CEAM IN BRAZILIAN OIL AND GAS EIA PRACTICE: PRELIMINARY FINDINGS

Vitor Calcenoni[1], Marcelo Montaño[2]

[1]University of Sao Paulo, Graduate Program in Environmental Engineering Sciences (PPG-SEA)
[2]Hydraulics and Sanitation Department, Sao Carlos School of Engineering, University of Sao Paulo
Core of Studies in Environmental Policy Instruments

Issues regarding cumulative environmental effects on Environmental Impact Assessment (EIA) can be fulfilled by specific procedures under Cumulative Effects Assessment and Management (CEAM). CEAM effectiveness is seen as strengthening acceptability on development projects evaluation, by its contribution to scenario analysis during scoping phase. Besides, CEAM may foresee Projects, Plans and Program integration on promoting adaptive management during monitoring and follow-up. The systematic practice of CEAM occurs in countries like Australia, Canada, UK, and USA. However, in developing countries, such as Brazil, environmental regulations requires the assessment of cumulative effects without providing specific guidance or technical reference, having little influence in decision making. The present paper is part of a wider project that aims at the identification of procedural elements and processes that may integrate CEAM best practices in Brazilian EIA framework. Preliminary results were based on the gaps found in the context of EIA application when compared to international best practices principles and guidance. Also, the findings showed some initiatives at agency's level that may contribute to decrease these gaps.

Introduction

Consideration on cumulative and synergetic environmental effects should be evaluated at project level decision making, mainly due to natural environment non-linear behavior on anthropogenic impacts, but also to determine each single project responsibility on significant environmental alterations (Therivel and Ross, 2007). Recognized practice on CEAM call upon a small set of tools globally, developed mainly by national guidance on countries where legislation demands it, e.g. Canada, UK, USA and EEUU member states (Canter, 2010). This set was developed by frequent necessity to minimize negative effects of project development in specific areas, where cumulative effects may overshadow single project contribution (Canter and Ross, 2010). Besides demanded by resolution CONAMA nº01/86, there's no official technical reference or guidance for consideration of cumulative effects under project EIA in Brazil, leading to dispersed and insufficient practice with low or any influence on decision making (Lima and Magrini, 2010).

In spite of not having common ground definition, CEAM's small set of tools is similar in national guidance and academia, with related step-wise frameworks aiming at better resource management for present and future generations (Canter and Ross, 2010; Duinker et. al., 2013). Nevertheless, the energy infrastructure boost promoted last decade in Brazil, specifically the oil and gas sector, creates a background where more intense resource extraction is demanded by area of production, a scenario where cumulative effects evaluation may be significant for projects approval.

Authors present a research proposal aiming at practice and procedures gap about cumulative effects evaluation requirements and tools in Brazil, oriented at CEAM consolidated international practice, whereas results are expected to show bottlenecks, pressures and advances (even by diffuse implementation), especially for Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) at its coordination for oil and gas exploitation (CGPEG). Evidence rests at practice and regulations on cumulative effects evaluation procedures, proposed by a gap comparison between consolidated international practice and Brazilian context.

Consideration on cumulative effects by recent regulation reform in Brazil

In order to express the readiness of Brazilian institutions to undertake CEAM related procedures, early effort summarized modernization on federal licensing process. The definition of environmental licensing is an "administrative procedure by which the environmental agency licenses initial site studies (Prior License – PL), construction or expansion (Construction License – CL) and operation (Operating license – OL) of undertaking and activities that makes use of environmental resources, considering legal provisions, regulations and technical standards applicable to the case" (Lima and Magrini, 2010, p 109).

According to regulation (Supplementary law nº140/2011 – LC 140), the government agency responsible for environmental licensing of oil and gas activities is IBAMA at federal level. However, multiple agents can be involved other than the entrepreneur and IBAMA, adding complexity to the process, which may lead to slowness, excessive demands and, for many senior Brazilian authorities, a barrier to economic development. On the other hand, priority given to economic issues lead to lack of social legitimacy necessary for environmental licensing (Lima and Magrini, 2010).

Recent regulation related to federal licensing entered into force by 2011, such as a supplementary law to determine cooperation norms between state agencies on common ground competences for natural resource use (LC 140), regulations on procedure particularities for some activities (roads, energy transmission), including oil and gas exploitation (IBAMA ordinance nº422/2011 – Oil ordinance). These new regulation pretend a modernization of federal licensing related to shortcomings shown by specialists, practitioners and audit bodies in the last decade.

To represent how the proposed modernization may forecast institutional learning, authors cast a light upon reflects of themes recommended by CEAM consolidated practice on Brazilian *modus operandi*. As noted by Canter and Ross (2010), changes from scoping phase to mitigation, monitoring and follow-up EIA phases can strengthen cumulative effects evaluation.

Methods of analysis:

The methods presented express the current stage of a wider project regarding procedures-practices gap comparing CEAM "best" practices and Brazilian cumulative effects evaluation context. Exploratory nature of the present research expects a discussion about what environmental policy instruments already in force allow CEAM practice. Current research methods were divided in three phases, aiming at Brazilian EIA procedures that may reach consolidated CEAM practice, described below:

1) Build a recommended practice on CEAM framework: Using a systematic review of scientific publications regarding state of CEAM practice at leading scientific databases (Elsevier's *Science Direct* and *Scopus*, ISI's *Web of Science*), a research was conducted on science relevant papers by high impact factor publications. By abstract review, chosen papers were: "Cumulative effects assessment: Does scale Matter?" by Therivel and Ross (2007), "State of practice of cumulative effects assessment and management: the good, the bad and the ugly" by Canter and Ross (2010), "Scientific dimensions of cumulative effects assessment: toward improvements in guidance for practice" by Duinker et. al. (2013).
2) Identify CEAM related procedures for Brazilian EIA regulation for oil and gas: By exhaustive regulatory documentation review, norms and procedures related with oil and gas licensing were identified, when those with potential influence on cumulative effects consideration are discussed. Also, an investigation attempt at IBAMA's federal licensing website on available oil and gas production EIA processes was made, in order to express cumulative effects consideration. Processes were reviewed using adapted criteria questions from a systematic study on cumulative effects consideration by Burris and Canter (1997).

3) Show procedures and practice similarities that may strengthen cumulative effects consideration by Brazilian CGPEG: Results from phase 1 and 2 are summarized and validated, targeting an exhaustive SWOT analysis (Strenghts, Weaknesses, Opportunities and Threats) on how CEAM procedures could be performed by CGPEG, being this phase still under analysis.

Brief discussion and results will be presented as current research is still under progress, though new data is under evaluation by the authors.

Brief results and discussion:

On reviewing selected articles on phase 1, some expected similarities were found between the authors, where Therivel and Ross (2007) and Canter and Ross (2010) rely on state-of-the-art and practice recommendation, Duinker et. al. (2013) survey focused on how science may influence CEAM practices.

As general rule, CEAM evaluation focus shifts from stressor-based approach, where project impacts are the main driver for proposing action to a resource-based approach, where resulting effects from diverse human activities surpasses single project impacts to take action. This shift serves as center for evaluation Valued Environmental Components – VECs, parcels of the entire environment considered for CEAM. VECs examples are soil, groundwater, water quality, low atmosphere among others. Mention to VEC-related inquiry occurs in every documentation consulted, all scientific papers and grey literature.

VEC selection incurs in different criteria at significance determination of effects, whereas composite accumulation of effects should be accessed, accounting for context particularities, such as resources, ecosystems and human communities sensitiveness to past, present and reasonable foreseeable future stresses. In order to tackle significance, an reasonable argumentation approach is recommended (Lawrence, 2004), whereas inputs from stakeholders and experts are mediated by government agencies, leading to consent about description, mitigation and monitoring measures for cumulative effects. Nonetheless, enlisting VECs influence on other actions (past, present and future) needs analysis, including not just other projects but plans, programs and policies (PPP) as well (Canter and Ross, 2010).

The ultimate effectiveness test can only happen CEAM is able to integrate different stakeholders in each level of decision-making (Therivel and Ross, 2007). Orientation towards collaborative adaptive management is recommended by academia and reference guidance for this matter, where the responsible agency is expected to summarize mitigation and monitoring efforts for follow-up activities, discussing uncertainties among stakeholders, as well as individual responsibility at significant cumulative predicted and unpredicted effects (Therivel, 2007; Canter and Ross, 2010). Findings composed a recommended practice framework (Table 1).

Table 1. Recommended procedures and practices for CEAM evaluation, according to selected literature.

EIA structure	Topic addressed	Recommended practice		
		Therivel and Ross, 2007	Cater and Ross, 2010	Duinker et. al., 2013
Scoping	Methods usage	Use robust transparent methodology	Relies on principles and tools from EIA practice	Uses integrative methods for scientific investigation
	Evaluation Focus	Resource-based oriented	Use VEC-based perspective	CEAM should favor resource-based approach
	Context specifications	Cumulative effects depend on local situations and particularities "Inherit" cumulative issues in higher level studies (PPP)	Cumulative effects on specific VEC used for local, regional and strategic areas Proponent and agency context is used	Must know natural history, ecological processes and VEC condition
	Possible changes considerations	Considers possible future problems	Identify trends in VEC condition	Changes in VEC must be detected clearly
Describing affected environment	Study assumptions	Based on reasonable assumptions	Careful delineation of outline and topics addressed	Indicators should be direct linked to VECs
	Uncertainty	Consider long-term and short-	Scenarios are used to	Stressor data should be

	consideration	term effects, not abbreviating horizons with project spatial and time frames	address uncertainty	appropriately related to VEC condition changes
		Consider interaction on past, present and future actions	Proposed action consider interaction with other activities (not isolated in space or time)	Investigative protocols with retrospective-prospective nature
		Gets "fit for purpose" prediction	Positive lessons from past professional experience contributes on prediction	Strong predictive approaches are needed for future scenarios
	Significance and baseline	Uses baseline description to access cumulative significance	Environmental sustainability as tool to describe significance on each VEC separately	
Follow-up	Management	Make use of adaptive environmental management	Make use of adaptive environmental management	Scientific elements of CEA have to be embedded in strong socio-political processes
Integration	Stakeholder role	Support for inter-developer and inter-authority CEAM Proactive approach doesn't constrain behavior after decision making	Consider multi-stakeholder engagement Proactive approach for incremental mitigation	
	Collaboration	Ensure follow-up and monitoring measures work as planned, in collaborative way	Management measures are identified, implemented and evaluated	Strengthen analytical competency for researcher-practitioner collaboration

These results instruct Brazilian EIA regulation instruments reading, as direct consideration of cumulative effects consideration is not expected. Procedures that may be of use for CEAM implementation are presented below.

To address scoping and context description, main findings obtained from Oil Ordinance:

- Regional Sedimentary Basin Environmental Evaluation (RSBEE): Multidisciplinary regional procedure to plan exploitation according to area's sensitiveness to stress, based on diagnosis of expected socio-environmental and impacts of actual and proposed projects.
- Regional-Coverage Environmental Study (RCES): Multidisciplinary study characterized by classifying area's environmental aptitude, subsidizing exploitation block's licensing and bestow. RCES needs to be taken into account for pretended exploitations, serving as necessary context information.
- Art. 10: IBAMA may promote integrated exploitation licensing, using perforation area polygons, considering area sensitiveness, extension as well as estimated total, density and dwelling sites.
- Art. 13 §1: Different projects or activities may refer to the same PL.
- Art.19 : Entrepreneurs may be dismissed from complementary studies where data collection from RSBEE and RCES are in effect.

Findings from technical notes on oil and gas EIA procedures include:

- Technical note nº01/2010 (on Environmental Education Programs) - Obligatory shared environmental management: Procedure where stakeholders take part in discussion and intervention on entire-region significant environmental impact activities, with influence on social groups well-being. A participative diagnose is expected to identify main issues of conflict on resource use by the whole oil and gas supply chain or other activities.
- Technical note nº01/2011 (on pollution control projects) – Regionalization of pollution control goals: Entrepreneurs with more than one activity in each region may report final effect of pollution control according to region-wide goals, instead of single project reports.

- Technical note nº10/2012 (on impacts identification and evaluation – Oil EIA TN) - Definition of cumulative proprieties of an impact: The overlapping capacity in time and space of an impact (regardless of enterprise or activity) that are, or may be, incurred at the same VEC. The consideration addresses relevant spatial and temporal effects on VEC sensitiveness, possibility of interaction with other activities and interaction with other impacts. Cumulative occurrence typology stands for: inductor (causing another impact occurrence), inducted (consequence of another impact) or synergetic (as result of impact temporal and/or spatial interaction). -

Public agencies interaction and collaborative adaptive management came into force on LC 140:

- Cooperation action between state levels are discriminated by law, using instruments such as consortium, agreements, commissions, funding and attribution, authority and execution delegation. Also, information sharing is expected to take place, where information feedbacks strengthen integrative procedures in natural resource management.

Considering topics addressed by reference literature and linking with Brazilian selected regulation, authors indicate that cumulative properties of impact is aligned with context specifications, possible changes consideration and uncertainty consideration.

Phase 2 results shows from a total of 58 oil and gas production EIA available at IBAMA's website (IBAMA, 2014), only 15 (25,86%) had all process documents available (screening term of reference, scoping reports, EIA studies and licenses), where all term of reference obliges consideration of cumulative and synergistic properties, even before Oil EIA TN came into force. Requirement importance shows that obligation to consider cumulative properties of projects effects is a standard procedure for CGPEG licensing evaluation, but qualitative or quantitative description of cumulative effects appears on 7 (46,6%) studies. However, mainly due to lack of methods requirement, analysis led to overall (9 processes or 60%) poor identification and description of cumulative properties for Brazilian oil and gas EIA, integrated to one of many categories such as "frequency" or "magnitude", showing a need for better guidance (IBAMA, 2014).

Specific consideration of cumulative properties was found at six processes (40%) were 5 (20%) using any CEA specific method. CEAM related procedures, prior studies consideration and global and/or transboundary effects were identified only at pre-salt layer exploration at Santos's Basin, a strategic infrastructure project for federal government. The three other processes just met Oil EIA TN typology exigencies.

RSBEE and RCES are somehow attached with Context specifications, possible changes considerations, Study assumptions and Uncertainty consideration. Those evaluations have potential to embody CEAM tools, where its core definition goes beyond single project analysis to region-wide assessments. In addition, Oil Ordinance Articles 10, 13 and 19 are somehow integrative of many single actions (integrating past and present projects), therefore promoting better cumulative effects evaluation alongside preceding evaluations. Somehow, Regionalization of pollution control goals can fit this purpose as well, but in an indirect and specific way.

Obligatory shared environmental management have links with management, stakeholder role and collaboration but, as addressed by an environmental education technical note, influence is limited at whole project management, even further with expected less influence at regional level.

Conclusions:

CEAM glances can be inferred by Brazilian regulation under scrutiny in this paper, where public agents possibly may address cumulative effects by those obligations, when context situation pop-up. Besides

low importance and disperse mention may weaken evaluation, Brazilian regulation is walking towards incorporating such practices. Environmental licensing undertaken by CGPEG have potential to better manage natural resources allocation by integrating those dispersed practices, where adaptive management could play a central role.

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