Baltic Waste Investment Concept

www.recobaltic21.net

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Part-financed by the European Union
(European Regional Development Fund and European Neighbourhood and Partnership Instrument)
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The RECO project has recognized that the investment process is one of the cornerstones for a successful organization of municipal waste management. This document aims at describing the investment process as a cycle, taking into consideration the complexity and continuity of the process as well as the uncertainties related to the analytical tools, procurements, return on investments, evaluations, etc. It should provide practical assistance to all stakeholders interested in investments in municipal waste management.

The Baltic Waste Investment Concept identifies the following five phases of an investment process: Drivers, Analysis, Decisions, Implementation and Evaluation.

The Drivers phase describes legislation as the main direct force and environment/climate, economy and society as the main indirect forces. The outcome of this phase will be a clear definition of the objectives, addressing issues & challenges (main driving forces) as a basis for further analysis.

The Analysis phase is divided into three major types of analyses: i) Context analysis, where the national or regional perspective on waste management is in focus; ii) Project analysis, where the investment project is clearly identified; and iii) Experience analysis, where lessons from successes and failures in similar projects in the region are synthesized. The outcome of this phase will be 2-3 alternative solutions that can be further presented to decision makers.

The Decision phase is when the decision makers select one solution out of the 2-3 presented alternatives. It is important to remember and consider all different aspects (even if finances would normally play an essential role). This has been presented in a simplified scoring matrix. The outcome of this part will be one preferred solution selected for implementation.

The Implementation phase addresses several important aspects related to Finances, Procurement, Construction works, Operation and Maintenance. The outcome of this part will be an investment that is completed and commissioned.

The Evaluation phase is necessary in order to properly measure success and work toward continuous improvement. Two types of evaluations are suggested: Performance evaluation and Evaluation if the objectives have been met. The outcome of this phase is an evaluation of the completed investment.

All of the phases will be completed with a number of questions on the checklist. Finally, the importance of the complexity and continuity of the entire investment cycle is presented. Also, the significance of the waste management hierarchy for all phases of the investment cycle is stressed.
INTRODUCTION

A concept is a simplification of a reality or a process in order to present a complex system in an understandable form. Within the RECO project, one of the tasks included creating a simplified description of the municipal waste management investment process. A properly done simplification that takes into consideration all important aspects would be a good help for a comprehensive analysis of municipal waste management investments. Important perspectives to include in this simplification are the comprehensiveness and continuity of the process and the waste management hierarchy.

This document aims at describing the municipal waste management investment process, taking into account its complexity and the uncertainties involved in different aspects such as available analytical tools, procurements, return on investments, etc.

The direct target group for the concept is public or private investors that are planning an investment in the municipal waste management sector. The indirect target groups would be financing institutions and authorities that are looking for a framework on how to set efficient guidelines for such investors.

It is necessary to take into consideration the significant discrepancy in waste management between different parts of the BSR (Fig.1). Germany, Sweden, Norway, Denmark and Finland enjoy established and technically mature waste management systems, while Estonia, Latvia, Lithuania, Russia, Belarus and Poland keep fighting to develop a system that will help them achieve the requirements set by the EU and other international/national regulations (BiPRO, 2012). This has also been addressed in the Joint Strategy for the Baltic Sea Region (RECO, 2013). Therefore, this document will recognize a BSR EAST-WEST perspective when presenting different parts of the Waste Investment Concept.

The need for a comprehensive waste investment concept is justified by the following:

• There are large discrepancies in the level of waste management development in different parts of the BSR;
• There are large financial resources available to the south-eastern part of the BSR for improved infrastructure in waste management;
• There were significant inefficiencies in the use of available resources in the past, and this needs to be counteracted in future financing periods.
In developing the Baltic Waste Investment Concept, five parts of the investment process have been identified, and will be described in the following sections of this document:

- Drivers
- Analysis
- Decision
- Implementation
- Evaluation

**DRIVERS**

Normally, there must be an external force (a driver) that initiates the Waste Management (WM) investment process. When analysing different investments in WM, we have identified the following types of drivers:

- Legislation
- Environment/Climate
- Economy
- Society

Legislation is the most frequent direct driver that creates a need for specific investments to meet new rules and directives. Other issues, such as environmental considerations, social or economic aspects, can be indirect drivers or causes for new regulations. Considering the East-West perspective in the Baltic region, investments in the East countries are most often driven by requirements defined by the legislation. For example, when joining the EU in 2004, new member states had to transpose and meet requirements in EU directives. At that time, landfilling was the dominant waste treatment practice in the East countries. Lithuania can serve as an example of the situation. There was a general lack of environmentally safe landfill sites. The country has since then devoted special efforts into development of new landfills that meet all environmental requirements included in the EC Directive 1999/31/EC – since July 2009 there is no landfilling in non-complying landfills.

Financial support from the EU was used to achieve this goal. In the west, investments have also been driven by legislation. One example is the introduction of Producer responsibility for packaging in 1994, which was implemented though it brought higher costs to the waste management system. However, economic policies are also important; an example is that in countries with higher costs for landfilling the amount of landfilled waste is lower (Figure 2). The third important factor in the West is environmental/
climate goals. A good example here is Sweden, where the national environmental goal “35% of organic wastes should be treated with biological treatment” has really had an impact on the municipalities. Investments in biological treatment systems are mentioned in several municipal waste plans. We can also see that the waste management hierarchy and social demands are now having an impact on how the municipalities are acting with their waste management.

For example, the need to save free space for children’s playing grounds, parking lots and other needs of the society in densely built and populated areas may be a driver to install underground containers, which leads to investments in this technology. Social demands may also act as co-drivers. For example, if a farmer has a big pig farm, the desire of neighbouring inhabitants to live in an environment free from the smell that originates from spreading of pig’s manure on the fields is an additional driver to invest in an anaerobic treatment facility, which would reduce the odour problem by 80%.

The waste management hierarchy also has to be considered when identifying or responding to investment drivers. For instance, it is obvious that landfilling is the cheapest form of waste management. However, in the longer perspective it is not the most efficient way, and definitely not from the perspective of environmental or climate considerations (environmental costs). Thus taking the waste management hierarchy into account will ensure a more comprehensive analysis of all the potential drivers, even if the investment process is often driven by one factor only.

If the drivers are not well understood by the potential investor, it may lead to serious shortcomings and investment errors, for instance: If only legislative requirements are taken into consideration, this may lead to shortcomings and inefficiencies in the implementation phase. Usually a few factors/drivers act together, and the final choice may not always reflect the right balance between them (some drivers may even work in opposite directions). One example is the need to comply with legislation and the availability of EU funds, which have to be utilized within a short time period. Another is the need to comply with legislation, economic interests of investors (e.g. interests of various interest groups to earn money), and the need to avoid raising fees to levels that the inhabitants are not able to pay. When only environmental/climate considerations are analysed, this may lead to design of extremely expensive and inadequate systems, which may not necessarily be the best use of resources in general. If economy is the main driver, the proposed solutions may be cheap but inadequate for meeting the environmental or social goals.

Finally, if only social aspects are taken into account, this may lead to other problems, such as the famous ‘Not in my backyard (NIMBY)’ syndrome. This can be seen in many countries that are starting to build new waste management facilities, or where housing areas are expanding and reaching old waste management facilities. If decision makers are listening too much to neighbouring inhabitants, there might not be any new waste management facility, which leads to inadequate treatment and might in the long run actually harm the environment more.

Checklist for the Drivers Phase:
- Which is the main driver for an investment?
- Are the other potential drivers taken into account?
- What exactly is the problem/challenge to be addressed?
- What happens if the investment is not implemented?

The outcome of this phase will be a clear definition of the objectives, as well as issues & challenges (main driving forces) as a basis for further analysis.
ANALYSIS

The Analysis phase of the project cycle should provide information and analyses of a range of issues associated with the decision making in the project. First, the social, economic and environmental context in which the project will be implemented must be analysed. This is followed by an assessment of the technical feasibility and the financial potential of the project to survive the planned duration time, as well as the expected contribution to growth of the economy. Finally, it must also be assessed if, and how, the project assists in attaining the socio-economic objectives set for the country/region, and if it is a cost-effective way of meeting those objectives.

Context analysis

The first step when preparing a waste management investment project is to understand the social, economic and environmental context in which the project will be implemented. In fact, the possibility to achieve credible forecasts of benefits and costs often relies on how accurate assessments that can be made of the waste management system, the macro-economic and the social conditions of the region. The waste management context is usually given in the national, regional or local waste plans that have to be prepared by an authority (at national, regional or local level). The main purpose of waste plans is to analyse the current waste management system, set the directions where to go, outline waste streams and treatment options to invest in. More specifically, a waste management plan should provide a planning framework for the following:

• Outline of waste characteristics and sufficient capacity for managing waste: Waste management plans give an outline of waste streams and quantities to be managed. Furthermore, they contribute to ensuring that the capacity and the nature of collection and treatment systems/technologies are in line with the waste to be managed.

• Outline of economy and investment requirements: Waste management plans make way for a statement about the financial requirements for the optimal waste management alternatives – collection schemes, treatment technologies etc. On this basis, the needs for future investments are determined.

Therefore, it is important that the results of the waste management context analysis, in the form of waste plans, are used when preparing a specific waste management investment project. An in-depth analysis of the waste management context is also instrumental when carrying out the demand analysis for the specific waste management investment project. The demand forecast is a key indicator for the estimation of future revenues, if any, from the project and consequently its financial performance (see also the project analysis stage).
The Strategic Environmental Assessment (SEA) is usually mandatory for waste plans (Directive 2001/42/EC). The SEA procedure can be summarized as follows: an environmental report is prepared in which the likely significant effects on the environment and the reasonable alternatives of the proposed plan are identified. At least three waste management scenarios have to be set up to make it possible to choose between different available alternatives.

Compared to many other analytical assessment tools, the life cycle thinking and especially the Life Cycle Assessment (LCA) has gained wide acceptance when comparing the environmental impacts, as well as economic and social aspects of alternative waste management scenarios (e.g. testing the validity of the waste management hierarchy in different contexts). There are many LCA models/tools that can be used in a waste management planning process to evaluate and quantify the environmental and economic benefits/trade-offs associated with alternative waste management options and scenarios.

The following ones are the most commonly used for waste management in the BSR:

- WAMPS (www.recobaltic21.net), further described in Annex 1
- EASEWASTE (http://www.easewaste.dk)
- WRATE (http://www.environment-agency.gov.uk/research/commercial/102922.aspx)

More LCA tools can be found on the JRS database on: http://lca.jrc.ec.europa.eu/lcainfohub/toolList.vm

Project analysis

The specific waste management investment project must be clearly identified as a independent unit of analysis. Specifically, the analysis and choice (decision) of waste management options and activities included in the planned investment project must be based on the information and priorities that were identified in the context analysis (the waste plan). In addition to the context analysis (general significance and impact of the project), it is necessary to consider the local nature of the planned investment project and its objectives.

The project analysis is usually carried out by the project developer and is normally based on the Cost-Benefit Analysis (CBA) methodology, which sets the basic principles for how to compare costs and benefits for an investment appraisal (see also Guide to Cost-Benefit analysis of investment projects, 2008,

A CBA based project assessment usually covers the following types of analyses:

- **Technical feasibility and option analysis.** A description and assessment of the technical characteristics of the waste management facility is crucial for comprehension of the local economic and social impacts of the project, its environmental impacts and the total financial and economic costs and benefits involved. It is also important to compare the technical alternatives to the option selected (a comparison with the previous situation should also be added). For a composting technology, for example, this could be the type of composting system (e.g. open composting, or in-vessel composting) used.

- **Environmental analysis.** For a large number of waste management projects, a site specific Environmental Impact Assessment (EIA) is required in the legislation (see the Environmental Impact Assessment Directive (85/337/EC)), especially for large scale waste treatment facilities (e.g. recycling plants, landfills, composting facilities, and MBT facilities) (see also EC Guidance on EIA (http://ec.europa.eu/environment/eia/eia-guidelines/g-scoping-full-text.pdf). Furthermore, for many waste management facilities permits are required for the prescribed activities; in the permits the conditions for management and pollution control are specified. In any case, it is advisable to carry out a short environmental impact assessment even without a specific recovery or some other treatment is a key element of a decision to build a waste treatment facility. The estimate should be based on the following elements: an evaluation of waste production by waste type and type of producer for the geographical area of the project; present and expected changes in legal targets and norms for waste management. The evaluation of future demands on municipal waste management should take into account the demographic growth and migratory flows. It is important to take into account possible changes in waste producers’ behaviour (e.g. consumption increases). Legal compliance must also be considered in the demand analysis. According to the waste management hierarchy and considerations included in the applicable directives, the needs for waste treatment are expected to be increasingly satisfied by prevention, recycling and energy recovery. These issues should also be reflected in the context analysis. Consequently, the sizes of planned treatment facilities should be adapted to those future trends.

As part of the technical feasibility, a demand analysis should be carried out. The demand for waste
legal requirement (see also EC Guidance on EIA Screening (http://ec.europa.eu/environment/eia/eia-guidelines/g-screening-full-text.pdf)).

• Financial analysis. This should be done even if the services are totally free of charge and the financial return rate therefore is negative. The analysis should measure the net cost for public finances and provide a significant comparison with similar investments.

The financial revenue (inflow) is usually given by the price for treatment, paid by private or public users, and the sales of products (secondary materials, compost) or energy (heat and power) recovered, if any.

Financial outflows are:

- Investment costs (land, buildings, equipment), including investment feasibility studies
- Net residual values (residual value minus costs for site remediation and decontamination, if any)
- Stocks of raw materials or final products
- Replacement costs for the components with short life time in relation to the time horizon of the project (machinery)
- Maintenance costs (energy, management, labours costs etc.)

• Socio-Economic analysis. In addition to the elements derived from the financial analysis, an evaluation of the main social costs and benefits is often included in the project analysis. Both for the financial and the socio-economic analysis, a comparison between the situation with and without the investment should be conducted.

• Sensitivity and risk analysis. Uncertainties and risks regarding trends are important points to consider when appraising investment projects.

Experience analysis

In addition, the analytical & comparative capacity may be significantly increased by the following measures:

• Know-how (pilot cases, good examples, trainings)
• Experience exchange (study visits, networks)

Within the RECO Project we have developed several tools to facilitate both know-how and experience exchange.

On www.recobaltic21.net it is possible to get access
to a database filled with information about technology suppliers, know-how and also possible objects to visit within the waste management field. Organization of study visits is supported by an automatic system for selection and design of a study visit. The database developed has reference objects where techniques can be explored.

A very important idea is that these facilities are also located in the eastern part of the BSR. It is always relevant to see effective technologies, which are not exceeding available funds and which have proven successful in the different operational regimes.

Training is facilitated by the Knowledge Toolbox (www.knowbox.org/waste), which is a tool to create non-commercial courses and trainings in municipal waste management (MWM) of various types: country- and topic-specific. The Knowledge Toolbox is not a specific course; it is rather a resource pool of documents, presentations, photos, movies and any other data related to MWM. Interested stakeholders can use it according to their will, extracting only the knowledge that is interesting for them. This approach enable users from partner countries, which are in different stages of MWM development, to retrieve the knowledge they really need.

Different waste management networks have been analysed, and there is a clear intention to develop a Baltic Sea Region informal network (a Baltic Waste Management Council) to support exchange of good practices and joint lobbying for the regional interests.

Some of the available tools are shortly presented in Table 1.

It is extremely important to take the waste management hierarchy into account during the analytical phase of the investment process, as this will allow for a rational comparison of the proposed solutions in both short and long term perspectives. Maybe several alternative solutions are compared in the analytical phase, but it is recommended that only a few (2-3) of the most suitable solutions are presented for the decision makers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Owner/Developer</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot cases</td>
<td>RECO project</td>
<td><a href="http://www.recobaltic21.net">www.recobaltic21.net</a></td>
</tr>
<tr>
<td>Education</td>
<td>RECO project</td>
<td><a href="http://www.knowbox.org/waste">www.knowbox.org/waste</a></td>
</tr>
<tr>
<td>Study visits</td>
<td>RECO project</td>
<td><a href="http://www.recobaltic21.net">www.recobaltic21.net</a></td>
</tr>
<tr>
<td>Networks</td>
<td>RECO project</td>
<td><a href="http://www.recobaltic21.net">www.recobaltic21.net</a></td>
</tr>
</tbody>
</table>

Table 1. Short characteristic of the available tools for comparing experiences

Checklist for the Analytical Phase:

- What kind of LCA has been performed for the planned investment?
- Have the environmental impacts of the investment been analysed?
- Was the investment analysed with respect to the financial feasibility?
- Were the regional experiences taken into account in the analysis?
- How many alternative technological solutions have been analysed and compared?

The outcome of this phase will be 2-3 alternative solutions that can be further presented for decision makers.
DECISION

In this phase, decisions are made based on the presented alternatives, taking into consideration the following factors:

- Legal/political
- Environmental/climatic
- Social
- Economic

When a number of alternative technical solutions are presented for the decision makers, it is extremely important to make another comprehensive analysis, weighing all the analysed factors together. Therefore, a special analytical matrix is suggested as a tool to simplify the analytical process and recommend decisions.

It is extremely important to take into account the waste management hierarchy in the decision phase of the investment process, as this will help the decisions makers with the final evaluation of the suggested alternatives.

Checklist for the Decision Phase:

- Does the selected solution improve the environmental/climatic situation?
- Does the selected solution take into consideration improvements according to the waste management hierarchy?
- Has the public opinion been consulted?
- Is the selected solution socially acceptable?
- Is there a financial capacity to support the investment & maintenance of the suggested solution?
- Is there a stable political support for implementation of the suggested solution?
- Which alternative solution had the best score in the scoring matrix?
- Have the investment costs been compared to the costs of not doing anything?

The outcome of this part will be one preferred solution, selected for the implementation phase.

<table>
<thead>
<tr>
<th>Score</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal/political</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
</tr>
<tr>
<td></td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
</tr>
<tr>
<td></td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
</tr>
<tr>
<td>Environmental/climatic</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
</tr>
<tr>
<td></td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
</tr>
<tr>
<td></td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
</tr>
<tr>
<td>Social</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
</tr>
<tr>
<td></td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
</tr>
<tr>
<td></td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
</tr>
<tr>
<td>Economic</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
<td>Best – 6 pts</td>
</tr>
<tr>
<td></td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
<td>Average – 3 pts</td>
</tr>
<tr>
<td></td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
<td>Least beneficial - 0</td>
</tr>
<tr>
<td>Sum for each alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Example of a scoring matrix for selection of the best alternatives.
IMPLEMENTATION

Based on the final decision, the investment will be implemented (finances & construction). The following aspects of the implementation phase have to be taken into account:

- Financial issues
- Procurement
- Construction works
- Operation and Maintenance

Within the RECO Project we have developed information on how to facilitate financing of waste investments in the BSR. Even though one tends to assume that there are only a few opportunities to obtain financing for waste investments, this is not the reality. There are many financial sources, both international and European, which may be approved by anyone interested in obtaining financing for waste projects in the Baltic. Some of them are summarised in Annex 2. More information can also be found on Internet (http://ec.europa.eu/environment/waste/studies/pdf/financingmunicipalwaste_management.pdf).

Once a system is built it should also be run and maintained. The most efficient way to finance this is making the users pay a fee. The fee should be based on the costs of running the system and should not give too much profit; thus costs for smaller investments should be included. The fee should not be higher than the corresponding cost of the service. The cost refers to the overall costs of the waste management business and not to the cost of individual performance.

Changes in the waste sector mean changing conditions for the design of waste fees. The tariff is an increasingly complex issue as the costs of collection contracts have been pressed in metropolitan areas. At the same time, stricter environmental requirements, new services and new taxes have led to higher costs for treatment and management of various types of wastes. Despite increasingly detailed national goals and guidelines, it is the practical decisions at the local level that guide the investments, choices and cost level. Depending on the objectives of the municipality there are many ways to build a tariff. Having the same tariff model in all municipalities would stifle development as the conditions differ.

Designing a fee is a bit of an art and this is also a chance to communicate with your inhabitants on what you believe is the right option for the waste management. Currently, there is an increasing use of fees based on waste weight or volume.

Some basic criteria are:

- The fee should cover the total cost for waste management.
- The fee is determined by local physical and geographical conditions.
- Local ambitions, objectives and priorities for waste separation are important for the structure of the fee. The fee thus serves as an instrument to reach set environmental and operational goals.
- A fee design which combines a basic and a variable fee (collection and processing fee), and an added bill for additional services, will facilitate the allocation of costs to the right customer groups.
- The waste fee shall be adopted by the City Council and there should be rules about who is liable to pay and to whom the fee is payable.
- If the municipality signs a contract with a contractor, this agreement may be the basis for calculating the fee, provided it is not significantly more expensive than if the municipality would handle the refuse collection in-house.
The principle of equality should be applied, meaning that residents should have equal rights and obligations towards the municipality. The same fee shall be charged for the same performance / service.

The fee should be simple so that customers can easily understand the choices they have and what the total fee will be.

Procurement has received a special attention during the RECO project, as it is often considered one of the most difficult issues in the implementation phase. Guidelines for a good organisation regarding procurement have been developed within the project. It is important that the client is competent in the entire chain of actions in the procurement procedure. Professionalism in procurement is built upon an organisation that has well defined goals and a clear strategy. The work that is done before and after the formal procurement process is important to get successful contracts and a sustainable waste management system.

Construction works are the most intensive (time and money) part of the investment process. There are many international guidelines on how to proceed with this. A well established international standards organisation is the FIDIC, which provides contract templates for the construction industry. Depending on the project volume, time and who is adducing the main planning work, different templates are provided. However, the templates have to be finally adapted to the project. An overview is given in the table 3.

Operation and Maintenance is often given little attention during the investment process. However, several aspects of O&M need to be taken into consideration, such as economic efficiency, technical feasibility, service and repair, etc. Operation and maintenance include tasks such as lubricating, checking alignment, adjusting, repairing and replacing different machinery parts. In general, we can distinguish between corrective and preventive maintenance, which can be carried out daily, weekly, annual, or at breakdowns. During the investment process, the supplier should be urged to supply information on the operation and maintenance needs.

It is tempting to think that there is no room for the waste management hierarchy when all decisions have been taken. However, the waste management hierarchy should be considered also during the implementation phase of the investment process. This is particularly true for the procurement (when defining the tendering conditions), but also for the operation and maintenance when a lot of unexpected situations may occur, which require new directions and decisions.

**Checklist for the Implementation Phase:**

- Are the finances provided in an efficient way?
- Does procurement cause a lot of problems?
- Are construction works executed according to plans and costs?
- Will operation and maintenance guarantee problem-free functioning of the investment?

The outcome of this part will be a completed investment that has been commissioned.
Regardless if the project has successfully achieved its objectives or has failed – the investment cycle has to be evaluated. It is important to ensure that the lessons learned from the project are not forgotten. By learning from experiences of previous projects a better design and execution of future projects can be achieved. Even more important, an evaluation is important to check if further improvements are needed to achieve maximum expected results from the current project.

In order to properly measure success and work toward continuous improvement, two types of evaluations should be carried out:

- Performance evaluation;
- Objectives evaluation, i.e. to evaluate if objectives have been met.

**Evaluation of performance**

Performance evaluation means an evaluation of the investment process as such – how well the project was executed. It can be carried out shortly after the implementation has been finished, when people still remember most, and when most of the problems have been solved. The topics of a performance evaluation are whether investment was completed on time, with the planned budget, and according to the original technical design.

**Evaluation of objectives**

Contrary to the performance evaluation, an evaluation of objectives achievement (both environmental and economic) is best done some time after project completion to allow time to achieve results that can be measured. Setting a time frame for evaluation of the project goals is a critical consideration. Objectives have been set in the Drivers phase, key performance indicators developed in the Analysis phase, and decision on them taken in the Decision phase. Usually the goals and objectives are indicated in the business plan. The Evaluation phase, finally, is an occasion to go through indicators that express different objectives, and check whether expectations have been fulfilled, and if not, why they have not been fulfilled. The following questions should be addressed:

- Has the investment fully solved the waste management problem (legal, environmental, economic or social, as identified in the Drivers phase) that it was supposed to solve?
- Have the financial parameters and forecasts been met?
- Are corrective actions/ further investments needed to deliver even larger benefits?

When carrying out the evaluation, it is important to be open, objective, and to look at both positives and negatives. After the evaluation has been carried out, and areas for further development and lessons learned have been identified, it is important to report the findings and recommendations.

**Checklist for the Evaluation Phase:**

- Was the investment implemented on time?
- Was the investment implemented with the planned budget?
- Was the investment implemented according to the original technical design?
- Were the adequate indicators used to assess the quality of the investment?
- Has the investment fully solved the waste management problem that it was supposed to solve?
- Are corrective actions/ further investments needed to deliver even larger benefits?
- What went wrong, why did these things go wrong, and how can those problems be avoided next time?
- What went particularly well and needs to be learned from?

The outcome of this phase is an evaluation report of the completed investment.
IMPORTANCE OF THE INVESTMENT CONCEPT CONTINUITY

The Baltic Waste Investment Concept is a continuous process. Ideally, it should be repeated after the evaluation of an investment has been completed and new challenges for the waste management have been identified.

Figure 3. Continuity of the Investment concept

BWIC could be considered as an investment project’s quality endeavor for minimising defects. Similarly to the PDCA (Plan, Do, Check, Act), which is part of the Total Quality Management concept developed and described by Dr William Edwards Deming, BWIC is a process of ensuring quality by a continuous cycle of efforts to improve the services provided by the waste management system.

Ensuring continuity of the investment concept allows for better legal compliance of the waste management system and better competitive edge of the employed technology.

The traditional waste investment projects fail mostly in one of the two phases: DECISION or IMPLEMENTATION. The real value of the continuous BWIC is that analytical input (DRIVERS & ANALYSIS) and feedback (EVALUATION) wrap around these activities, thus ensuring continuous improvement.

IMPORTANCE OF THE WASTE MANAGEMENT HIERARCHY

The Baltic Waste Investment Concept is a process that takes into account the waste management hierarchy in all stages. It is also important to consider the local conditions, possibilities, cultures, etc. when analysing and suggesting any of the steps in the waste management hierarchy in a given location at a given time.

The EU Framework Directive on Waste (2008/98/EC) sets the basic concepts related to WM and says that the waste legislation and policy of the Member States must apply the waste management hierarchy as a guiding principle. The aim of the hierarchy is to minimise waste and extract the maximum practical benefits from all products. The highest priority should be given to preventative measures to reduce the amount of waste and minimise the harmful content in products because this gives the largest environmental gains. Other priority measures follow, such as re-use of products, material recycling, and energy valorisation with safe disposal being the lowest priority.

Waste prevention - preventing and reducing waste generation – is closely linked with improving product design and manufacturing methods (e.g. prolonging product’s life, lightweight design), influencing green
consumers demand, and lowering the use of package material. Waste prevention is addressed in the EU Thematic Strategy on the prevention and recycling of waste.

Reuse and preparation for reuse implies giving the products a second life before they become waste, and in doing so prolonging the products’ lifetime and delaying that new products are entering the market.

Material recycling refers to any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or for other purposes. It includes composting but excludes incineration. By recycling material the use of virgin materials can be reduced, which implies reduced environmental impacts.

Energy recovery refers to incineration with extraction and use of the energy content (waste-to-energy, WtE). Energy recovery can include the recovery of heat and/or the production of electricity. This option allows the recovery of the chemical energy in products and is resorted to when material recovery is not economically feasible or technically possible. However, it should only be used together with sound technologies for emission reduction.

Safe disposal is the process to dispose of waste with minimal environmental impact. It can include landfilling, storage or thermal treatment without energy recovery. It should be used only in cases where the options for higher order solutions have been exhausted. Today, landfilling is the prevailing solution and must be done using technologies that ensure minimal adverse effects to the environment and human health. Current technologies include proper bottom lining for isolation of the leachate, leachate treatment, and systems for landfill gas extraction and utilisation.

Adhering to the WM hierarchy requires a lifecycle perspective which systematically evaluates and takes into consideration the total environmental impacts from different waste management alternatives. This implies that due to local conditions higher hierarchy solutions may be less beneficial from the environmental and human health points of view. In such a case, the least harmful option is prioritised.
CHECKLIST FOR THE ENTIRE BWIC

Drivers Phase:

• What is the main driver for the investment?
• Are the other potential drivers taken into account?
• What exactly is the problem/challenge to be addressed?
• What happens if the investment is not implemented?

• Which alternative solution had the best score in the scoring matrix?
• Have the investment costs been compared to the cost of not doing anything?

Analytical Phase:

• What kind of LCA has been performed for the planned investment?
• Are the environmental impacts of the investment analysed?
• Was the investment analysed with respect to the financial feasibility?
• Were the regional experiences taken into account in the analysis?
• How many alternative technological solutions have been analysed and compared?

• Are the finances provided in an efficient way?
• Does procurement cause a lot of problems?
• Are construction works executed according to plans and costs?
• Will operation and maintenance guarantee problem-free functioning of the investment?

Decision Phase:

• Does the selected solution improve the environmental/climatic situation?
• Does the selected solution take into consideration improvement in the waste management hierarchy?
• Have the public opinion been consulted?
• Is the selected solution socially acceptable?
• Is there a financial capacity to support the investment & maintenance of the suggested solution?
• Is there a stable political support for implementation of the suggested solution?

• Was the investment implemented on time?
• Was the investment implemented with the planned budget?
• Was the investment implemented according to the original technical design?
• Were the adequate indicators used to assess the quality of the investment?
• Has the investment fully solved the waste management problem that it was supposed to solve?
• Are corrective actions/ further investments needed to deliver even larger benefits?
• What went wrong, why did these things go wrong, and how can those problems be avoided next time?
• What went particularly well and needs to be learned from?
REFERENCES:


COUNCIL DIRECTIVE of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (85/337/EEC);


EC Guidance on EIA (available on http://ec.europa.eu/environment/eia/eia-guidelines/g-scoping-full-text.pdf);

EC Guidance on EIA Screening (http://ec.europa.eu/environment/eia/eia-guidelines/g-screening-full-text.pdf);

Guide to Cost-Benefit analysis of investment projects, 2002;


ISO 14040:2006, Environmental management -- Life cycle assessment -- Principles and framework;

IVL, 2013, WAMPS manual;

RECO, 2013, Joint strategy for the Baltic Sea Region, RECO project;

ANNEX 1. WAMPS

As part of the RECO Baltic 21 Tech project, IVL Swedish Environmental Research Institute has developed a software application called WAMPS (Waste Management Planning System). The application enables the users to carry out calculations via a web interface in order to compare the environmental performance of different types of waste management systems. It is based on life cycle assessments (LCA).

WAMPS is an easy to use application and will primarily be used as tool and as a support for decision in the planning process. This will help to design the most suitable system for waste management, from an environmental point of view, in a certain region with its specific conditions. The application requires that the user has a basic knowledge about waste management and LCA competence.

The software has been developed during 2011 and 2012. Before being able to use the software, the user must fill in an application for a user account, after which login details are sent to the user. The user has to enter data in the following five consecutive steps, after which the environmental performance is calculated for the case of interest.

1. Composition of waste
In this step, the waste is specified regarding waste composition and amounts of each waste fraction. Examples of waste fractions are plastic and metal packaging, degradable kitchen waste and hazardous waste.

2. Sorting of waste
In this step, the user specifies and calculates how much waste in each waste fraction that is material recycled. In order for a waste fraction to be material recycled, the waste must be sorted, either at source, at a central sorting facility (material recycling facility) or at a mechanical sorting facility (mechanical biological treatment facility) which is defined at this step.

3. Treatment of waste
In this step, the user defines how the waste that is not material recycled is treated. For the biodegradable waste, the user specifies how much waste that is composted and how much that is treated through anaerobic digestion. For the residual waste, i.e. the waste that is not material recycled or treated biologically, the user specifies how much is landfilled and how much is incinerated. Furthermore, the treatment of the output fractions from the mechanical-biological treatment is also defined. In addition, it is also specified to what extent the energy content in the waste is recovered.

4. Collection of waste
In this step, parameters that affect the environmental performance of the waste collection system are specified, such as average distance between collection sites, number of households, average waste load and type of waste collection vehicle used for the collection.

5. Transport of waste
In this step, the user specifies the parameters that affect the environmental performance for long distance transports, for example to waste treatment plants.

After the 5 steps have been completed, WAMPS shows the results for the specific case study. The environmental performance is shown and divided into the following environmental impact categories: “Global Warming”, “Acidification”, “Eutrophication” and “Photo oxidant formation”. WAMPS also allows the user to compare different waste scenarios of interest and to export data to other formats, such as Word and Excel, in an easy way.

More information can be found at http://www.recobaltic21.net/
There are a number of organisations that may be in a position to provide support for investments in waste management. Those may be loans, grants or a combination of both. The list provided in this section offers an overview of the various financing institutions which may be contacted to discuss possible funding to support waste management investments.

### European Investment Fund (EIF)

EIF is a specialist provider of risk finance to benefit small and medium-sized enterprises (SME) across Europe. EIF is part of the EIB Group; the shareholders are the European Investment Bank (EIB), the European Commission and a wide range of public and private banks and financial institutions. EIF facilitates realization of environmental projects by investing financial resources in the implementation of environmental infrastructure development projects.

UNDP and EIF realized a project about environmentally sound disposal of PCBs containing equipment and waste. EIF developed a financial loan mechanism for replacement of PCBs containing equipment with environmentally friendly technologies.

[www.eif.org](http://www.eif.org)

### The Nordic Council of Europe Development Bank (CEB)

The CEB is an autonomous multilateral development bank under the authority of the Council of Europe. The CEB grants loans to finance social projects or to respond to emergency situations, aiming to improve living conditions and social cohesion in less advantaged regions. Aid to refugees, migrants and victims of natural or ecological disasters is prioritised, but some 27% of the CEB’s loans have been granted for social projects in the fields of environmental protection, rural modernisation, and the preservation of historic heritage.

[www.coebank.org](http://www.coebank.org)

### The European Bank for Reconstruction and Development (EBRD)

The European Bank for Reconstruction and Development (EBRD) aims to promote an open market-based economic system in the transitional countries. The EBRD provides direct financing for private sector activities, restructuring, privatisation and infrastructure projects.

The EBRD usually requires a sovereign guarantee for public sector loans, but also aims to promote private sector involvement in public sector operations. The focus is shifting from sovereign loans to private sec-

### ANNEX 2. POSSIBLE FUNDING FOR WASTE INVESTMENT

The Nordic waste group has developed three plastic waste projects under the overall “Resource efficient recycling of plastic and textile waste” project activity. They will also support projects for improvements in existing collection and recycling systems for plastic waste from households and other municipal waste sources.

[www.norden.org](http://www.norden.org)

### Nordic Co-operation

The political co-operation is built on common values and a willingness to achieve results that contribute to a dynamic development and increase the Nordic competences and competitiveness. The Nordic countries cooperate in a wide range of areas such as, for example, research, environment, nature and sustainable development.

The Nordic Council is the Nordic inter-parliamentary body, while the Nordic Council of Ministers is the inter-governmental body. A range of other Nordic organisations and associations also exist.

[www.eif.org](http://www.eif.org)
Short descriptions of pilot projects

Incorporator transactions, and finding ways to enhance the
creditworthiness of borrowers is increasingly impor-
tant. The EBRD have co-financed several water and
wastewater projects, some of which are priority pollu-
tion hot spots in the JCP.

The European Investment Bank (EIB)

The European Investment Bank (EIB) is the European
Union’s financing institution. The EIB supports finan-
cially viable public and private sector projects in in-
frastucture, industry, agro-industry, energy, environ-
ment, tourism and services beneficial to the private
sector.
The EIB is a major shareholder in the European In-
vestment Fund (EIF), which was created in 1994 as
a public-private partnership focusing on extending
guarantees for Trans-European Network infrastruc-
ture projects and development of small and medium
scale enterprises. The EIB and EIF operate within the
European Union and in selected transitional countries.
The EIB is a major financer of water and wastewater
investments and has provided extensive support to
several countries, including the partial financing of
projects that have resulted in the removal of pollution
hot spots from HELCOM’s list.
The EIB has also, together with the World Bank, co-
financed several major investments to reduce air pol-
lution through improved energy efficiency and the re-
habilitation of district heating systems.

The Nordic Environment Finance Corporation (NEFCO)

The Nordic Environment Finance Corporation (NEFCO)
is a multilateral risk capital institution that fi-
nances environmental projects in Central and Eastern
European countries. NEFCO aims at improving the
environmental conditions in the partner countries and
the Nordic region, with the emphasis on air and water
pollution.
NEFCO can take part in projects through equity in-
vestments, and by offering loans and guarantees. A
Nordic partner should be involved in all NEFCO pro-
jects.
NEFCO has so far co-financed (in co-operation with
the EBRD and the World Bank) more than 30 projects
that have had impacts on the Baltic Sea, including
support for municipal water and wastewater projects
at pollution hot spots. NEFCO has also financed
three types of smaller-scale projects: modernisation
schemes at industrial plants and energy utilities; im-
provements in municipal environmental services; and
the manufacture of environmental equipment or the
provision of environmental and energy consulting ser-
\[www.nefco.org\]

The Nordic Investment Bank (NIB)

The Nordic Investment Bank (NIB) is a multilateral
financial institution owned by the five Nordic Coun-
tries. The NIB finances projects that promote Nordic
cooporation, with high priority given to projects im-
proving the environment in the Nordic Countries and
neighbouring regions. The NIB has financed success-
ful municipal and industrial environmental projects
that have enabled several industrial hot spots to be
deleted from the list.
In 1996, a new ECU 100 million environmental loan
facility was established at the NIB to support the fi-
nancing of environmental projects in the Baltic Sea

\[www.nib.org\]
region and north-western Russia. These loans are guaranteed by a special fund set up by NIB shareholders, and are intended for wastewater treatment, solid and hazardous waste management and district heating projects. Projects involving Nordic suppliers and co-financing from other Nordic and multilateral financing institutions will be given priority.

www.nib.int

The Nordisk Innovation Centre

The Nordisk Innovation Centre funds ideas with a Nordic profile with the purpose of supporting the business community and immigrants in the Nordic countries.

www.nordicinnovation.org

The World Bank Group

The World Bank Group operates in the Baltic Sea region through the following organisations: the International Bank for Reconstruction and Development (IBRD), which supports public and private sector investments; the International Finance Corporation (IFC), a private sector lending affiliate which works with local, foreign and joint venture investors; and the Multilateral Investment Guarantee Agency (MIGA), which provides investment guarantees against political risks to foreign investors.

The World Bank has supported policy, institutional and investment activities related to environmental management in the Baltic Sea region. Projects have focused on water, wastewater and solid waste management services, with examples including support for the demonstration of small-scale wastewater treatment alternatives, management of pig farm wastes, and of agricultural non-point source pollution.

The World Bank has also supported significant projects in coastal zone management, coastal lagoon and wetland management, development of protected areas, and eco-tourism. Projects supported by the World Bank have included co-financing from the EU (Phare), the Nordic Countries and NEFCO.

www.worldbank.org

United Nations Development Programme (UNDP)

The focus of UNDP’s network is to help countries build and share solutions to different challenges such as poverty reduction, achievement of the Millennium Development Goals, democratic governance, crisis prevention and recovery, and environment and energy for sustainable development.

UNDP has supported the government in developing and strengthening good governance and the civil society in Latvia. Although UNDP finalized its activities in Latvia in the end of 2005, the UNDP environmental unit continues to work to realize various new projects in the field of environmental protection.

www.undp.org

The Neighbourhood Investment Facility (NIF)

NIF brings together grants from the European Commission and the EU Member States with loans from European public Finance Institutions, as well as own contributions from the partner countries. NIF is a financial mechanism aimed at mobilising additional funding to cover the investment needs of the EU Neighbouring region (Belarus included) for infrastructures in sectors such as transport, energy and the environment.

http://ec.europa.eu/europeaid/where/neighborhood/regional-cooperation/irc/investment_en.htm
German Reconstruction Loan Corporation KfW (Kreditanstalt für Wiederaufbau)

As a promotional bank, KfW Bankengruppe supports change and encourages forward-looking ideas – in Germany, Europe and throughout the world. The KfW bank group is e.g. financing the installation of up to ten offshore wind farms in the German North and Baltic Sea with credit at market, and supports innovation and modernisation in small and medium-sized Russian enterprises.

www.kfw.de

Latvian Environmental Investment Fund (LEIF)

The LEIF has been established to pool domestic funding with foreign funding to finance environmentally friendly projects by lending financial resources to public and private sector projects.

The Mission of the LEIF is to reduce environmental pollution, promoting the implementation of environmental protection projects, and also to increase the capacity of municipalities and commercial organizations to prepare and carry out qualitative and effective projects all the way from idea to realization.

The LEIF has worked with development of different environment protection and environment friendly projects for over 16 years. Activities are directed to reach maximum environmental improvement, supporting commercial activities in both the public and the private sectors, and stimulating attraction of finances for realization of projects in the field of environmental and business infrastructure development.

www.lvif.gov.lv

Lithuanian Environmental Investment Fund (LEIF)

The Lithuanian Environmental Investment Fund (LEIF) was founded in 1996. The main goal of the LEIF is to support the public and private sectors in realization of environmental projects and projects to reduce the negative impact of economic activities on the environment.

The Fund supports investment projects in the form of soft loans and subsidies. Each year the Supervisory Board of the Fund establishes which type of applicants and which field of environmental investments shall be granted the aforementioned types of financing.

www.laaiif.lt

Estonian Environmental Investment Centre (KIK)

KIK provides funding for environmental projects in Estonia. KIK is also the main implementing institution for EU-funded environmental projects. The Environmen-
Short descriptions of pilot projects

The Programme of the Environmental Investment Centre (sub-programme for waste treatment) provides state assistance (funding for local authorities) for the following activities:

- construction of waste management plants and reloading plants, if the cost does not exceed 320,000 euros, on the basis of local government waste management plans;
- construction of waste collection points on the basis of local government waste management plans;
- development and implementation of newer waste treatment systems and waste handling technologies.

The Environmental Investment Centre has also coordinated several programmes for the EU Cohesion Fund funded measures that were aimed at closure of ordinary waste landfills, expansion of waste treatment centres, recovery of waste, closure of oil shale industry landfills and waste deposits and renewal of the ash removal system.

See more www.kik.ee

National Fund for Environmental Protection and Water Management in Poland (NFOŚiGW)

The National Fund of Environmental Protection and Water Management was established in 1989 as a result of the regime transformation in Poland. In cooperation with voivodeship funds for environmental protection and water management it is the pillar in the Polish system for financing environmental protection. The mission of the National Fund is to financially support undertakings intended for protecting the environment and respecting its value, based on the principle of sustainable development which is included in the constitution. The National Fund and the voivodeship funds provide financial support for projects which contribute to the enforcement of Polish obligations resulting from the Accession Treaty and other EU directives.

The National Fund has been responsible for the absorption of 5.035 billion Euros in the period 2007-2013, mainly on tasks concerning waste water management, water management, waste management, environmentally-friendly energy and provision of co-financing for projects in nature conservation and environmental education.

Waste management includes not only processing and utilization of municipal waste, but also the disposal of hazardous waste (such as “electro”), so called disarming of “ecological bombs”, help with closing and reclaiming landfills, promotion of vehicles recycling, assistance for the removal of asbestos, planning and many other tasks. Several subsidies and preferential loans are distributed by the National Fund for those tasks.

See more www.nfosigw.gov.pl

Swedish Industrial Development Fund

The Swedish Industrial Development Fund links to a number of private equity players active in the Swedish and Nordic markets.

See more www.industrifonden.se/en
ANNEX 3. CONCEPTUALIZATION AND DEVELOPMENT

The process of defining Baltic Waste Management Investment Concept has gone through several stages. The first version has been discussed and developed in several meetings of the RECO project. Version 1.0 was considered as a linear process with the following steps: identification of drivers, analysis of the situation and possible alternatives, taking the final decision, implementing investments (Figure 5).

Another approach (Version 2.0) was modified to a circular process with the following steps: identification of drivers, analysis of the situation and possible alternatives, taking the final decision, implementing the project and evaluating the results (Figure 6).

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**Figure 5.** Linear Baltic Waste Management Investment Concept, version 1.0, (March 2012).

**Figure 6.** Baltic Waste Investment Concept with Cycles, version 2.0, (June 2012).
Finally, the most mature version of the BWIC (Version 3.0) has added a new perspective, continuous improvement in relation to PDCA/Deming cycle of management. Dr. J.Edward Deming, the famous quality guru, provided a simple yet highly effective technique that serves as a practical tool to carry out continuous improvement in workplaces. PDCA is an acronym for Plan, Do, Check and Act. Moreover, the Waste management hierarchy has been added as a fundamental aspect underlying the work in all the stages of the Concept.

Figure 7. Baltic Waste Investment Concept with Continuous Improvement and the Waste Hierarchy, version 3.0, (September 2012).
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