the offshore oil and gas sector, and can help inform and improve the efficacy and efficiency of project-based assessment, was not consistently supported across all three systems reviewed. International experience suggests that SEA administered in the offshore for strictly petroleum licensing, and managed by a single authority, will be inherently restrictive in nature and challenge the delivery of influential SEA. To effectively deliver on the benefits of SEA, and to ensure appropriate planning for the onshore impacts of offshore development, a multi-sectoral approach is required in the offshore environment, with direct tiering and terms and conditions for project-specific developments and regional monitoring programs. Though there are multiple models of SEA for offshore planning and development, a consistent message is that without clear coordination between higher and lower tiers, SEA will fail to achieve not only its objective, but decisions about offshore development will continue to be made in a restrictive environmental and socioeconomic context.

Acknowledgements

This research was supported by a grant received from the Social Sciences and Humanities Research Council of Canada. We

also wish to acknowledge the research participants for their time and insight and the constructive feedback of three anonymous peer reviewers.

References

Amos W. Development of Canadian Arctic offshore oil and gas drilling: lessons from the Gulf of Mexico. Review of the European Community and International Environmental Law (RECIEL), 20(1). ; 2011. p. 39–46.

Arctic Council. Protection of the arctic marine environmental working group: arctic offshore oil and gas guidelines; 2009.

Arts J, Tomlinson P, Voogd H. EIA and SEA tiering: the missing link? Prague: In international experiences and perspectives in SEA. IAIA conference; 2005.

Bina O. Strategic environmental assessment. In: Jordan A, Lenschow A, editors. Innovation in environmental policy? integrating the environment for sustainability. Massachusetts: Edward Elgar Publishing; 2008. p. 134–56.

Bjørnbom E, Nesse S, Hansen O, Foldness G. IA for the Goliat offshore oil field development. World's northernmost offshore oil development? Society of petroleum engineers, SPE 126598. Paper presented at the SPE International Conference on health, safety and environment in oil and gas exploration and production. Rio de Janeiro; 2010.. April.

Beaufort Sea Strategic Regional Plan of Action (BSStRPA). Beaufort Sea Strategic Regional Plan of Action; 2008 www.bsstrpa.ca. Available at.

Campagna C, Short FT, Polidoro BA, McManus R, Collette BB, Pilcher NJ, et al. Gulf of Mexico oil blowout increases risks to globally threatened species. BioScience 2011;61(5):393–7.

CCME Canadian Council of Ministers of the Environment. Regional strategic environmental assessment in Canada: principles and guidance. Ottawa, ON; 2009.

Cashmore M, Bond A, Cobb D. The role and function of environmental assessment: theoretical reflections upon an empirical investigation of causation. Environ Manage 2008;88:1233–48.

Cooper LM. Guidelines for cumulative effects assessment in SEA of plans. EPMG Occasional Paper, 04/LMC/CEA. London: Imperial College; 2004.

Creasy R. Moving from project-based cumulative effects assessment to regional environmental management. In: Kennedy A, editor. Cumulative environmental effects management: tools and approaches. Calgary: Alberta society of professional biologists; 2000.

Dalal-Clayton B, Sadler B. Strategic environmental assessment: a source- book and reference guide to international experience. London: Earthscan; 2005.

Davey LH, Barnes JL, Horvath CL, Griffiths A. Addressing cumulative environmental effects: sectoral and regional environmental assessment. In: Kennedy A, editor. Cumulative environmental effects management: tools and approaches. Calgary: Alberta society of professional biologists; 2000.

Dubé MG. Cumulative effect assessment in Canada: a regional framework for aquatic ecosystems. Environ Impact Asses Rev 2003;23:723–45.

Duinker P, Greig L. The impotence of cumulative effects assessment in Canada: ailments and ideas for redeployment. Environ Manage 2006;37(2):153–61.

Environment Canada. Learning about regional and strategic environmental assessment. Conference proceedings. Halifax: Her Majesty the Queen in Right of Canada; 2004.

Fischer T. Theory and practice of strategic environmental assessment: towards a more systematic approach. London: Earthscan; 2007.

Fischer TB. Strategic environmental assessment performance criteria: the same requirement for every assessment? J Environ Asses Policy Manag 2002;4:83–99.

Fischer TB, Gazzola P. SEA good practice elements and performance criteria: equally valid in all countries? The case of Italy. Environ Impact Asses Rev 2006;26: 396–409.

Gibson RB, Hassan S, Holtz S, Tansley J, Whitelaw G. Sustainability assessment: criteria, processes and applications. London: Earthscan; 2005.

Gunn J, Noble BF. Conceptual and methodological challenges to integrating SEA and cumulative effects assessment. Environ Impact Asses Rev 2011;31:154–60.

Haggett C. Understanding public responses to offshore wind power. Energy Policy 2011;39:503–10.

Harriman Gunn J, Noble BF. A conceptual basis and methodological framework for regional strategic environmental assessment (R-SEA). Impact Asses Proj Apprais 2009a;27:258–70.

Harriman Gunn J, Noble BF. Integrating cumulative effects in regional scale strategic environmental assessment frameworks: lessons from practice. J Environ Asses Policy Manag 2009b;11:267–90.

Hasle JR, Kjellen U, Haugerud O. Decisions on oil and gas exploration in an Arctic area: Case study from the Norwegian Barents Sea. Saf Sci 2009;47:832–42.

Heiland S. Requirement and methods for public participation in SEA. In: Schmidt M, João E, Albrecht E, editors. Implementing strategic environmental assessment. Berlin: Springer-Verlag; 2007. p. 421–32.

Hilding-Rydevik T, Bjarnadóttir H. Context consciousness and sensitivity in SEA implementation'. Environ Impact Asses Rev 2007;27:666–84.

Horvath CL, Barnes JL. Applying a regional strategic environmental assessment approach to the management of offshore oil and gas development. Jacques Whitford Environment Ltd; 2004 http://siteresources.worldbank.org/INTRANETENVIRONMENT/1705736-1127758054592/20686579/UK_Oil_and_Gas_SEA.pdf. Available at:.

IGC Inuvialuit Game Council. Letter to Honourable David Anderson, PC, MP; June 21, 2004 www.bsstrpa.ca. Accessed 03 January 2011.

Jackson T, Dixon J. Applying strategic environmental assessment to land-use and resource management plans in Scotland and New Zealand: a comparison. Impact Asses Proj Apprais 2006;24:89-101.

Jay S. Strategic environmental assessment for energy production. Energy Policy 2010;38:3489–97.

João EM. Key principles of SEA. In: Schmidt M, João EM, Albrecht E, editors. Implementing strategic environmental assessment. Berlin: Springer; 2005. p. 691–700.

Johnson D, Lalonde K, McEachern M, Kenney J, Mendoza G, Buffin A, et al. Improving cumulative effects assessment in Alberta: regional strategic assessment. Environ Impact Asses Rev 2011;31:481–3.

Jones C, Baker M, Carter J, Jay S, Short M, Wood C. Strategic environmental assessment and land use planning: an international evaluation. London: Earthscan; 2005.

Ketilson S. Regional strategic environmental assessment roles and stakes in Arctic oil and gas development. M.E.S. Thesis. Saskatoon, SK: University of Saskatchewan; 2011.

Kinn SJ. Regional environmental impact assessment – experiences from Norwegian petroleum activity. Proceedings from the 3rd Nordic EIA/SEA conference; November 1999.

Knol M. The uncertainties of precaution: zero discharge in the Barents Sea. Marine Policy 2011;35:399–404.

Knol M. Scientific advice in integrated ocean management: the process towards the Barents Sea plan. Marine Policy 2010;34:252–60.

L.G.L. Ltd. Orphan Basin Strategic Environmental Assessment. NL: Canada-Newfoundland and Labrador Offshore Petroleum Board. St. John's; 2003.

Marshall R, Fischer T. Regional electricity transmission planning and SEA: the case of the electricity company Scottish Power. J Environ Asses Policy Manag 2006;49: 279–99.

Massachusetts Ocean Partnership. A review of ocean management and integrated resource management from around the world; 2009 http://www.massoceanpartnership.org/documents/ProgramSummaries.pdf.. Accessed 4 May 2011.

Noble BF. Promise and dismay: the state of strategic environmental assessment systems and practices in Canada. Environ Impact Asses Rev 2009;29:66–75.

Noble BF. Strategic approaches to regional cumulative effects assessment: a case study of the Great Sand Hills, Canada. Impact Asses Proj Apprais 2008;26:78–90.

Noble BF. The Canadian experience with SEA and sustainability. Environ Impact Asses Rev 2002;2:3-17.

Noble BF, Harriman J. Regional strategic environmental assessment: methodological guidance and good practice. Report prepared for the Canadian Council of Ministers of the Environment. Environmental assessment task group: Ottawa; 2008.

Noble BF, Storey K. Towards a structured approach to strategic environmental assessment. J Environ Asses Policy Manag 2001;3:483–508.

Norman D. A Review of the Potential Implications of an Offshore Oil and Gas Industry on Coastal Communities. UNBC Community Collaborative Studies on British Columbia Offshore Oil and Gas #5, Vancouver, BC; 2005.

NPD Norwegian Petroleum Directorate. The Norwegian Petroleum Sector; 2009 http://www.npd.no/en/. Accessed 15 December 2010.

ODPM Office of the Deputy Prime Minister. A practical guide to the strategic environmental assessment directive practical guidance on applying European Directive 2001/42/EC "on the assessment of the effects of certain plans and programmes on the environment; 2005 http://www.communities.gov.uk/publications/planningandbuilding/practicalguides.. Accessed 9 May 2011.

O'Faircheallaigh C. Public participation and environmental impact assessment: purposes, implications, and lessons for public policy making. Environ Impact Asses Rev 2010;30:19–27.

OSPAR Commission. Quality Status Report. Ch 9, Other human uses and impacts; 2010 http://qsr2010.ospar.org/. Accessed 28 May 2011.

Ottersen G, Olsen E, Van der Meeren G, Dommasnes A, Loeng H. The Norwegian plan for integrated ecosystem-based management of the marine environment in the Norwegian Sea. Marine Policy 2011;35:389–98.

Partidário MR. Elements of an SEA framework – improving the value added of SEA. Environ Impact Asses Rev 2000;20:647–63.

Partidário MR. Arts J. Exploring the concept of SEA follow-up. Impact Asses Proj Apprais 2005;23:246–57.

Runharr H, Driessen P. What makes strategic environmental assessment successful environmental assessment? The role of context in the contribution of SEA to decision making. Impact Asses Proj Apprais 2007;25:2-14.

Salter E, Ford J. Holistic environmental assessment and offshore oil field exploration and production. Mar Pollut Bull 2001;42:45–58.

Sinclair AJ, Diduck A. Public participation in Canadian environmental assessment: enduring challenges and future directions. In: Hanna K, editor. Environmental impact assessment: practice and participation. 2nd ed. Ontario: Oxford University Press; 2009. p. 56–82.

Sinclair AJ, Sims L, Spaling H. Community-based approaches to strategic environmental assessment: lessons from Costa Rica. Environ Impact Asses Rev 2009;29:147–56.

Spiridonov V. Large-scale hydrocarbon-related industrial projects in Russia's coastal regions: the risks arising from the absence of strategic environmental assessment. Sibirica 2006;5:43–76.

Thérivel R, Walsh F. The strategic environmental assessment directive in the UK: 1 year onwards. Environ Impact Asses Rev 2006;26:663–75.

Thérivel R, Wilson E, Thompson S, Heaney D, Prichard D. Strategic environmental assessment. London: Earthscan; 1992.

US Office of Technology Assessment. Coastal Effects of Offshore Energy Systems: An Assessment of Oil and Gas Systems, Deepwater Ports and Nuclear Power Plants off the Coasts of New Jersey and Deleware. NTIS order #PB-274033. Washington DC: United States Congress office of Technology Assessment; 1976.

Vicente G, Partidário MR. SEA—enhancing communication for better environmental decisions. Environ Impact Asses Rev 2006;26:696–706.

Voutier K, Dixit B, Millman P, Reid J, Sparkes A. Sustainable energy development in Canada's Mackenzie Delta-Beaufort Sea coastal region. Arctic 2008;61: 103–10.
Wagner J, Armstrong K. Managing environmental and social risks in international oil and gas projects: perspectives on compliance. J World Energy Law Bus 2010;3: 140–65.
Wagner JP, Jones MG. Strategic assessment of oil and gas activities: looking beyond EIA/SIA. Paper presented at the seventh SPE international conference on health, safety, and environment in oil and gas exploration and production. Calgary; March 2004.
WWF World Wildlife Fund. Where are all the SEAs? Project finance, and strategic environmental assessment of major oil and gas developments. UK: WWF; 2005.

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