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Strategic Environmental Assessment and the Cumulative Impacts

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Abstract

Ways to assess the Cumulative Impacts (CI) have been discussed since the seventies. Despite the absence of consensus, the Strategic Environmental Assessment (SEA) has been increasingly said to be an appropriate conceptual basis for Cumulative Impact Assessment (CIA), even though there is no practical evidence of this in the literature.

The purpose of this study is to determine whether the SEA intrinsically evaluates CI, thus performing a useful tool to study this type of impact.

To meet the proposed objective, this study explores and gathers the methods and guidelines for the CIA scattered in the literature, and based on that information it analyses a set of national and international case studies.

It was found that CIs are not properly addressed on a project-based environmental assessment like Environmental Impact Assessments (EIA), and that the SEA, with its regional and strategic approach, is “the best fit for the job”.

Generally the international case-studies assumed the intention to evaluate the CI, which was not true for the national ones.

The main conclusion is that the SEA intrinsically assesses the CI, and that it already makes use of the recommended methods for CIA. However it was also found that the added value of SEA for CEA is not recognized, which ultimately results in SEA project-based procedures like EIA.

Keywords: Strategic Environmental Assessment, Cumulative Impacts, Cumulative Impacts Assessment

1. Introduction

There are a number of countries (Canada, United States of America, United Kingdom, Holland, Portugal, Spain, and others) where the consideration of CIs in the EIA process is required by law. However, conducting a CIA according to the guidelines of an EIA has proven to be an inefficient and limited practice to accurately assess CIs due to EIA nature, too focused on the project-level. Because of its strategic nature and broader border analysis in relation to EIA, the SEA has been increasingly

cited as the conceptual base that allows for better consideration of the CI (Fischer, 2002; Therivel, 2004). According to Hegmann, et al. (1999) there is a lot of useful information and adequate methods to perform a proper CIA. Based on this, many experts say that CIs are already studied, or partially assessed in several studies, but in a non evident way, sometimes not referenced and with no intention. In fact, being a presumably ideal tool for CIA, it's possible that many SEAs have studied CIs and its effects on the environment, even without assuming that, or in a separate chapter for that purpose.

So the question that arises is: Is the CIA an independent exercise or it is inherent to the SEA process?

2. Methodology

This study begins with an exploratory phase where the spread information in the literature about the way CIs have been assessed is collected. In this stage, CIs are clearly defined and its conceptual basis, methods and guidelines of assessment are presented.

Subsequently the main assessment guidelines recommended in the literature to strategically assess CIs are presented, and therefore the "key orientations" of the state of the art are gathered. Consequently these "key orientations" are analyzed from the standpoint of their suitability, feasibility and effectiveness in the study of CIs.

Based on the conclusions drawn from the "key orientations" analysis, a set of national and international SEAs are studied with the goal to ascertain or not the SEA capability to assess CIs. This set of SEAs was selected according to certain standards:

1. SEAs with wide scales (regional or national) so the probability of choosing SEAs where there's a tendency to "fall" in project-based processes is reduced;
2. SEAs of countries recognized as leaders in the SEA process, increasing the probability of choosing SEAs representative of the current best practices;
3. The latest possible SEAs, so the chosen SEAs incorporate the latest developments of Environmental Assessment (EA);
4. SEAs full Environmental Reports (ER) availability. The scarcity of ERs publicly available was acknowledged, so this was a criterion that had to be taken. Due to this shortage, an SEA online database (http://seadatabase.webs.com/) resulted from this study, where all the RAs examined and others that have been sent by users, are available

Finally, conclusions are woven from the study of the selected SEAs and the "key orientations" for CIA analysis.

3. Cumulative Impacts

The concept of Cumulative Impact was introduced along with the first EIA system by the National Environmental Policy Act (NEPA) in 1970 in the USA. In its section 1508.7 the NEPA defines CI as "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (…)". Later, in 1978 the Council on Environmental Quality (CEQ) adds that these impacts are considered "(…) regardless of what agency

(Federal or non-Federal) or person undertakes such other actions.". This was just the starting point as over the years this type of impact has been evolving in concept, emerging new and improved definitions such as Canter's (1999) which states "Cumulative Impacts can be additive, iterative, synergistic or irregular (unpredictable), generated by individually insignificant actions but collectively significant that accumulate in space and time." From now on, the Canter's definition is the one used in this study.

The importance of CIs is further strengthened is by the publication of the European Directive 85/337/EEC, which requires, since 1985, the consideration of CIs in EIAs. The changes introduced by Directive 97/11/EC, maintain and enforce this requirement by establishing that the criteria for selecting projects to be evaluated should include "(…) cumulative effects with other projects (…)" (n.1, Annex III). It is then published, in 2001, the SEA Directive 2001/42/EC on the assessment of the effects on the environment caused by certain plans and programs, which requires taking into account "(…) any significant effects (…) including cumulative and synergistic effects on the environment."

CIA implies a different perspective from the usual analysis of environmental impacts. So instead of emphasizing the project and analyze its impacts, direct and indirect – a project-based perspective, it becomes necessary to focus the analysis on the environmental components that are affected by the project – a resource-centered perspective (Partidário & Jesus, 2003).

4. CIA conceptual bases

4.1. CIA under EIA

CIA is currently part of the vast majority of existing EIA procedures. Examples include the United Kingdom that since 1988 requires consideration of CIs in EIAs (Cooper & Sheate, 2004), Canada where the Canadian Environmental Assessment Act of 1995 requires, in section 16 (1), consideration of '' (...) any cumulative effects that may result from the project in combination with other projects or activities that have been or will be conducted." (Duinker & Lorne, 2005), or the USA where the CEQ requires the consideration of, not only the direct and indirect impacts, but also the potentially cumulative ones (Clark, 1994).

In Hegmann, et al. (1999) it's stated that "(…) a CIA is a well done EIA.". According to Baxter, et al. (2000) there are benefits when performing a project level CIA, since the EIA can address CIs at the decision level through the approval of projects, and can reduce projects contribution to incremental cumulative impacts (Cooper & Sheate, 2004).

Another feature of the recent approaches to CIs is the adoption of the concept Valued Ecosystem Component (VEC). By the early '80s, exhaustively examine all environmental values was a recurrent practice in the EIA process which resulted in confusing and unobjective EIAs, contributing to the uncertainty of whether or not some unwanted impacts would occur. It was then that Duinker and Beanlands introduced the concept of VEC in order to help understand the central issue of EIA (Duinker & Lorne, 2005). VEC are then defined as any environment component (resources, ecosystems and human communities) considered important by the proponent, public, scientists or the Government involved in the evaluation process. This importance can be determined based on cultural values, concerns of the population, and scientific concerns (Hegmann, et al., 1999). Despite the "VEC"

designation being adopted by the Canadian assessment systems, other countries, although not using the same terminology, also adopted the concept, just using different terms such as “Valued Resources of the Environment” (DEAT, 2004) or “Sensitive or Important Environmental Resources” (Cooper L. M., 2004). In Portugal, the used concept is that of “Critical Factors for the Decision” (CFD) (Partidário, 2007), which adds the economical and social dimension to the VEC concept.

The Canadian designation will be used in this study, except in cases where other similar concept is adopted, as the case of CFDs.

Since the extension of CIs normally goes over large areas and long periods of time, it is necessary to define which resources "are worth evaluating", those who are really important and decisive for the quality of the environment and the well-being of populations. The definition of VEC fits perfectly this need of focus.

There are several guides, based on analysis of case-studies, to support CIA under EIA, and two are highlighted in the literature: Considering Cumulative Effects, published in the USA (Council on Environmental Quality, 1997) and Cumulative Effects Assessment Practitioners Guide, published in Canada (1994, revised and upgraded in 1999 by Hegmann, G. *et al*.). In these guides, the process of CIA follows the EIA process, and so the CIs are assessed in a project-based approach.

There is also a third guide – “Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions”, published for the European Union (EU) (Hyder, 2001), where Clark (1994) states that it is necessary to conduct a CIA at the policy and program level, so that CIs are correctly assessed. So although the EU guide follows the steps of an EIA, it is assumed that a broader, strategic approach may be a “better fit” to CIA.

It’s easy to acknowledge that a project-based approach as EIA is not compatible with an CIA, both conceptually and operationally (Antoniuk 2002; Kennet 2002). If the goal is to evaluate impacts resulting from incremental impacts of the action when added to other actions, past, present or reasonably foreseeable in a particular place, a correct approach should focus on the VEC and evaluate all the pressures in it generated by human activity, and not the reverse. It is clear that the evaluation of interactions between a single project and a specific VEC is largely incapable of ensuring the sustainability of the VEC (Ross W. A., 1994).

It’s not surprising that a “VEC-centered” EIA (what are the consequences of human action on the VEC?) is not easily accepted by the proponents that have the main objective to get their project approved and wish above all that the negative impacts of their own project are the least significant possible. Proponents are reluctant when faced with the fact that minimal impacts of their project, cumulatively with other impacts of other projects, existing or future, may result in significant impacts. This mentality adopted by most professionals, leads to poor and incomplete CIAs that are only carried out to comply with the law requirements. This contributes to, even if there are plans for future projects, they are not very specific with regard to its implementation or kept confidential by its proponents. In fact a large number of studies in various countries show that the way CIs are described and included in EIAs is not satisfactory (Wärnbäck & Hilding-Rydevik, 2009). The inadequate description of CIs in EIA is, for example, reported in USA (Burris & Canter, 1997), Canada (Duinker & Lorne, 2005) and UK (Cooper & Sheate, 2002; Ross & Therivel, 2007).

Another shortcoming of EIA is the lack of mechanisms to incorporate information gathered during the execution of the project (Canadian Environmental Assessment Agency, 2001). In CIA, where the data to collect is difficult to obtain, a limitation like this gains a high importance and limits its success. CIA needs wider borders of analysis (of time and space) than those used in assessments focused on the project (EIAs) since impacts may occur in locations, spatially and temporally, far from the project and therefore not considered in it (Ross W. A., 1994) & (Drouin & LeBlanc, 1994). This is the main reason for the fact that SEA is seen as the ideal process for conducting a CIA, since its borders are more comprehensive than those of EIA. Moreover is the fact that the SEA can be implemented from the beginning of the development of policies, plans or programs (PPP), before any decisions, developing early multiple alternatives, a wide range of mitigation measures and providing an holistic view of the assessment object.

4.2. CIA under SEA

Strategic level approaches to CI are also legislated, namely by the European Directive 2001/42/EC of 25 June that states the application of criteria for determining the likelihood of significant environmental effects and requires a comprehensive and systematic approach. In its Annex I the Directive also state that Environmental Reports should include any significant environmental effects, which include cumulative and synergistic effects.

In (Fuller & Sadler, 1999) and (Spaling & Smit, 1993) it is stated that, unlike a regional and strategic CIA, a project level CIA does not effectively address gradual degradation of environment due to multiple pressures and actions, and the interaction of multiple projects, programs and policies. Davey, et al. (2002) claim that authorities responsible for strategic planning are in a better position than the proponents to address CI since the proponents' ability to identify, quantify and evaluate the impacts of other projects and activities may be quite limited by the unavailability of information and resources. Moreover Davey, et al. (2002) also highlight the fact that the extent to which the proponent of a project is responsible for assessing and controlling cumulative impacts is not clear, so SEA would provide a more appropriate structure to the CIA, supporting the decision, especially in regard to the identification of responsibilities. Kennet (2002) adds that the necessary measures to address the CI are simply beyond the proponents control and therefore there should be an approach led by government agencies to make basic elements for a consistent CIA available. Cooper & Sheate (2004) suggest that a strategic approach to CIA can be more proactive to identify and minimize potential cumulative impacts and allows them to be early addressed in the planning process. Finally Cooper (2004) notes that SEA facilitates the analysis of development alternatives at an early stage of the process, which allows the selected options of a plan to less likely contribute to CIs.

4.3. Other CEA obstacles

The Government, which typically prepares PPPs, is supposedly less susceptible to market pressures and interests than proponents of projects. However, the Government intends to stay elected, is constantly in financial difficulties and therefore wishes to encourage development to ensure the maximum possible economic sustainability. Thus the Government ends up being targeted by the same

pressures and constraints than projects proponents', and this is clearly reflected in the CIAs (Ross & Therivel, 2007).

The lack of a structured methodology has led to SEAs seen as *ad hoc* exercises and therefore it was not recognized the added value they bring to CIAs (Noble & Harriman, 2008). As a result, regional CI approaches are made without a strategic vision; converge to methods based on the pressure agents; are focused on describing the current state of the environment or its response to existing or past pressures.

Wärnback & Hilding-Rydevik (2009) suggest that lack of knowledge and procedures regarding the way CIs are included in the process of EIA / SEA and the lack of legislation and clear rules for this purpose are seen as major obstacles to CIA. This allows the emergence of many cases where one considers that the responsibility of finding solutions to CIs is from the Government or is it simply refused (local authorities refuse the responsibility). This leads to the consideration and management of cumulative impacts take place only if those responsible for decision making wish so and if they have sufficient power and influence to do it (Ross & Therivel, 2007).

Threshold is a CIA fundamental concept, which is associated with more difficulties. Basically the threshold is the point at which the behavior of the components of a system changes so rapidly and unpredictably it becomes impossible to return to their initial state. In other words threshold refers to the sustainable yield of natural systems, and this concept is fully implemented in the social and economic systems. It is thus clear that to meet the objectives of CIA, these thresholds should be fully known, and if they are not, one should not interfere with the system under study in order to safeguard the VEC (Duinker & Lorne, 2005). The problem is that these thresholds are difficult to study and identify and in some cases impossible to determine, which means that many studies consider these thresholds negligible, putting VECs and their sustainability at risk.

5. CIA Methods

CIA methodological basis has been expanding since the beginning of his practice. Interestingly, this development has involved both EIA methodologies and modifications of them (Canter, 1997 e 1999; Canter & Kamath, 1995). In 1997 CEQ identified and listed methods considered relevant to the CIA exercise which have been continuously studied and improved up to today (Council on Environmental Quality, 1997). The most commonly used methods are: Interaction Matrices which can be used to evaluate the relation between activities and the resources of concern affected by them; Checklists can be used to identify CIs by providing a list of common or likely effects and juxtaposing multiple actions and VECs; Networks, System Diagrams and Flowcharts which are useful for delineating the cause-and-effect relationships resulting in CIs; and Trend Analysis which can be used to assess the status of VECs over time and to develop graphical projections of past or future conditions (Council on Environmental Quality, 1997).

In establishing spatial and temporal boundaries of assessment, it is important to bear in mind that it may be necessary to consider different boundaries for different VECs (Noble, 2008; Cooper, 2004). The temporal boundary determines the extent to which the assessment considers past trends and data and how far in the future should CIs be considered, so questions like "when impacts, similar to

those identified, occurred in the past?" or “when it is expected that specific resource meets the legal requirements?” should be considered.

The indicators used in SE are particularly useful, since they allow measuring the extent to which objectives have been met and its changes can help predict potential CIs.

According to Cooper, L.M. (2004), the identification of CIs implies:

- Identifying and describing cause-effect relationships between impacts and VECs. For that purpose flowcharts can be used;
- Determining environmental changes due to the actions identified in the flowcharts;
- Predicting the VECs response to the impacts. In this case, baseline data collection and trends analysis are essential;
- Assessing CIs magnitude and significance. Significance can be assessed in the context of identified SEA objectives and existing legal thresholds. Some caution is required in determining CIs magnitude, since CIs on a given resource are not necessarily the sum of all impacts.

Given that the focus of SEA is the VEC and CIA process fits perfectly within SEA, it is natural to consider that a Strategic Environmental Assessment intuitively assesses the CI.

6. Guidelines for CIA

There is scattered information in the literature regarding the ways to conduct a strategic approach to CIs. That information was gathered and systematized in ten guidelines:

1. Identify potential cumulative processes *(DEAT, 2004; James, et al., 2003; Cooper, 2004 a; Hegmann, et al., 1999; Thérivel, 2005);*
2. Consider past, present and reasonable foreseeable actions *(Thérivel, 2005; DEAT, 2004; James, et al., 2003; Hegamnn, et al., 1999);*
3. Establish temporal boundaries to include all potential sources of impacts *(DEAT, 2004; James, et al., 2003; Cooper, 2004 a; Hegmann, et al., 1999);*
4. Establish an area of assessment large enough to allow the evaluation of VECs likely to suffer impacts. This can result in an area beyond administrative boundaries *(DEAT, 2004; James, et al., 2003; Cooper, 2004 a; Hegmann, et al., 1999);*
5. Set thresholds and indicators as the CIA basis *(Thérivel, 2005; Cooper, 2004 a; DEAT, 2004; James, et al., 2003)*;
6. Assess the interaction between the impacts of the proposed activity in the VEC *(Cooper, 2004 a; Hegmann, et al., 1999; DEAT, 2004; James, et al., 2003);*
7. Assess the total impact on the proposed action and other actions on the VEC. This impact should be compared to thresholds or policies, if available *(Cooper, 2004 a; Hegmann, et al., 1999);*
8. Propose mitigation measures for CIs and evaluate the significance of Residual Impacts (RI) after the implementation of these measures *(Cooper, 2004 a; Thérivel, 2005; Hegmann, et al., 1999; DEAT, 2004, James, et al., 2003);*
9. Promote monitoring actions in order to improve the consideration of future actions which could generate impacts in the VECs under study *(Cooper, 2004 a; Thérivel, 2005; DEAT, 2004; James, et al., 2003);*
10. Provide the involvement of stakeholders in the SEA *(Alberta Environment, 2007; Thérivel, 2005).*

The first guideline, despite its importance and proven feasibility in the literature, lacks a concrete explanation of how it can cover CIs, to the extent that examples advanced in the literature fall into project-level scales of assessment. So these examples are therefore insufficient to answer questions like “And at the regional scale? How do we apply the recommended methods on a regional scale?”

Regarding the second guideline, it is unclear its usefulness to the CIA. For instance, in a SEA of the energy sector of any country, it can be seen that the past renewable energy form was hydropower, it is solar in the present and is currently a noticeable trend of high growth of wind energy. In this example it is not clear how this information is useful for CIA.

It is not clear in the literature if the determination of assessment borders (temporal and spatial) in a regional scale is useful and doable. This is due to the fact that CIs can extend over vast areas and for large periods of time, even reach a global scale in spatial borders and centuries in time, like the ultimate CI, the Global Warming. If we are assessing the impacts suffered by the VEC, we realize its extension by the simple fact that we are evaluating it, so there is no reason to restrict the evaluation of CIs with a spatial border. Moreover, it is recommended to identify past, present and future actions based on a trends analysis, so it is not necessary to define spatial and temporal boundaries that restrict that identification, since to examine the past, present and future dynamics, such actions are automatically identified.

There are examples of the application of indicators and thresholds at the regional and strategic scale, however the conditions under which such indicators and thresholds were defined and how they were obtained are unknown. It is true that indicators and thresholds can be obtained by legal thresholds, scientific studies or PPP already approved, but what if no sufficient indicators or thresholds that are suitable for the studied PPP are found? What is an indicator or threshold suitable for the strategic level assessment o CIs? In fact, despite its potential usefulness, the use of this thresholds and indicators at a strategic level seems to be rather difficult and there are no practical results of it in the literature.

Regarding the assessment of the interaction between the impacts and of the total impact on the proposed action (guidelines six and seven), both are theoretically useful and its contribution to CIA is easily understood. However, all examples of its application fall into a project-scale assessment. Thus, the implementation of these guidelines at strategic scales is unclear and weakly supported.

The importance and utility of mitigation measures and monitoring actions (guidelines eight and nine) to strategic-scale CIA is evident. The two major problems, common to these guidelines are: there are no implementation examples that approach CIs at the strategic level, and these guidelines are highly dependent on the cooperation between stakeholders regarding the sharing of responsibilities by CIs. These are indeed two guidelines that make sense, however its implementation will be extremely difficult, existing only sporadic examples of situations in which there is cooperation between stakeholders, lacking however the evidence of how this was achieved.

It is not clear in the literature, how providing the involvement of stakeholders in the SEA contributes specifically to the assessment of CIs, since one of the objectives of any SEA is to provide the involvement of stakeholders in the plan, program or policy.

After this guideline examination, one can conclude that in general, the existing and recommended approach structure to assess CIs in a strategic way is weakly sustained and eventually falls in a project-centered assessment, typical of EIA processes. This tendency to rely on EIA is evident by the numerous examples used in the literature, always focused on the project.

7. Case-Studies

Following the purpose of this study, a set of SEAs (case studies) were analyzed in order to pragmatically determine the extent to which these SEAs assess the CIs. Next, the case studies and the main conclusions drawn from them are showed:

SEA for the Regional Plan of Territorial Cohesion of Alentejo (RPTCA) (CCDR do Alentejo, 2008):

- The objectives of the Regional Plan were confronted with the existing environmental macro-policies, allowing the early identification of potential cumulative issues;
- An Interaction Matrix is presented, where the interaction between RPTCA challenges and environmental factors for evaluation (of the European Directive 2001/42/CE) is represented. This way potential cumulative issues of the RPTCA can be identified;
- CFD's are determined and its current state is assessed. Then a trend analysis is performed relating CFD's current state with the regional dominant development dynamics. This way the total impact of all those dynamics is assessed;
- A threshold is used for the amount of built infrastructures, at which any action liable to result in impacts on the CFD is prohibited. This way, the threshold prevents the occurrence of CIs, not only at the project level (prevention of new construction) but also at regional level (conditioning of PPP aiming to expansion of tourism based on new buildings);
- The attempts to demonstrate the occurrence of CIs were always reliant on the professional judgment.

SEA for the Investment and Development Plan of the National Electricity Transport Network (REN, 2008):

- There is an assumed attempt to assess CIs as the criterion "minimize CIs" is used to assess the Fauna CFD;
- The assessment of CIs is mainly focused on the addictive nature of impacts. So it is unclear how the synergistic dynamics are assessed;
- The maps of the affect areas by each strategy of the plan were overlaid, giving a general representation of the areas affected by all the infrastructures of the plan at a regional scale;
- The compilation of all the strategic guidelines of other PPPs with influence on the Plan helps to predict the outset of future actions and thus identify potential cumulative issues;
- Measure like 10x10km squares were used to assess CIs. It is clear that a 10x10km square, at the national scale of the Plan, has no meaning and it is a project-scale procedure.

SEA for the National Program of High Hydroelectric Potential Dams (COBA & PROCESL, 2007 a)

- The compilation of all the strategic guidelines of other PPPs with influence on the Plan helps to predict the outset of future actions and thus identify potential cumulative issues;
- Since the implementation of this program will obviously have repercussions at the national level, one would expect that the effects of the Program were evaluated in a holistic way, considering the joint

impact (cumulative) of the group of projects to choose from. However this does not happen and there is only a comparative analysis of the impacts of each project separately;

- CIA is recommended to be done on future EIA processes;
- Tables where opportunities and threats of the Program within each CFD are built. This alone allows the identification of potential cumulative issues by observing all the threats and opportunities together;
- An Interaction Matrix between the Program options and CFDs is shown. This matrix has a clear potential to identify CIs of the main options of the program.

Final Sustainability Appraisal (integrating Strategic Environmental Assessment) of the Yorkshire and Humber RSS Revision (Levett - Therivel Sustainability Consultants, 2008)

- The main component of SEA is not a VEC or CFD but "SEA objectives" that can represent more than one resource. This forces a holistic view of the impacts resulting from the RSS;
- A matrix where the RSS policies and the SEA objectives are related, is shown at the beginning of SEA, so the " cumulative impacts of all RSS policies in each SEA component are summarized" (Levett - Therivel Sustainability Consultants, 2008);
- CIA is based on the intersection of conclusions drawn from the initial matrix and the conclusions of a trends analysis;
- The chapter where the environmental impacts are assessed is entitled "Cumulative impacts", clearly showing that the main goal of the SEA is to evaluate CIs.

Southern Newfoundland Strategic Environmental Assessment (LGL Limited, 2010)

- The use of Large Ocean Management Areas (LOMA), not only facilitates the implementation of mitigation/monitoring measures for CIs, but also facilitates the "share of responsibility" for CIs because LOMAs are "marine regions established for planning purposes and they form the planning basis for implementation of integrated-management plans. LOMAs are typically thousands of square kilometers in size. (…) LOMAs are delineated so that ecosystem health and economic development issues within their boundaries can be addressed and suitably managed" (LGL Limited, 2010);
- Individual projects are assessed in a typical project-scale assessment, and then a "Cumulative Impacts" chapter is presented where the sum of the earlier assessed impacts is made;
- Security distances between projects are determined to minimize CIs. This is however a project-scale measure, and it is well evidenced by the value of the safety distance (five hundred meters), that makes no sense at a regional scale;
- Underwater noise thresholds are determined from which several marine species are affected. These thresholds can contribute to CIs prevention, defining noise levels from which no further noise generating activity would be permitted.

Sustainability Appraisal (SA) / Strategic Environmental Assessment (SEA) of the St. Helens Core Strategy Publication Draft Development Plan Document (Scott Wilson Ltd., 2009)

- The compilation of all the strategic guidelines of other PPPs with influence on the Plan helps to predict the outset of future actions and thus identify potential cumulative issues;
- The main component of SEA is not a VEC or CFD but "the SEA objectives" that can represent more than one resource. This forces a holistic view of the impacts resulting from the Plan;
- A matrix where the Plan strategic options and the SEA objectives are related, is shown at the beginning of SEA, so it is possible to identify cumulative issues;
- The chapter where the environmental impacts are assessed is entitled "Cumulative impacts", clearly showing that the main goal of the SEA is to evaluate CIs;
- A three column table is shown, where the columns are: SEA objectives; time effects (assessment of the impacts duration); and certainty (assessment of the impact occurrence uncertainty)

8. Results discussion and Conclusions

The challenges of CIA are well documented, its conceptual bases are well defined and there are already several guides and methods to support it. The advantages of a strategic approach rather than a "project-centered" one are well sustained and SEA is pointed out as the ideal tool for the study of CIs. However, evidence of these advantages in practice has not been demonstrated. This study sought to successfully demonstrate, in an objective and pragmatic way, these benefits that SEA has for CIA.

The compilation of the strategic orientations of other PPPs with influence on the assessed PPP is common to all the analyzed SEAs. So it is possible to predict future actions and consequently identify potential cumulative issues.

A widely used method, also common to all the analyzed SEAs, is the interaction matrix. These matrices face the strategic options of the addressed PPP and the key elements from which the SEA proceeds (CFDs, VECs or SEA objectives). It was found that the resulting analysis of these matrices show cumulative processes, so the actual outcome of the interaction matrices is the CIA of the actions envisaged in the PPP study.

Another common practice to all the case studies is the analysis of development trends preceded by a characterization of the current state of environment (reference state). Trend analysis and characterization of the reference state usually arise interconnected, since the trend analysis is based on the current state of the environment to identify outcomes of the identified trends. Now, as the characterization of the reference state is based on analysis of the CFDs / VECs identified in the SEA and thereafter the trend analysis starts off from this characterization, we are actually assessing CIs of development dynamics identified in environment. So the common procedure of SEA ultimately results in a CIA.

Although it was proved that in practice most of the SEA findings reflect an assessment of CIs, professionals still do not recognize the potential of SEA, and the evaluation of CIs, although accomplished, falls short of what it could be. In this regard it is noted a significant difference between

national and international SEAs. In the international cases it is recognized that SEA allows the assessment of CIs, but in the national cases this is not true.

It is indeed important to assume that this strategic and broad temporal and spatial scales procedure called Strategic Environmental Assessment assesses CIs. Not recognizing this added value of SEA may be the source of the major flaw identified in SEA which is the downscaling to project-scaled assessments as a way of evaluating CIs.

For everything that was said, it is clear that SEA assesses CIs itself, but there are still some gaps to eliminate. It is therefore suggested that practitioners assume that it is only the total impacts that matter to the resources and affected populations (Ross & Therivel, 2007), and that SEA is an adequate tool to assess them. From there, the methods already used in SEAs and whose potential for CIA is proven and documented will be used in a more effective and efficient way to assess CIs.

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