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# IMPROVEMENT OF ENVIRONMENTAL IMPACT ASSESMENT IN THE BALTIC STATES

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**Abstract.** The main purpose of the Environmental Impact Assessment (EIA) is to assess the possible impact of the implementation of intended activities, or a planning document, on the environment and to subsequently develop proposals for the prevention or decreasing of negative effects in order to beyond compliance specified in regulatory enactments. The EIA 85/337/EEC was adopted and proclaimed 25 years ago, during these years a system for impact assessment was built and many projects have been conducted including the methodology. Latvia, Lithuania and Estonia belong to the same region, however, significant differences in the procedure exist. In the Baltic States the EIA procedure has been carried out for more than ten years, every country has its own procedure for screening and scoping. In the same period the development of alternative methodology started blooming in Europe: the Life Cycle Assessment (LCA) methodology. LCA is a specific procedure for product or process impact assessment specified in the ISO Standards 14040-44. LCA differs from EIA in its primary holistic approach that is referenced not on the evaluation of the impacts of a particular site or facility but on the entire environmental effects (direct and indirect) of a certain product or system among all their single life processes (cradle-to-grave thinking). The LCA and EIA tools are compared in this article. The examples of how LCA methodology and results of LCA can be used to improve the EIA procedure are also presented. The work concludes with the suggestions how to include principles of LCA in the EIA procedure for the improvement of the impact assessment in the Baltic States.

**Keywords:** environmental impact assessment, life cycle assessment, transboundary impact, screening process, EIA systems in Baltic States, EIA legislation, EIA effectiveness.

## 1. Introduction

Nowadays the idea about the necessity to safeguard the environment is not questioned any more. Rational use and protection of environmental and nature resources is one of the main basic principles for sustainable development. It has been established and proven with the course of time that economic activity and increasing proportion of production sector has smaller or bigger impact on the surrounding environment.

The negative impact that can arise through implementation of one or the other project in most cases can be foreseen, avoided or notably reduced by performing study and assessment of environmental condition and prognosticating impact of the particular activity on the environment. In our days projects are not planned, built, operated and decommissioned in isolation, but within regional, national and international processes of change which include other projects, programmes, plans and policies (Morris and Therivel 2009).

Environmental impact assessment (EIA) is performed in all three Baltic States, and it is a proven method for identification and assessment of impact. Meanwhile, the quality of EIA should be improved, ensuring equal approach for assessment of impact in the entire Baltic Region.

## 2. Methodology

The research questions are answered mainly through the review of literature on EIA projects. The research methodology is based on a fusion of quantitative and qualitative research; the data about EIA in the Baltic States was collected through the archival analysis of relevant legislation, EIA programmes and reports, the use of questionnaires and semi-structured personal and focus groups interviews with the field and EIA experts.

The study started with the analysis of scientific literature and theoretical basis of EIA formation worldwide followed by the analysis of EIA legislation in the EU and Baltic states. Further a survey of EIA studies, programmes and reports in Latvia was given.

## 3. Goal and scope of EIA

Impact assessment is a component of several environmental policy instruments. Impact assessment is performed within the frameworks of environmental impact assessment, life cycle assessment, ecological footprint

and expert systems for impact assessment. At the same time, each of the methods has its own different characteristics; therefore combination of several methods is the best way to perform a possibly more complete and thus more objective impact assessment.

EIA is a process which studies the environmental consequences caused by proposed projects prior to their implementation. The environmental impact of developments has always been assessed; however, the approach has not been systematic, integral and interdisciplinary as in the case with EIA (Glasson and Therivel 2005).

The EIA Directive 85/337/EEC is in force since 1985; since then a system for impact assessment has been developed and the methodology has been elaborated on the basis of implemented projects. In compliance with the regulatory enactments of the Republic of Latvia the initiator of an intended activity shall finance the environmental impact assessment and initial impact assessment.

The strengths and weaknesses of EIA have been studied from the very beginning. Environmental impact assessment is a major tool used in the planning and design stage of a project. EIA has turned out to be successful with regard to providing information on environmental decision making; unfortunately it has not satisfied the need of industry to move beyond prediction, planning and assessment (Ridgway 1999).

## 4. Screening methods in EU Member States

The EIA procedure is a tool used with the purpose to assess the possible environmental impact of a proposed project and its alternatives that might be an essential factor of influence on the environment: both the natural, and the man-made (Koornneef *et al.* 2008).

Project screening, to decide if the project be subject to the EIA procedures (preparation of Environmental Statement and the following assessment) to support planning application, shall be made; it is the first step to EIA.

The system requires that supervisory bodies perform suitable project screening; private developers can also benefit from the opportunity of different project arrangements to find out if EIA is needed before beginning the complex and costly development control process (Rodriguez-Bachiller and Glasson 2004).

The approach for performance of EIA in the EU member states should be harmonized, leaving a possibility for each member state to establish its own individual approach.

Currently EIA is mandatory in all member states to the projects listed in Annex I to the Directive 97/11/EC. The approaches differ for projects listed in Annex II of the Directive, even regardless the fact that Annex III of the Directive clearly states the criterion for assessment of projects listed in Annex II.

Table 1 presents a classification of Member States according to the screening method and the number of distinct EIA procedures.

In Latvia, Lithuania and Estonia the lists+listed case-by-case method is used in screening process (Pinho *et al.* 2008).

**Tab. 1.** Screening methods (Pinho *et al.* 2008)

| Screening method | | | | |
|---|---|---|---|---|
| | List of projects | | Lists+CBC analysis | |
| | 1 list | ≥ 2 lists | List(s) + Listed CBC | List(s) + Not Listed CBC |
| One type of EIA proced. | Belgium | Slovenia | Belgium (partly) | Sweden |
| | | | Denmark | Finland |
| | | | Estonia | |
| | | | Ireland | |
| | | | Lithuania | |
| | | | Luxemburg | |
| | | | UK | |
| Two or more types of EIA proced. | | France | Austria | |
| | | Malta | Cyprus | |
| | | Portugal | Čhech Republic | |
| | | | Germany | |
| | | | Greece | |
| | | | Hungary | |
| | | | Italy | |
| | | | Latvia | |
| | | | Netherlands | |
| | | | Poland | |
| | | | Slovakia | |
| | | | Spain | |

## 5. EIA in Latvia

The environmental impact assessment process in Latvia is regulated by the law "On Environmental Impact Assessment" as of 1998.

In compliance with the regulatory enactments of the Republic of Latvia, the institution responsible for implementation of the environmental impact assessment procedure is the Environment State Bureau. The Environment State Bureau makes decisions on application or non-application of the environmental impact assessment procedure. The bureau elaborates the environmental impact assessment program, evaluates the work and final environmental impact reports prepared by consultants. The screening procedure is performed by the accordant regional environmental board of the State Environment Service, depending on the planned location of the project.

Main task of the environmental impact assessment is to prevent or reduce the possible unfavourable environmental impact created by the planned activities of physical or legal entities. However, the environmental impact of various activities differs greatly, and not always the rather expensive and time-consuming environmental impact assessment procedure should be applied in full amount.

The environmental impact assessment should be performed only to activities the environmental impact of which is substantial due to the type, amount or possible location of the activity.

Figure 1 presents EIA sheme in Latvia.

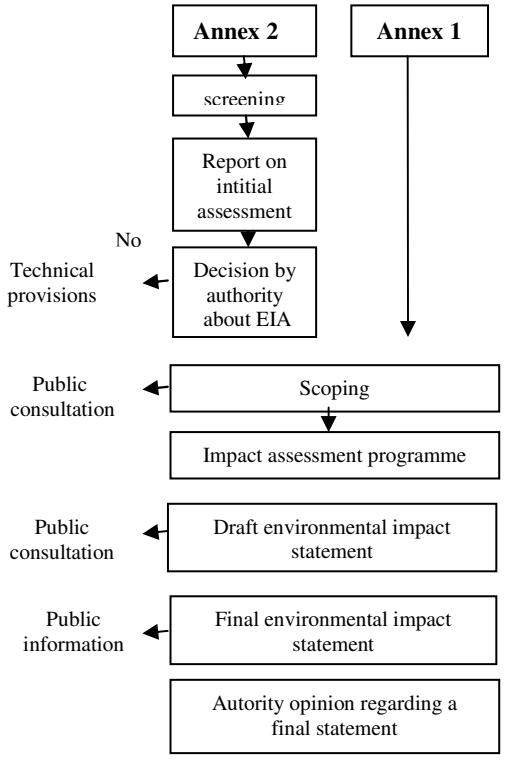


**Fig 1.** Outline of the EIA process in Latvia

The division of activities depending on their possible environmental impact and the amount of activity has been established in the legislative acts:

1. activities for which full environmental impact assessment procedure should be always performed listed in Annex 1 to the law "On Environmental Impact Assessment" are established as the first and the main group subjected to the EIA procedure;
2. the environmental impact assessment should be performed to the planned activities that might have transboundary impact and the impact assessment to which should be performed in compliance with the concluded international contracts of the Republic of Latvia;
3. activities for which it is set by the regional environmental board in compliance with the results of initial assessment;
4. activities the environmental impact of which is insignificant and to which initial assessment is not applied, and the regional environmental board issues technical regulations in compliance with the requirements of regulatory enactments should be stated as the last group.

It is established in Latvia that screening procedure should be performed to the projects listed in Annex II to the Directive 97/11/EC. On the basis of the results of the screening procedure the decision is made on application or non-application of the environmental impact assessment procedure.

Screening procedure is carried out based upon environment quality standards, emission limiting values and limits set by legislative acts. The report on screening procedure is an administrative act issued by the regional environmental board. It should be recognized that if the regional environmental board issues a positive normative act, also all the further normative acts should be positive, as it is established by the basic principles of the Administrative Procedure Law. Therefore it is very important that when the initial environmental impact assessment is evaluated also the best available technical methods are taken into account if the planned project complies with the category 'A' polluting activity, and that the requirements of the regulatory enactments are taken into account if the planned project complies with other category of polluting activity.

Currently the screening procedure is often only a formal procedure, and the assessors do the necessary minimum, rather than evaluate the planned activity in detail. On one hand, formal assessment is permissible because not all submitted projects can have substantial impact, however, if such approach is used projects the planned technical solution of which is below any critique and does not comply with the requirements of regulatory enactments might be approved.

In Latvia, screening procedure of more than 4000 projects have been performed. The initial assessment has been performed for the majority: 96 % of the projects.

During the last 5 years, on average in 40 % of cases the environmental impact assessment procedure was initiated based on the results of the screening. It attests the significance of the screening process.

## 6. Comparison of EIA procedure and practice in the Baltic States

Beginnings of the environmental impact assessment system in the Baltic States trace back to the time of the Soviet Union. In the late 80s of the 19$^{th}$ century, performance of ecological examination of projects was commenced in Latvia, Lithuania and Estonia. However, it must be admitted that assessments in this process were performed non-coordinated. Aim of the ecological examination was to assess the ecological hazard level of economic activity, ecological situation in specific objects and sites, and elaboration of propositions for improvement of environmental quality.

In the Baltic States the environmental impact assessment procedure was introduced in late 90s of the 19$^{th}$ century. In Lithuania the initial law on EIA called Law on Environmental Impact Assessment was introduced in 1996, in Latvia, the law On Environmental Impact Assessment was adopted in 1998.

The Baltic States are one of the first post-soviet countries that elaborated and adopted the EIA laws. A law is the main normative instrument in the EIA field in each of the Baltic States. At the same time the assessments in Slovenia were formalized in 1993 with the Slovenian act on environmental protection, which introduced project and strategic environmental impact assessments (George and Colin 2007).

One of the most substantial stages in the EIA process is screening during which it is determined whether the

planned activity might or might not have notable impact. Significance of impact is determined in compliance with the selection criterion established by the directive. It should be noted that in compliance with the report from the Commission on the application and effectiveness of the EIA Directive, when establishing the border values, the EU member states often exceed the freedom of action either by observing only several of the selection criterion of Annex III or initially not envisaging the EIA to some projects. Moreover, though the tendency to perform EIA increases, the EIA performed in several member states notably differ (in some less than 100 and in other up to 5000), even when similar member states are compared.

In order to improve screening quality it would be necessary to simplify and unify the verification mechanism, for example, by elaborating identical methods for screening and assessment for all Baltic States. Substantial is ending of the "salami-slicing" practices when the project is divided into separate parts, thus evading the border values of the EIA procedure.

It shall be mentioned that many screened projects do not require EIA as a result – the number of projects screened would be higher than the number of those subject to EIA. It means that screening might become a routine procedure with a growing number of projects subject to it (Rodriguez-Bachiller and Glasson 2004).

Number of screening procedures performed in Latvia and Lithuania between 2001 and 2007 is given in Figure 2.

Number of initial assessments performed in this period in Latvia increased from 14 cases in 2002 up to 636 cases in 2007; in Lithuania from 150 cases in 2001 up to 666 cases in 2007 (Kruopiene *et al.* 2009).

In Lithuania the probability of significant effects has been acknowledged, and subsequently a full environmental impact assessment study with a report has been required only in 4.1–27.3 % cases in different years (Kruopiene *et al.* 2009).

In Latvia, the EIA procedure was applied to 4 % of the assessed projects based on the results of screening process.

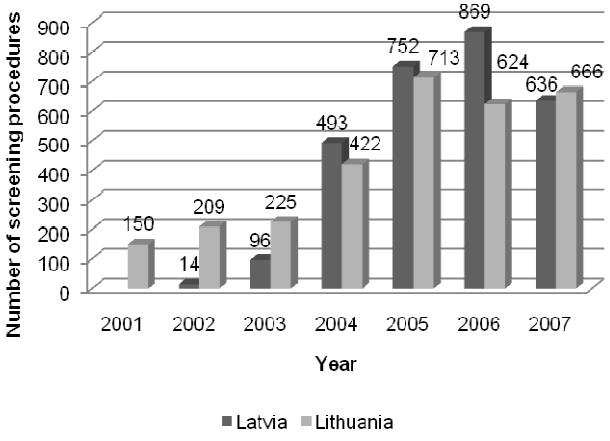


**Fig 2.** Screening procedures performed in Latvia and Lithuania

The difference of EIA procedures of Lithuania and Latvia regarding scoping is that the program for performance of EIA in Lithuania is elaborated by the submitter of the project, but in Latvia – by the competent institution – the Environment State Bureau.

The number of full EIA studies increased from 23 cases in 2001 to 56 cases in 2007 in Lithuania and from 6 cases in 2001 to 27 cases in 2007 in Latvia (see Fig 3).

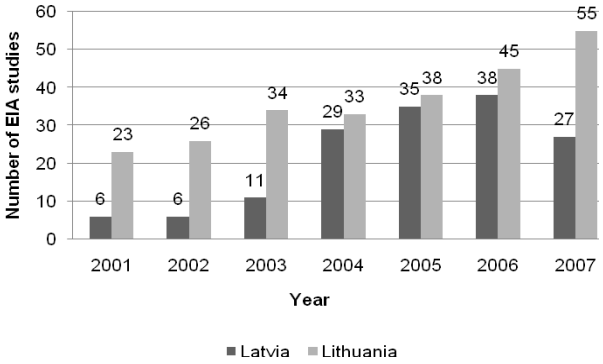


**Fig 3.** EIA studies in Latvia and Lithuania

Estonian legislation establishes mandatory EIA projects for 33 activities (including dredging–dumping, closure of old waste depositories and other routine activities), compared to 22 activities stipulated by Annex I of EU EIA Directive (Heinma 2010).

In order to improve the quality and efficiency of EIA, a consultant should be introduced that would participate in EIA, as well as accordant accreditation.

The environmental impact assessment should be performed by independent consultants, assessment methods for particular type of projects that would allow objective impact assessment within the entire territory of the Baltic States should be elaborated.

## 7. Projects with Transboundary impact in the Baltic States

The Espoo Convention was adopted in 1991 and it sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

Latvia joined the Espoo Convention on 31.08.1998, Lithuania – on 11.01.2001, and Estonia – on 25.01.2011.

The government of the Republic of Latvia and the government of the Republic of Estonia signed an agreement on the environmental impact assessment in transboundary context on 14 March 1997.

The agreement envisages cooperation between the countries in order to prevent transboundary impact of planned activity that could lead to substantial undesirable environmental impact. The contract refers to the following planned activities within a zone of 15 kilometers from mutual border:

1. Thermal power stations or other combustion installations with heat output of 100 MW or more;
2. Processing and transformation of asbestos or products containing asbestos;
3. Industrial installations or their groups where the amount of dangerous chemical substances used in technological processes exceeds 200 t per year;
4. Construction of motorways or new lines for railway traffic regardless the length of the section;
5. Construction of airports;
6. Large diameter pipelines intended for long distance transport of oil or gas;
7. Construction of new and extension of existing ports, as well as all hydrotechnical installations in coastal zone;
8. Waste disposal installations for the incineration or chemical treatment and installations for disposal of toxic and dangerous wastes;
9. Water regulation projects;
10. Drainage of wetlands of 500 hectares or more;
11. Clearcutting of woodland areas of 10 hectares or more;
12. All groundwater abstraction activities where the water to be abstracted exceeds 1000 $m^3$/d in the case, if the depression cone from them could affect the other country;
13. Extraction of mineral resources and earth materials, where the area involved would be greater than 5 hectares;
14. Paper manufacturing of 50.000 t per year or more;
15. Industrial plants for production of pulp;
16. All offshore installations for exploration and extraction of mineral resources;
17. Storage facilities for oil and petrochemical products where storage capacity would exceed 50.000 cubic meters or other chemical products where the storage capacity would exceed 20.000 cubic meters;
18. Dumping into the sea.

No such agreement has been concluded with Lithuania up to now. Cooperation with Lithuania is performed only within the frameworks of the Espoo Convention.

Cooperation within the frameworks of transboundary impact between Latvia and Lithuania has been performed regarding liquidation project of the Ignalina Nuclear Power Plant, storage of radioactive wastes, storage of low-level radioactive wastes, and the project on construction of a new nuclear power plant in the territory of Lithuania, as well as projects on construction of oil processing plant and hydroelectric power station in the territory of Latvia.

Latvia and Estonia cooperated regarding projects on extraction of dolomite and sand in the territory of Latvia with the possible transboundary impact.

Guidelines defining transboundary discussion terms, establishing joint procedures and, probably, implementing single EIA procedure in the Baltic States should be elaborated within the context of transboundary impact.

## 8. Environmental management decision tools

No single tool or approach to all issues of environmental management exists (Manuilova *et al.* 2008). A wide range of environmental assessment and management tools have been developed since the introduction of EIA; they comprise different project stages: strategic environmental assessment, EIA, risk assessment, environmental permits, initial environmental review, life cycle analysis, environmental audit, environmental management system, environmental monitoring (Ridgway 1999).

Environmental impact assessment shall be considered within the framework of other environmental management decision tools. They supplement the group of assessment approaches, including such issues as life cycle assessment (LCA), cost-benefit analysis, environmental auditing, risk analysis, environmental management tools (EMAS), best practicable environmental option (BAT) etc. (Glasson and Therivel 2005).

## 9. LCA concept and framework

In the recent years the concept of Life Cycle Thinking has become essential in evaluating the environmental impact of a product or service. This approach involves consider the entire product chain and identifying which improvements and innovations can be made to it. By the evaluation of the supply of raw materials, their production, use and end of life in the same wide view offers an enormous potential for many products and/or processes since it makes it possible to manufacture products that are closely integrated both with the production system in the region and with consumption uses and habits, providing a broad scope for real improvements in more "green" approach.

The supply of raw materials close to the production site or an end-of-life that maximizes collection and recovery of waste are fundamentals elements of continuous improvement within the scope of sustainability.

In the light of a Life Cycle Thinking the Life Cycle Assessment (LCA) it is the main tool to implement this strategy. Hence, LCA is an objective method for evaluating and quantifying the energy and environmental consequences and potential impacts associated with a product/process/activity throughout its entire life cycle, from the acquisition of raw materials until its end of life ("from cradle to grave"). In this technique, all phases of a production process are considered related and interdependent, making it possible to evaluate the cumulative environmental impacts. At an international level, LCA is governed by the ISO 14040 and ISO 14044 standards (see Fig 5).

Environmental impacts in LCA include those emissions directly into the environment and/or through the consumption of resources associated with the entire life of a certain product from extracting resources till end-of-life. These emissions and consumptions (energy and materials) contribute to a several type of impacts (e.g. climate change, stratospheric ozone depletion, tropospheric ozone creation, eutrophication, acidification, toxicological stress on human health and ecosystems, the depletion of resources, water use, land use, and noise). A clear need

to decrease this amount by the help of regulatory practices (Rebitzer *et. al.* 2004) is needed: the LCA is exactly one of those.

When conducting an LCA, the design phase is usually excluded, since it is often assumed not to contribute significantly. However, one has to note that the decisions in the design phase highly influence the environmental impacts in the other life cycle stages. This the direction implemented in the eco-design strategy that foresees that possibility to implement the concepts of the LCA for a better eco-efficient design.

In the Figure 4 is presented and example of the product life concept, which is usually connected to the idea of ''life cycle'' including loops (reuse and recycling) between the several life phases.

LCA can be defined in first instance as methodological framework for estimating and assessing the environmental impacts attributable to the life cycle of a product in which structural pathways in the economic and environmental system are delineated and connected to environmental problems.

As such, it can be seen as an extension (or complement) of an energy analysis. The main aim of an LCA is to quantify potential environmental impacts of products over their full life cycle.

Basically the LCA consists of a series of stages running from extraction of raw materials, through design and formulation, processing, manufacturing, packaging, distribution, use, re-use, recycling and, ultimately, waste disposal.

The ISO 14040-44 standard determines four stages for LCA studies, schematically represented in Figure 5 and briefly described in this section.

A typical LCA-study consists of the following stages:

1. Goal and Scope definition,
2. Life cycle inventory (LCI) definition,
3. Potential Impact assessment evaluation,
4. Interpretation of the results from the previous phases.

More in specific the goal and scope must be stated clearly, together with the intended objectives of the LCA and the system boundary of the process under study. Then the Life Cycle Inventory (LCI) analysis, consisting of the material and energy balance of the product system, aims at the identification and quantification of substances that may be environmentally relevant.

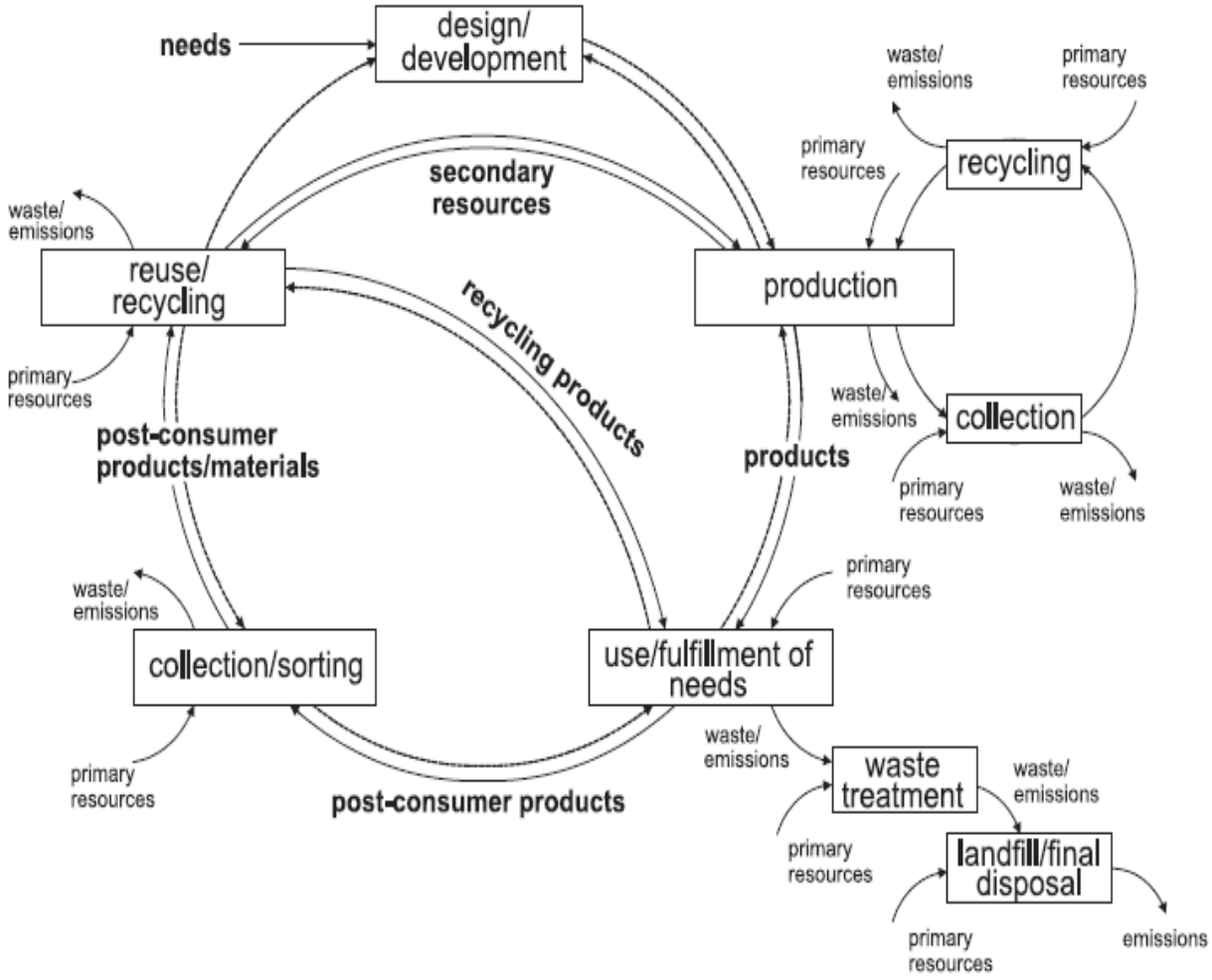


**Fig 4.** Schematic representation of a generic life cycle of a product (the full arrows represent material and energy flows, while the dashed arrows represent information flows) (Rebitzer *et. al.* 2004)

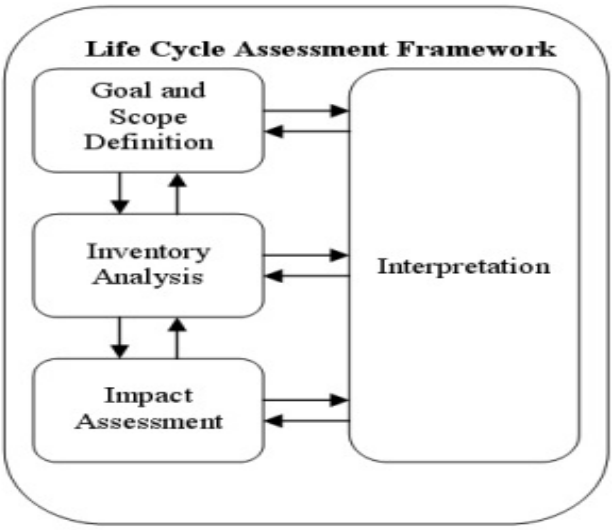


**Fig 5**. The phases of a LCA (ISO 14044)

The Life Cycle Impact Assessment Life is the phase in which the set of results of the inventory analysis (mainly the inventory table) is further processed and interpreted in terms of potential environmental impacts and societal preferences. In reference to the ISO Standards 14040-44 this phase includes three stages: characterization, normalization and weighting where the last two are not mandatory. This procedure in term of impact evaluation is fundamental in order to reference each impact category to a certain emission factor and/or to make comparable the results among all the impact category (identification of the environmental hot spots).

Interpretation is the last stage of an LCA study, where the results obtained are presented in a synthesis of all stages in the LCA process, in order to check the consistency of the assumptions and the data quality in relation to the goal and scope of the study.

## 10. Use of LCA in EIA process

Though the intentions of LCA and EIA are basically the same – to support decision making concerning environmental aspects of significant projects – they have their differences, too.

LCA is a tool for environmental assessment of a product, service or a process, as well as for identification of possible improvements through the product life cycle. Meantime, EIA is a procedure for evaluation of potential positive and negative environmental impact of a proposed project. LCA would have a key role in improving EIA by integration of the analysis of the product, service or a process life cycle. (Manuilova *et al.* 2008).

EIA basically focuses on possible environmental impacts of a project, for example, a power plant. It takes into account the environmental effects in the area surrounding the power plant. Quite often, downstream and upstream life cycle stages/processes are not part of the EIA. Separate elements of LCA can be integrated into EIA to improve the level and details of environmental impact assessment (Manuilova *et al.* 2008).

Among other weaknesses of EIA should be mentioned the following: limitation of analysis to a specific project and the inability to easily address regional and global effects or effects through the life cycle. LCA, on the contrary includes upstream and downstream activities, taking into account all environmental aspects during the life cycle.

No specific environmental impact assessment methodology has been developed for EIA. In addition to the best available methods, EIA practitioners have to use their own expertise and judgment to estimate environmental impacts of the project. Development of site-dependent LCA methodologies would allow application of these models to EIA to increase the level of detail and accuracy of environmental assessment (Manuilova *et al.* 2008).

## 11. Conclusions

In the Baltic States, EIA system has been elaborated, the necessary regulatory enactments have been adopted, but at the same time a single approach for assessment of EIA projects should be elaborated in the Baltic States.

LCA principles allowing improvement of EIA quality and efficiency, objective assessment of the planned activity and offered options for minimization of impact should be introduced in the impact assessment procedure.

LCA must be used in EIA for impact assessment of the following projects:

1. Crude-oil refineries and installations for the gasification and liquefaction of coal or bituminous shale;
2. Thermal power stations and other combustion installations, and nuclear power stations and other nuclear reactors;
3. Installations for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes;
4. Integrated chemical installations for the manufacture on an industrial scale of substances using chemical conversion processes;
5. Waste water treatment plants;
6. Extraction of petroleum and natural gas for commercial purposes;
7. Installations for the intensive rearing of poultry or pigs;
8. Industrial plants for the production of pulp from timber or similar fibrous materials; paper and board.

When performing screening procedure, LCA might be used in the following economic sectors:

1. Industrial installations for the production of electricity, steam and hot water;
2. Installations for production and processing of metals;
3. Installations for mineral industry;
4. Installations for chemical industry;
5. Installations for food industry;
6. Installations for textile;
7. Leather, wood and paper industries;
8. Rubber industry.

A single approach for assessment of EIA projects should be elaborated in the Baltic States. LCA principles allowing improvement of EIA quality and efficiency should be introduced in the impact assessment procedure.

Use of LCA principles in EIA procedure would allow more objective assessment of the planned activity and comparison the offered options. Such approach will allow solving of environmental problems complexly and systematically.

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