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How much is a lot? A systematic approach to impact significance assessment

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Abstract

Impact significance assessment is one of the most important, but also most difficult tasks in environmental impact assessment (EIA). However, assessment practices have varied, and the principles of assessment are not always communicated to the reader. This article presents an approach to assessing the significance of impacts developed in the IMPERIA project, and the experiences and opportunities for applying this approach.

The IMPERIA project addressing essential issues

The separation of essential and nonessential issues and an improved understanding of the scale of impacts are key objectives of environmental impact assessment. In order to understand the basics of assessment, systematic and illustrative methods are needed that rely on widely accepted principles of assessment. Otherwise, it is easy to end up in a situation where the most vociferous interest groups have the strongest impacts on public debate.The Nord Stream gas pipeline built in the Baltic Sea is a good example of a project where, before the EIA, the views presented in public debate were very far apart from each other. However, the information systematically produced in the EIA contributed to the public debate by aligning the views of different parties on the impacts.

The IMPERIA project (LIFE11 ENV/FI/905), carried out in 2012–2015, has identified and developed tools and practices to support environmental impact assessment. The project sought to address a number of partly contradictory development objectives of the EIA process discussed in recent years; the evaluations should on the one hand be high quality, comprehensive, detailed and interactive, but on the other hand also focused on the essential aspects, sensitive to the key environmental risks and reasonable in terms of duration and cost. In this article, we present the most important output of IMPERIA project, i.e. the systematic assessment of impact significance using the developed ARVI approach.

Significance assessment is a challenge to experts and laymen

The IMPERIA project initially conducted an extensive survey of the international and Finnish literature on the topic. The main results of the survey can be summarized as follows: First, impact significance assessment is the central, but perhaps also the most difficult task of EIA. Secondly, there is no consensus

on how significance should be assessed, which is partly because the practices and terminology have varied, both in Finland and abroad. Thirdly, the assessment of significance is always tied to values and is also open to interpretation. This is well illustrated by the following definition presented by the recognized EIA expert David Lawrence: "*Significance determination in EIA [Environmental Impact Assessment] practice makes judgments about what is important, desirable or acceptable. It also interprets degrees of importance.*" Fourthly, communication of the results of impact significance assessment and their basis is difficult because of the awkward terminology. Fifthly, EIA projects should focus on the most important impacts, because too often a large proportion of the resources are allocated a very detailed review of what are on the whole nonessential impacts.

One of the objectives of an amendment to EIA Directive (2014/52/EU) that came into force in 2014 is to increase the effectiveness of the EIA process in decision-making on permits for projects. The aim is also to improve the cost-effectiveness of EIA procedures, which also involves highlighting the assessment of impact significance.

Can ARVI help?

In the ARVI approach developed in the IMPERIA project, the assessment of impact significance is based on the sensitivity of the target and the changes that might result from the project as follows (Figure 1):

1) The sensitivity of the target is assessed based in its characteristics (existing legislation, social significance and vulnerability to change)
2) The magnitude of change resulting from the project is assessed based on its characteristics (magnitude and direction, scope and duration, including timing and periodicity)
3) An assessment is formed of the significance of impacts based in the above assessments of target sensitivity and the magnitude of the change utilizing, for example, an indicative table (Table 1)

To support the assessment, various impact classification scales have been compiled in IMPERIA project, which can be used in determining the target sensitivity and magnitude of change. The Excel-based ARVI tool developed in this work provides the EIA project manager with a means to directly collect the evaluations of impact assessment experts using electronic forms and compile the results in tables and graphs that can be utilized in the EIA report.

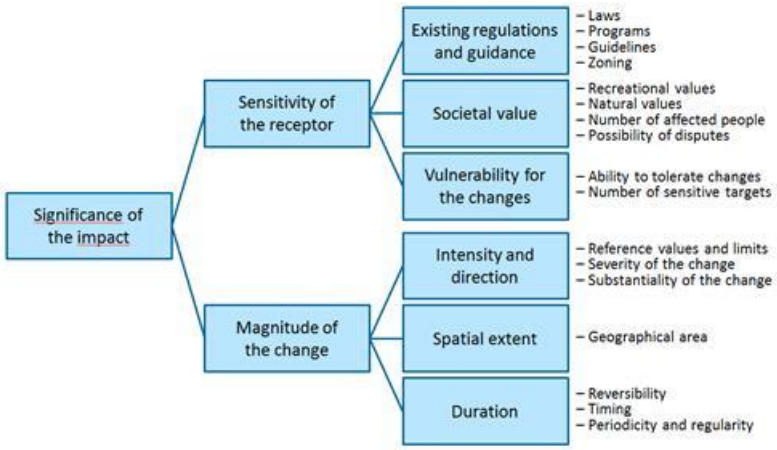

Figure 1. The ARVI approach to impact significance assessment.

Table 1. Indicative table for impact significance assessment based on the sensitivity of the receptor and magnitude of change caused by the project.

Impact significance		Magnitude of change								
		Very high	High	Moderate	Low	No change	Low	Moderate	High	Very high
Sensitivity of the receptor	Low	High*	Moderate*	Low	Low	No impact	Low	Low	Moderate*	High*
	Moderate	High	High*	Moderate	Low	No impact	Low	Moderate	High*	High
	High	Very high	High	High*	Moderate*	No impact	Moderate*	High*	High	Very high
	Very high	Very high	Very high	High	High*	No impact	High*	High	Very high	Very high

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

The ARVI approach can be applied as such or utilizing its features in different steps of the EIA procedure (Figure 2). However, experience of its application has so far are been limited to the assessment reporting stage.

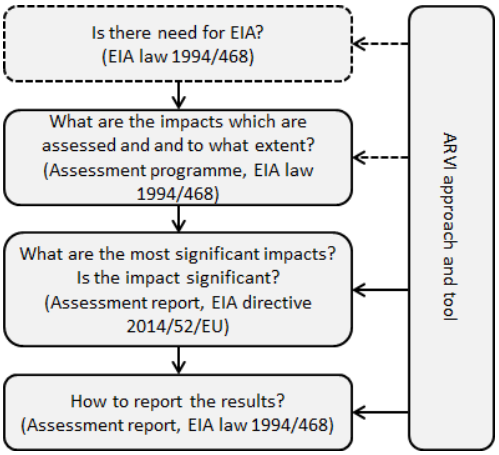

Figure 2. The ARVI approach supports the various stages of the EIA process

From theory into practice

Pilot projects for testing the ARVI approach included EIAs for the Piiparinmäki-Lammaslamminkangas wind farm, wastewater management options for the Vihti commune, and the Balticconnector natural gas pipeline between Finland and Estonia. In addition, the approach has been applied to the EIA of energy alternatives for the city of Helsinki (Helsinki Energy 2014). In the first pilot project of IMPERIA, a three-tier scale of significance was applied (low–moderate–high significance). Later, the significance scale was supplemented by the addition of a new category, "very high". One reason for the change was that based on the findings, the experts seemed to avoid the use of the extreme class in situations where the impact assessment had a variety of uncertainties. The ARVI approach can also be used to interactively as a planning tool. For example, in the Helsinki Energy project, the options were modified during planning process so that significant negative effects could be avoided. Table 2 summarizes the benefits and challenges of the ARVI approach based on pilot experience.

Table 2. The benefits and challenges of the ARVI approach.

Benefits	Challenges
- Improves the discussion between EIA experts - Helps to systematically take into account all the factors affecting the assessment - Supports the justification of assessment and illustrates the formation of the significance assessment - Unifies the impact assessments of different experts - Helps in identifying differences of opinion and their causes - Supports the targeting of impact investigations and reports to relevant issues - Improves the comparability of impact assessments for different projects	- Can increase the workload of large projects with multiple options - The application of this approach has many different possibilities, and identifying the most workable requires experience in EIA and understanding of the ARVI approach - If schematically used, it might give a one-dimensional and too objective picture of the significance of impacts - By targeting individual impacts, the significance of impacts may be experienced in a completely different way

What can be inferred from the results of ARVI?

The ARVI approach enables the significance of impacts to be assessed, but the essential question is how the results thus obtained can be used in EIA to identify any significant negative consequences. The challenge is also that there can be very different interpretations of the evaluations derived using the ARVI approach (Figure 3). We believe that at least those impacts assessed as having a moderate to higher significance using the ARVI approach can be characterized as significant.

It cannot be inferred from the results of impact assessment whether a project is feasible from the perspective of legislation, as different laws have different interpretations as to whether the adverse effects prevent the implementation of the project. For example, based on principle of compensation laws, such as the Water Act, a project can be implemented in certain situations, despite significant adverse effects, if the social benefits of the project greatly outweigh the disadvantages. The final decision as to whether the effects are so significant that a project cannot be accepted takes place in either as a separate decision of the project manager, in municipal decision-making, in licensing authorities and the various courts.

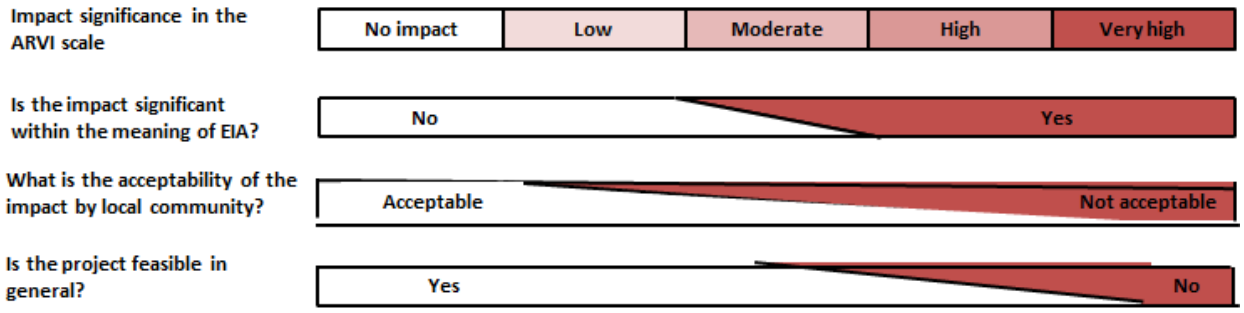

Figure 3. Interpretations of how assessments derived using the ARVI approach can be interpreted in different contexts.

Good practices in significance assessment

According to the principles of the IMPERIUM project, significance assessment can be successful if:

- the concepts have been clearly defined and are used in a uniform manner,
- the assessment of significance is based on a logical framework and is systematic and transparent,
- the values connected with the assessment of the significance are highlighted, for example by describing how the different parties perceive the significance of impacts, and
- identification of the essential impacts and significance assessment are included in the various phases of the project (Figure 2), and they also influence the course of the evaluation, so that the focus is on the assessment of the most significant impacts.

Understanding of values in connection with impact assessment is important, because it helps to accept that different parties may have different views on the significance of impacts. A certain degree of ambiguity is associated with the assessment of significance, which is also a challenge, because it allows for purposeful evaluation, i.e. depending on the interest, the significance of impacts can be downplayed or exaggerated. With systematic, transparent and universally accepted rating scales and significance assessment founded on principles, this possibility is reduced, but not completely eliminated.

Conclusions

The IMPERIA project has attached considerable attention to communication and the training in the method. Consequently, we have widely communicated the fact that significance assessment is an essential part of EIA, and that the ARVI approach to inspection provides the necessary systematic approach and clarity. One expert who had applied the approach commented on the IMPERIA project as follows:

> "IMPERIA has greatly developed statements and assessment reports in connection with impact assessment within a few years. Awareness of the concepts of IMPERIA has spread among experts, and issues are consequently interpreted in the same way. Now, everyone stops to reflect on what is meant by a significant impact."

The application of the ARVI approach is not only limited to EIA projects, but it can be applied to all projects where there is a need to evaluate options and their effects. The strengths of the approach are especially apparent in projects that include different types of effects and associated complex mechanisms of action, as well as different views on the significance of the effects.

IMPERIA was carried out in close cooperation with the Finnish Environment Institute, the University of Jyväskylä, the University of Oulu, the Thule Institute, Ramboll Finland Oy and Sito Oy. The project was financed by the EU, the Ministry of the Environment and the Ministry of Agriculture, as well as the project partners. Reports, instructions and tools drawn up in the project can be found on the IMPERIA project website (http://imperia.jyu.fi/).

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