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Green Public Procurement Criteria for Waste Water Infrastructure

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DISCLAIMER

Content

List of Abbreviations and Acronyms

BOD	Biological Oxygen Demand
CBA	Cost-Benefit Analysis
CEN	European Committee for Standardization
CENELEC	European Committee for Electro technical Standardization
CHP	Combined Heat and Power system
COD	Chemical Oxygen Demand
CPR	Construction Product Regulation
dB	Decibel
DDT	Dichloro-diphenyl-trichloroethane
DEHP	Di(2-ethylhexyl)phthalate
DS	Dissolved solids
EIA	Environmental Impact Assessment
EMAS	Eco-Management and Audit Scheme
EMP	Environmental Management Plan
EN	European Standard
EPA	Environmental protection agency
EPBD	Energy Performance of Buildings
EPD	Environmental Product Declaration
EQS	Environmental Quality Standards
ESTI	European Telecommunications Standards Institute
ETC	Emission trading scheme
EU	European Union
FIDIC	International Federation of Consulting Engineers
GHG	Green House Gases
GPP	Green Public Procurement
HCL	Hydrogen chloride
Hg	Mercury
IPPC	Integrated Pollution Prevention and Control
ISO	International Organization for Standardization
KPI	Key Performance Indicator
kWh	Kilo Watt Hours
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
mg	Milligram
N	Nitrogen
Nm^3	Normal cubic meter
NO_x	Nitrogen oxide
NPV	Net present value
P	Phosphorus

PAH	Polycyclic Aromatic hydrocarbons
PE	Person Equivalent
PFOS	Perfluorooctane Sulfonic Acid
PoM	Programme of measure
RB	River Basin
RBMP	River Basin Management Plan
RES	Renewable Energy Sources
SO_2	Sulphur dioxide
SS	Suspended solid
UWWTD	Urban Waste Water Treatment Directive
VOC	Volatile Organic Compounds
WFD	Water Framework Directive
WWTP	Waste Water Treatment Plant
µg/l	Micrograms per litre

1 Introduction

This document provides the EU Green Public Procurement (GPP) criteria recommended for the procurement of waste water infrastructure projects. The accompanying Technical Background Report provides full details on the reasons for selecting these criteria and references for further information. The use of GPP criteria should be seen as an opportunity for waste water managing authorities to build and operate waste water infrastructures in an environmentally friendly manner.

The document includes the following sections:

Section 1 gives an introduction to the purpose and general idea of using GPP criteria for waste water infrastructure projects.

Section 2 shortly describes the type of waste water infrastructure that is considered and included in the GPP criteria.

Section 3 provides an overview of the main key environmental impacts related to waste water infrastructure projects.

Section 4 shortly describes the different phases in developing waste water infrastructure projects and describes the GPP related activities in the different phases, including a "decision tree" and examples of an evaluation model that can be used in connection with tendering of a waste water infrastructure project.

Section 5 sets out the recommended GPP criteria.

Section 6 describes how Life Cycle Costing (LCC) can be used in GPP.

Section 7 provides relevant European legislation and information sources.

In general, EU GPP criteria[1] correspond to two levels of ambition:

Core GPP criteria address the most significant environmental impacts, and are designed to be used with minimum additional verification effort or cost increases compared to a purchase without green criteria.

Comprehensive GPP criteria are intended for use by authorities who seek to purchase the best environmental products available on the market, and may require additional administrative effort or imply a certain cost increase as compared to fulfilling the core criteria.

[1] Other GPP criteria and technical background reports can be found here: http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

The application and use of GPP criteria for waste water infrastructure is distinctly different from other GPP criteria. The reason is that these GPP criteria relate to:

1 Big and often complex infrastructure projects

2 An area with different levels of legal requirements (EU and national) for the effluent depending on the location of the projects and the environmental sensitivity of the receiving water bodies.

3 Projects that themselves have a positive environmental impact through the treatment of waste water. The discharge of the remaining content of substances is the main contributor to the overall total potential environmental impact from waste water treatment plants.

1.1 Use of this GPP guidance

The present document is *voluntary guidance* with the intention of supporting Green Public Procurement. This document does not hinder any public authority from using national/own developed approaches to GPP.

The document does not in any way supersede national legislation and existing national and international standards[2], and it is voluntary for the contracting authority to utilise this GPP guidance. However, it is the responsibility of the contracting authority to conduct the procurement process in compliance with EU and national procurement rules. It is the responsibility of the contracting authority to identify and select the green criteria presented in this document which are suited best for their project.

The present document describes the recommended GPP criteria that can be used in tendering waste water infrastructure projects and how and when the criteria are applied in the different phases of the development of a project. The GPP criteria can be used in tendering procedures for the construction of new waste water infrastructure, operation of waste water infrastructure, and renovation and maintenance contracts.

Procurement of waste water infrastructure is a complex process. In most cases, the procuring organisation will need technical support with specific engineering, environmental and economic knowledge to undertake the whole tender process from initial feasibility studies to the final selection of a contractor.

A waste water infrastructure project will necessarily include a design phase, selection of a contractor followed by the construction as such. The subsequent operational phase will, like the earlier phases, include various environmental concerns, and the GPP guidance therefore covers all these phases. The guidance covers the procurement of design, construction and operation, whether separately or

[2] Reference to CEN, CENELEC, ETSI, ISO, etc.

combined, in one tender as in the case of a fully-fledged public-private partnership. At the other end of the spectrum, the guidance also covers tendering of renovation and maintenance contracts.

In defining GPP criteria, it is often relevant to consult national and international technical standards. It is not possible to make references to all the relevant standards in this document. In many cases, there are national standards that are either obligatory to comply with or they describe best practice. Similarly, there are guidance and best practice documents on cost assessment which are not repeated in this document (see Technical Background Report, 7.3.1).

1.2 Analytical tools for assessment of environmental impacts

Due to the complexity of waste water infrastructure projects, it is recommended to use analytical frameworks and evaluation models/tools to assess the expected environmental impacts of such projects. These tools may include Life Cycle Costing (LCC), Life Cycle Assessment (LCA) and multi-criteria models where financial, technical and environmental assessments are combined. This assessment can be carried out in four ways:

1 Monetary valuation of the environmental impacts, using the monetary values as indicators for the relative importance of all the environmental impacts (LCC tools)

2 Normalisation,[3] where all the potential environmental impacts are expressed in the same unit and are related to an average person's contribution (LCA tools)

3 Weighting, where the most significant impacts can be ranked according to the seriousness of the impact categories (LCA tools)

4 Overall weighting where economic, technical and environmental aspects are weighted in relation to each other (multi-criteria tools)

An example of an evaluation model utilising multi-criteria tools is described in Section 4.5.

[3] According to Life Cycle Assessment methodology descriptions, normalisation is defined as the potential impacts divided by the corresponding normalisation references. The normalisation references are the specific potential impacts which e.g. an average person's contribution imposes on the environment each year.

2 Waste water infrastructure

These EU GPP criteria address the planning, design, construction, operation and decommissioning of sewerage networks, waste water and sludge treatment plants defined as:

Sewerage system/networks used for collection and transportations of domestic, industrial and commercial/institutional waste water which may comprise pipe network, retention basins and pumping stations. Sewerage systems are normally classified as combined (designed for handling of waste water and storm water) or separate systems (designed for handling of waste water only).

Wastewater treatment is the process of removing contaminants from domestic, industrial and commercial wastewater. Waste water treatment can, generally, involve the following four stages:

- *Primary treatment* typically involves screening, grit and grease removal and sedimentation of suspended solid materials. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.
- *Secondary treatment* removes dissolved and suspended biological matter including organic matter,
- *Tertiary treatment* includes nitrogen and phosphorus removal and might involve both biological and chemical processes. Tertiary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or additional treatment.
- *Additional treatment* following the primary, secondary and tertiary processes. It is employed when primary, secondary and tertiary treatment cannot accomplish all that is required. The purpose for the additional treatment is in most cases to remove additional nitrogen or phosphorus or, where required, removal of pathogens and/or removal of specific hazardous substances.

The EU Urban Directive on waste water treatment[4] is the legal basis for which all treatment plants in the EU must deliver primary, secondary and tertiary treatment (the latter for the removal of nutrients).

Sewage sludge treatment describes the processes used to manage and dispose of the sludge produced by wastewater treatment. It typically involves one or more of the following processes: thickening, stabilisation, dewatering, drying and/or incineration.

The Technical Background Report provides short descriptions of the wastewater infrastructure technologies most commonly used.

[4] Ref. http://ec.europa.eu/environment/water/water-urbanwaste/index_en.html.

3 Key environmental impacts

The proposed GPP criteria are designed to reflect the key environmental impacts. The approach is summarised in Table 3-1. The order of the environmental impacts does not necessarily translate to the order of their importance.

Table 3-1 Approach for developing the GPP criteria for waste water infrastructure

Key Environmental Impacts		GPP Approach
• Energy consumption especially in the operation phase which contributes to greenhouse gas emission	→	• Purchase equipment with high energy efficiency • Increase the energy efficiency of electricity and heat producing units[5] • Promote use of renewable energy sources
• Emission of nutrients with the treated waste water • Emission of pathogens and/or hazardous substances with the treated waste water	→	• Purchase equipment with a high treatment efficiency
• Emissions from sludge incineration	→	• Purchase equipment with a high flue gas treatment efficiency
• Water consumption	→	• Incentivise the reduction of water consumption • Promote reuse of water and use of grey/rain water

The reduction of greenhouse gases has a high priority in many Member States. As emissions of greenhouse gases are closely related to energy consumption, this important environmental aspect is addressed in the form of energy-related criteria.

As regards hazardous substances, it should be stressed that their removal in waste water treatment plants is, under normal circumstances, not necessarily considered to be the preferred option, since source-control measures might be more cost-effective. They could contribute to reducing the need for and cost of end-of-pipe treatment.[6] However, municipal waste water often still contains significant quantities of hazardous substances, and it can be expected that they will also be present in the future,

[5] E.g. gas boilers and gas engines

[6] See Impact Assessment (SEC(2011) 1547 final), accompanying the Commission proposal for a directive amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

but with lower and lower concentrations. Even for chemicals that are phased out, it will take several years before they no longer exist in waste water.
Eutrophication caused by remaining nutrients and the toxicity of the hazardous substances when they are present in the effluent are usually considered amongst the most important impacts. Therefore, the GPP criteria include requirements related to reduction of both nutrients and hazardous substances.

The GPP criterion for water consumption is mainly relevant for countries/regions with water scarcity. The high prices for water in some member states are, however, in itself an incentive to reduce drinking water consumption and to use water efficient equipment.

4 Project phases and GPP related activities

In this section, the different phases in developing a waste water infrastructure project and the GPP related activities for different phases are described.

The overall differences between core and comprehensive criteria are described and recommendations for when to use the different criteria are given.

Section 4.4 includes a decision tree which illustrates the different activities and decisions to be undertaken by the public authority in each project development phase if they want to include GPP criteria in development and tendering of the project.

Furthermore, an example of an evaluation model that can be used in connection with tendering of a waste water infrastructure project is presented.

4.1 Process and methodology for GPP criteria

An overview of the different phases for development and implementation of a waste water infrastructure project and how the GPP criteria can be used is shown in Figure 4-1 below.

PROJECT DEVELOPMENT PHASES	HOW TO USE GPP CRITERIA
TENDERING CONSULTANCY SERVICES	Qualification criteria for consultant: Technical, economic, LCA and LCC experience within waste water infrastructure
INITIAL PHASE MASTER PLAN, FEASIBILITY STUDY CONCEPTUAL DESIGN **PREPARATORY PHASE** CONCEPTUAL /PRELIMINARY DESIGN	Public authority selects GPP criteria. Overall LCA and LCC calculations at screening level for selected options. Decisions of principles for evaluation model and weighting of GPP criteria. (weighting factors must be determined by the public authority).
DETAILED DESIGN AND TENDER DOCUMENT PHASE DETAILED DESIGN TENDER DOCUMENTS	Qualification criteria for contractor. Specification of GPP criteria. Selection /evaluation model for how GPP criteria will be assessed compared with other criteria (the award criteria and scoring mechanism shall be fully understandable for the tenderer).

TENDERING PHASE FOR CONTRACTORS TENDERING WORKS CONTRACTS TENDER EVALUATION AWARD OF CONTRACT	Evaluation of qualitative selection criteria. Evaluation of compliance with technical specifications. Collection of data from tenderer for GPP assessment and model calculations. Evaluation model calculations for GPP criteria, possibly assisted by simple LCA/LCC calculations. Overall assessment of all criteria (economic, technical, environmental and selection of best offer).
CONSTRUCTION PHASE PROJECT IMPLEMENTATION	Monitoring and verification of GPP criteria.
OPERATION PHASE PROJECT IMPLEMENTATION	Monitoring, testing and verification of GPP criteria.
END OF LIFE PHASE DECOMMISSIONING	Monitoring of reuse-type, quality and amount of material.

Figure 4-1 Project development and how to use GPP criteria in the different phases

For more precise timing of the activities and when the different decisions have to be made, please see the decision tree in Section 4.4.

This document recommends GPP criteria for all phases of development and implementation of waste water infrastructure projects. Nevertheless, for each step in the procurement process, the public authority has to evaluate its actual needs and possibilities for incorporating environmental issues. Each project is unique, therefore, some criteria might have to be strengthened, others omitted. Moreover, the degree to which the procurement process includes the various phases (design, construction and operation) will also determine choice and formulation of GPP criteria.

4.1.1 Tendering for consultancy service phase

Tendering for consultancy services (engineers, planners and architects) is typically based upon the consultant's experience in performing similar projects, the qualification and the experience of the consultant's personnel and the consultant's proposal for performing the services.

The selection of the consultant is often based upon an evaluation model consisting of the above requirements and may include the consultant's relevant experience in sustainable design, LCA and LCC calculations for waste water infrastructure projects.

4.1.2 Initial phase

The initial phase includes a general outline, feasibility study and to some extent conceptual design[7]. In these phases several potential solutions to the problem are commonly discussed.

The decisions made during the initial phases have great impact on the economic and environmental performance of the project. Thus, it is very important to incorporate sustainability considerations very early in the process.

For waste water treatment infrastructure, the following issues need to be considered:

- The number and locations of the treatment plants
- The effluent standards to be achieved. Distinction should be made between the basic requirements in the Urban Waste Water Treatment Directive (UWWTD), i.e. primary, secondary and tertiary treatment for the removal of nutrients and additional requests (for instance bathing water quality in the receiving water bodies or treatment of specific hazardous substances)
- The sludge treatment requirements (e.g. level of sludge treatment and methods for sludge disposal).

The effluent standards are the most important issue to consider as the main objective of the infrastructure is to improve the treatment of waste water.

In this initial phase, the contracting authority should consult with the relevant environmental authority to make sure that possible future changes to the effluent standards are also taken into account.

In the EU, the effluent standards are established by the UWWTD. Other pieces of EU legislation may, nevertheless, require more stringent treatment to minimize the effects on receiving waters, e.g. the Bathing Water Directive and the Water Framework Directive (WFD).

While the UWWTD requirements are known and their implementation follows common patterns in the whole EU, and, similarly, it is known whether the receiving water body is designated as a bathing water site, the situation is different as regards the WFD. Firstly, these requirements will necessarily depend on the condition of the recipient waters. Secondly, in practical terms, they might still not be determined when the decision to build a plant has to be taken.

[7] Conceptual design outlines the main technical structures and their functions for the waste water infrastructure components.

The WFD requires the development of a River Basin Management Plan (RBMP) which should have been approved by the end of 2009. The programme of measures (PoM) for achieving the objectives should have been made operational by the end of 2012, and this programme should include the considerations on the additional need for treatment at each point source. Through consultation with the environmental authorities responsible for the RBMP and those responsible for the treatment requirement for the waste water treatment plant (if that is a different authority), the specific requirements on biological oxygen demand (BOD), nutrients and priority substances should be decided on.

Requirements beyond the UWWTD will typically depend on the situation in the receiving water body. If there are specific pollution problems or is it a designated area (bathing water, Natura 2000 site etc), then there are probably additional requirements.

The question of whether specific treatment requirements should be included in the technical specification or as award criteria should be answered during the planning and feasibility phase. If it is clear, when considering the RBMP, that additional treatment is necessary for compliance with the WFD, then these treatment requirements need to be part of the technical specification.

If it is, however, considered to be *desirable* to achieve a better quality of the effluent, but not *necessary* according to legislation and as specified in the discharge permit, then it might be relevant to include GPP criteria addressing nutrients and/or hazardous substances in the award phase. Higher treatment efficiencies can then be rewarded while weighing them against potentially higher costs.

In the conceptual design phase, the project will be further developed and the type of waste water treatment, demands and efficiency of primary, secondary, tertiary and perhaps more stringent treatment facilities, type of sludge treatment etc. will be determined.

In this initial phase, it is also relevant to determine other environmental criteria such as, for instance, demands on energy consumption.

A model for evaluating the environmental impacts in proportion to economic consequences of the project should also be considered in the initial phase. This model can be further developed as the project develops and ultimately be used during tender evaluation when actual offers for the project have been submitted. An example of an evaluation model is given in Section 4.5.

In Table 4-1 below, GPP related activities in the initial phase of a waste water infrastructure project are listed.

Table 4-1 GPP related activities - initial phase

Determination of effluent standards (WWTPs) and/or emission standards (sludge incineration) that go beyond the EU and national standards
Determination of other relevant environmental criteria for selection of the waste water infrastructure
Selection of GPP criteria relevant for the project
Determination of evaluation model and weighting of the different criteria (economic, technical and environmental criteria)
Life Cycle Assessment (LCA) and/or Life Cycle Costing (LCC) calculations for different options

4.1.3 Preparatory phase

The preparatory phase is also called the preliminary design phase.

The site of the waste water treatment plant, sludge incinerator, sewage pipes etc. has typically been decided in the previous initial phases. In the preparatory phase, the more specific technical solutions are considered and decided, for example: is it best to have chemical precipitation or biological removal of phosphorous? Which aeration system is the most appropriate in an activated sludge waste water treatment plant? Should the sludge be treated on site or at an external sludge treatment plant?

The answers to these questions in the preparatory phase can be supported by setting up an *evaluation model* which includes economic, technical and environmental performance/GPP criteria for the specific project as described in Section 4.5. This evaluation model can further be developed during the detailed design and tender phase and be used as a *contract award model*.

The calculation of potential environmental impact can be made based on LCA, and assessment of the total economic impact can be based on LCC calculations.

In this phase, for instance, energy consumption can be assessed for parts of the waste water treatment plant, the entire waste water treatment plant, sludge incinerator or sewage system. In this way, the potential environmental impacts from energy consumption, water consumption etc. for different technical solution can be calculated and assessed.

These analyses can help a public authority to identify the best environmental solutions to technical problems.

Table 4-2 below shows GPP related activities in the preparatory phase:

Table 4-2 GPP related activities - preparatory phase

Modification/adjustment of the GPP criteria relevant for the preparatory phase
Adjustment of the evaluation model and weighting of the different criteria (economic, technical and environmental criteria)
LCA and/or LCC calculations for different technical solutions

4.1.4 Detailed design/tender documents phase

In the detailed design/tender documents phase, the necessary design, technical specifications and tender documents for the waste water infrastructure project will be developed ready for issue to the tenderers. The level of detail in the design and technical specifications will depend on the contract form. The type of contract that is most frequently used within the EU Member States for the implementation of waste water infrastructure projects is the FIDIC type developed by the Federation Internationale des Ingenieurs-Conseils, or similar national contract types.

Form of contracts

Typically, three/four types of International Federation of Consulting Engineer (FIDIC -http://fidic.org/) contracts are used for the implementation of waste water infrastructure projects, namely FIDIC Red Book, Yellow Book, Silver Book and Golden Book contracts (see Section 4 in the Technical Background Report).

The **Red Book** is applied for a building or engineering works contract based on a detailed design by the contracting authority, and the tender documents will include precise specifications of the different project components, and there will be limited possibilities for the tenderers to offer other solutions. Therefore, the use of GPP award criteria in this phase of the project implementation should be limited.

When construction works may include elements of contractor-designed civil, mechanical, electrical and/or construction works, the tenders are typically based on the contract form **Yellow Book** (design and build). For this form of contract the contracting authority typically prepares a conceptual design defining the main waste water treatment technologies and design parameters which provides a high degree of control and the possibility for clear GPP criteria. If the project is tendered based on a design-build contract, it will be more open for the tenderer to offer innovative solutions, and the weights of GPP award criteria should be higher, and technical specifications setting minimum requirements for the design will play a role as well.

The **Silver Book** is applied for establishing projects on an engineering, procurement and construction (EPC turnkey projects) basis with the Contractor assuming total responsibility for the design including choice of technology and execution of the project until handing over to the contracting authority. While the contracting authority has little influence on the design of the plant, it is still able to set clear GPP criteria to be fulfilled by the contractor. Operation of the works constructed is either an integrated part or a separate contract of the turnkey project when operation is shorter than say 5 years. For long-term operation, the **Golden Book** (design, build and operate) contract form can be utilised, where the operation period is typically not less than 20 years.

Depending on the choice of contract used for a specific project, the need for and comprehensiveness of life-cycle costing will differ.

The tender documents must include a clear and transparent explanation of the GPP criteria and how the offers will be evaluated and scored during the tender evaluation. An example of an evaluation model for a WWTP project is given in Section 4.5.

Table 4-3 GPP related activities - detailed design/tender document phase

Modification/adjustment of the GPP criteria relevant for the detailed design/tender document phase
Adjustment of the evaluation model and weighting of the different criteria (economic, technical and environmental criteria)
LCA and/or LCC calculations for different technical solutions

Contractual clauses

The GPP criteria include guidance for contractual performance clauses. This is because requirements for the construction and operation of the infrastructure as such include a number of environmental aspects that will need to be included in the contract as contractual obligations. Performance clauses are understood here as setting requirements for the manner in which delivery takes place in the construction or operating activities. Together with the specification of what must be delivered, the performance clauses constitute what the constructor/operator must “do” according to the contract.

The relevant aspects of environmental performance, such as minimizing odours, waste generation, noise or local traffic, are essentially similar whether the contract concerns construction or operation. Identical types of GPP criteria can therefore apply, but the concrete performance levels would normally need to differ given the fact that there are different requirements during the construction phase as compared to during operation. Current best practices on how to design the contractual clauses for environmental performance is not a matter of using specific clauses with specific wording in the contract itself. The environmental performance requirements will, for the purpose of precision, normally be spelled out in annexes to the contract. Best practices are reflected in the FIDIC standard contracts in the Red and Silver Book standard contracts (see Section 4 in the Technical Background Report and below in “Life Cycle Cost Considerations” for explanation of these contracts). The standard contract includes in both cases a general environmental clause which refers to more concrete requirements in the Employer’s Requirements (i.e. the description and specification of the public authority's requirements in the case of the Yellow, Silver and Golden Book) or the Specifications (in the case of the Red Book).

The general environmental clause in the Yellow, Silver and Golden Book essentially includes an overall requirement for the builder/operator to take all reasonable steps to protect the environment affected by his activities on and off the site. This is then followed up by the specific obligation to ensure that emissions, surface discharges and effluent from his activities do not exceed the values indicated in the Employer's Requirements or in applicable laws. The Environmental Management Plan (EMP) will together with the performance requirements for construction and/or operation become part of the annexes to the contract and form part of the technical requirements annexed to the contract.

Specific performance levels concerning odours, noise etc. will in many cases reflect legislative requirements and therefore are fixed in advance as part of the planning of the project. Another possibility is to open up for competition to arrive at the highest levels possible. However, this should only happen if these aspects are considered to be so important for the project that they should become actual award criteria to identify the successful bid.

For the sake of transparent competition, award criteria have to be formulated in a clear way and verifiable. Thus, award criteria could include for example the percentage of reuse of waste generated during operation or the levels of concentrations of hydrogen sulphide for the purpose of optimal reduction of odours.

4.1.5 Tendering phase for construction

The tendering phase includes finalisation of tender documents and the tender process itself, ending with the tender evaluation and award of contract to the successful tenderer.

The tender documents will also include GPP selection and award criteria. The weighting of the individual GPP award criteria and scoring mechanism (evaluation model) must be clearly stated allowing the tenderer to identify and react to the demands and wishes of the procuring public authority. Furthermore, the required data related to the evaluation model calculations must be clearly specified.

The GPP criteria will not change according to the type of contact tendered, but their deployment may very well vary, as explained in 4.1.2 above. The tender may include design, construction and operation as a whole or be limited to design and operation, either together or separately.

Table 4-4 GPP related activities - tendering phase

Collection of data related to the selected GPP criteria for calculation of environmental part of the overall evaluation
Assessment and verification of technical specifications and award criteria for the tenderers/contractors
Evaluation model calculations (economic, technical and environmental criteria) possibly including LCC calculations
Award to the successful contractor with the best economic-technical-environmental offer

4.1.6 Construction phase

The European Commission is currently developing new GPP criteria for office buildings which are scheduled for publication by mid-2013[8]. They can be used in the future as regards criteria for the tendering of the administrative buildings. At present, it is not possible to give recommendations on the procurement of green building materials and construction products in the framework of the GPP criteria on waste water infrastructure projects.

During the test on completion of the construction works for the waste water infrastructure, it is of paramount importance that it is verified that the performance/GPP criteria included in the tender documents have been fulfilled by the contractors and the performance/GPP criteria are documented by test on completion before issuing the take-over certificate.

4.1.7 Operation phase

During the operation phase, there are only a few environmental aspects left to consider, since most aspects have been dealt with during the design phase. The contract to be tendered may include the operation phase, either separately or in a comprehensive project involving design and construction in various combinations.

It must be ensured that the specifications guaranteed by the contractor are fulfilled. For example, when the contractors guarantee certain treatment efficiency, it must be verified during operation of the waste water treatment plant or sludge incinerator. If the promised treatment efficiencies are not fulfilled, it can have a significant impact on the total economic and environmental performance. When the contract includes design, construction and operation, it becomes the direct interest of the contractor, from the start, to ensure, in an optimal manner, that the specifications developed during the design phase actually “work” during operation.

During the operation phase, there must also be focus on the energy consumption, water consumption and consumption of chemicals. Often, this is done via the yearly reports where the consumption is indexed in relation to m^3 treated waste water (for waste water treatment plants), ton of sludge (sludge incineration) or m^3 transported waste water (for sewage networks).

A public authority can use the GPP criteria for waste water infrastructure to verify the intended and promised performances (see the text about verification in the GPP Criteria).

Table 4-5 GPP related activities - operation phase

Test and verification of GPP criteria related to the operation phase, e.g.: • Test and verification of energy consumption for the entire plant and/or for

[8] The criteria will be published here: http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

individual equipment

- Test and verification of energy consumption in buildings
- Test and verification of waste water treatment efficiency for the selected substances
- Verification of chemical consumption
- Test and verification of flue gas treatment efficiency for the selected substances
- Verification of water consumption

4.1.8 End of life phase

During the tender phase, where the contractors have provided information about the construction materials, information about the construction materials' disposal after use, i.e. at decommissioning, should also be given. Requirements regarding choice of materials must have been incorporated during the detailed design or working design.

4.2 Core GPP criteria

The core GPP criteria are designed to tackle the key environmental impacts and are designed to be used with a limited additional verification effort and little or no cost increases.

The efficiency needed to deliver the levels of quality for the effluents defined by the EU Directive on waste water treatment, as a result of primary, secondary and tertiary treatment are incorporated in the core GPP criteria.

The use of LCC can bring about cost reductions.

4.3 Comprehensive GPP criteria

The comprehensive criteria are intended for those public authorities who wish to choose the best option/project based on environmental considerations.

Not all of the contributors to potential environmental impacts from emission of treated waste water are incorporated in the core criteria, inter alia because data collection on treatment efficiencies of pathogens and hazardous substances can be time consuming and demands the involvement of experts. Nevertheless, if these aspects contribute significantly to the total potential environmental impact from the waste water treatment plant concerned, public authorities should be encouraged to use the comprehensive criteria.

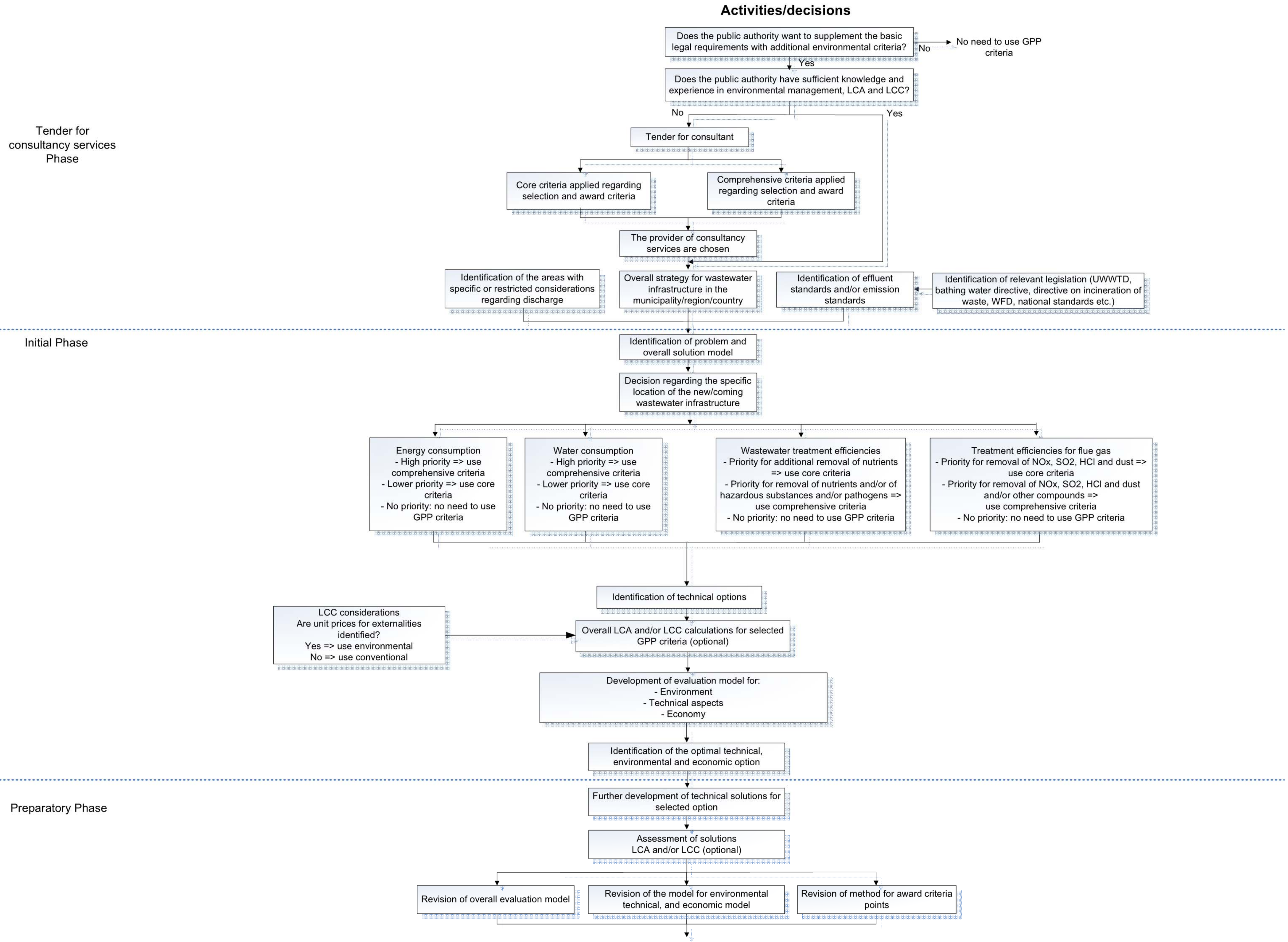
Fulfilling the comprehensive criteria will require an extra effort by the contractors. Managing and handling the information from the contractors will also require additional administrative effort and costs by the public authority. Here as well, the use of LCC can bring about cost reductions.

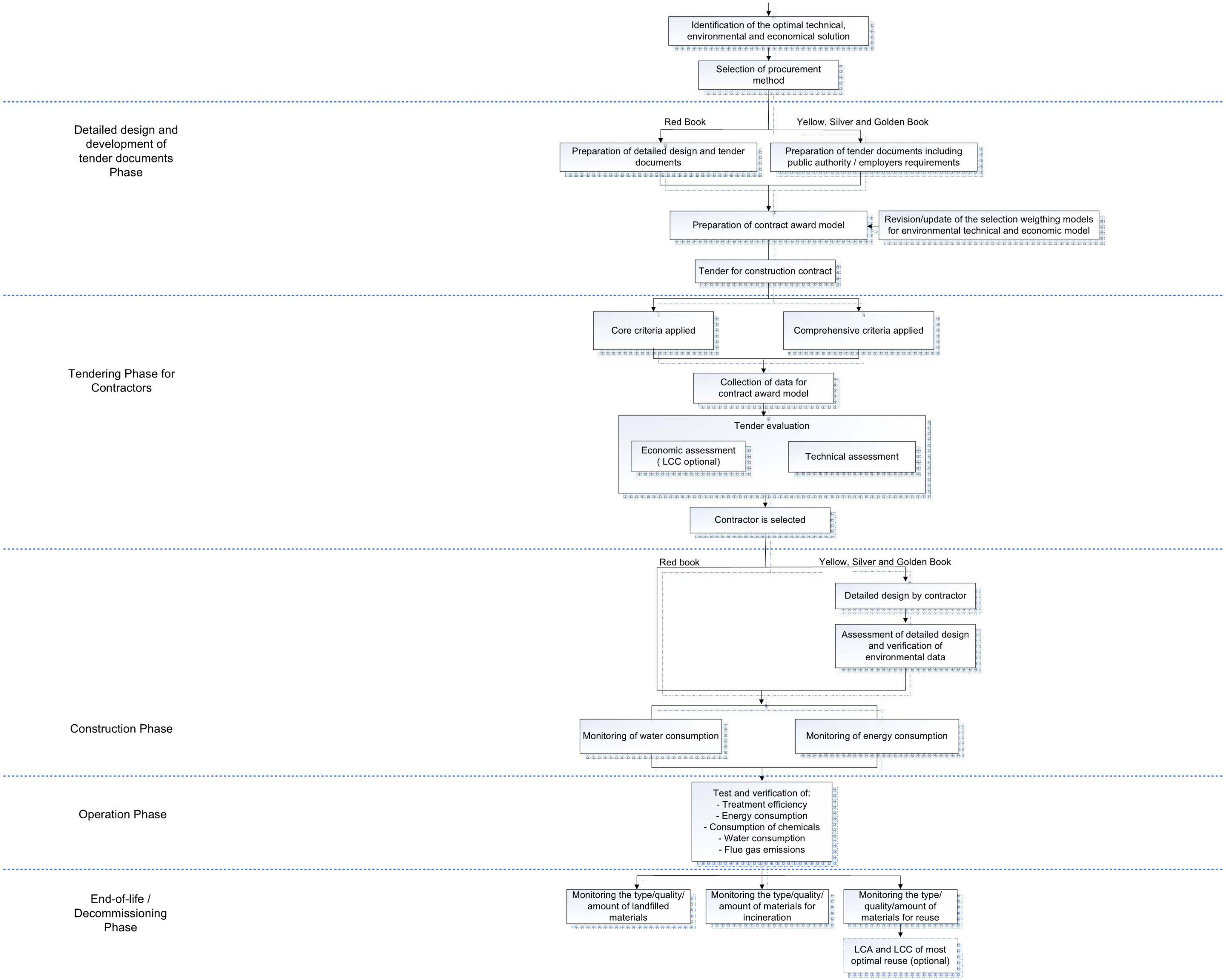
If the contracting authority decides that impacts from hazardous substances are important enough to make use of the related removal efficiencies as criteria, detailed and extensive expertise on this subject is required and might be sourced in-house or with the help of external consultants.

It must be stressed that it is not necessary for public authorities to implement all of the criteria. The whole set of possible criteria must be assessed by the public authorities to identify those relevant for the actual project in question. An example is the comprehensive requirement for pathogens which are intended for use when the public authority wants to ensure bathing water quality in the receiving stream, lake, sea etc. The public authority can also choose to include core criteria for one aspect and comprehensive criteria for other aspects.

4.4 Decision tree

The decision whether to use core or comprehensive environmental GPP criteria and whether to conduct Life Cycle Assessments and/or Life Cycle Cost analysis are illustrated in the decision tree below.


Activities/decisions
Tender for consultancy services Phase
Initial Phase
Preparatory Phase
Does the public authority want to supplement the basic legal requirements with additional environmental criteria?
No
No need to use GPP criteria
Yes
Does the public authority have sufficient knowledge and experience in environmental management, LCA and LCC?
No
Yes
Tender for consultant
Core criteria applied regarding selection and award criteria
Comprehensive criteria applied regarding selection and award criteria
The provider of consultancy services are chosen
Identification of the areas with specific or restricted considerations regarding discharge
Overall strategy for wastewater infrastructure in the municipality/region/country
Identification of effluent standards and/or emission standards
Identification of relevant legislation (UWWTD, bathing water directive, directive on incineration of waste, WFD, national standards etc.)
Identification of problem and overall solution model
Decision regarding the specific location of the new/coming wastewater infrastructure
Energy consumption
- High priority => use comprehensive criteria
- Lower priority => use core criteria
- No priority: no need to use GPP criteria
Water consumption
- High priority => use comprehensive criteria
- Lower priority => use core criteria
- No priority: no need to use GPP criteria
Wastewater treatment efficiencies
- Priority for additional removal of nutrients => use core criteria
- Priority for removal of nutrients and/or of hazardous substances and/or pathogens => use comprehensive criteria
- No priority: no need to use GPP criteria
Treatment efficiencies for flue gas
- Priority for removal of NOx, SO2, HCl and dust => use core criteria
- Priority for removal of NOx, SO2, HCl and dust and/or other compounds => use comprehensive criteria
- No priority: no need to use GPP criteria
Identification of technical options
LCC considerations
Are unit prices for externalities identified?
Yes => use environmental
No => use conventional
Overall LCA and/or LCC calculations for selected GPP criteria (optional)
Development of evaluation model for:
- Environment
- Technical aspects
- Economy
Identification of the optimal technical, environmental and economic option
Further development of technical solutions for selected option
Assessment of solutions
LCA and/or LCC (optional)
Revision of overall evaluation model
Revision of the model for environmental technical, and economic model
Revision of method for award criteria points


Identification of the optimal technical, environmental and economical solution
Selection of procurement method
Detailed design and development of tender documents Phase
Red Book
Yellow, Silver and Golden Book
Preparation of detailed design and tender documents
Preparation of tender documents including public authority / employers requirements
Preparation of contract award model
Revision/update of the selection weigthing models for environmental technical and economic model
Tender for construction contract
Tendering Phase for Contractors
Core criteria applied
Comprehensive criteria applied
Collection of data for contract award model
Tender evaluation
Economic assessment (LCC optional)
Technical assessment
Contractor is selected
Construction Phase
Red book
Yellow, Silver and Golden Book
Detailed design by contractor
Assessment of detailed design and verification of environmental data
Monitoring of water consumption
Monitoring of energy consumption
Operation Phase
Test and verification of:
- Treatment efficiency
- Energy consumption
- Consumption of chemicals
- Water consumption
- Flue gas emissions
End-of-life / Decommissioning Phase
Monitoring the type/quality/ amount of landfilled materials
Monitoring the type/quality/ amount of materials for incineration
Monitoring the type/ quality/amount of materials for reuse
LCA and LCC of most optimal reuse (optional)

4.5 Evaluation model

To evaluate complex projects, evaluation models are often prepared to determine the most feasible project proposal in respect of the given criteria. The evaluation models differ in complexity and are often developed in the initial phases of the project and further refined until the tendering phase.

An example of an evaluation model for a waste water treatment project during tender evaluation is described in this section. The evaluation model should be seen as a "best value for money" tool in addition to many other national selection models and guidance available for infrastructure projects. The evaluation model described here is an example only, and contracting authorities can utilise their own evaluation model.

The model includes economic, technical and environmental criteria with different weights, which can be used by a public authority in procuring waste water infrastructure facilities.

The final selection of the criteria and the weighting between the different items will depend on local conditions and the priorities of the contracting authority.

Furthermore, the weighting between the different items might depend on the way the project is tendered. If the project is tendered based on a detailed project prepared by the public authority, there will typically be limited possibilities to vary the offered solution and hence the weight for price will typically be relatively high (70-80%), and the weightings for technical and environmental items relatively low (for instance 10-15% for technical items and 10-15% for environmental items). If the project is tendered as a "design-build contract", there will, typically, be room for a higher variation in the proposed solutions, and technical and environmental weights are higher.

If the project is tendered as a comprehensive project involving design, construction and operation, the weighting of technical and environmental aspects will be high, and there will be additional focus on actual performance as regards energy consumption, water consumption and consumption of chemicals.

The financial assessment of the received offers may, for example, be made on the basis of life cycle cost calculations (one of the different options for determining the costs as shown in the table below). The offer with the lowest cost could for example be given 35 points as shown in the example below.

All other valid tenders would be given points proportionally to their cost in comparison with the tender with the lowest cost. The formula could then be:

Points to tender = Max. points available x (Lowest cost valid tender/Cost of tender)

If for example another tender would have costs that are 20% higher than the lowest cost tender, and the maximum points available are 35, the tender with the 20% higher costs would receive 29.2 points.

The model example below can therefore just be used as inspiration for the public contracting authority in setting up an evaluation model.

Further considerations and guidance to the possible use of LCC in connection with tendering of wastewater infrastructure are given in Section 6.

Example of Evaluation Model (WWTP project)

	Cells to be filled out by the Public Authority			
Financial assessment		**Weight:**	**Point:**	**Score (= Weight x Point x 10):**
Select *one* price calculation option:		**35%**		
1.	Construction cost (Net Present Value (NPV))		0.0 - 35.0	
2.	Construction, operation and maintenance cost (NPV)		0.0 - 35.0	
3.	Conventional LCC		0.0 - 35.0	
4.	Environmental LCC		0.0 - 35.0	
Point for the evaluated tender price may be calculated as follows:				
Points to tender = Maks. points * (L1/Lx)				
L1 = Lowest price (LCC or other)				
Lx = Price (LCC or other) for option x				
Technical assessment		**Weight:**	**Point:**	**Score (= Weight x Point x 10):**
Wastewater treatment process and technology		**15%**		**0 - 15**
	Proven technology	6%	0.0 - 10.0	0 - 6
	Reliability	4%	0.0 - 10.0	0 - 4
	Flexibility to cater for inlet quantity and quality variations	3%	0.0 - 10.0	0 - 3
	Extent and quality of process and performance guarantees	2%	0.0 - 10.0	0 - 2
Plant and Equipment		**15%**		**0 - 15**
	Quality & performance of equipment	7%	0.0 - 10.0	0 - 7
	Plant design and layout	3%	0.0 - 10.0	0 - 3
	Ease of operation and maintenance	3%	0.0 - 10.0	0 - 3
	Process control and automation	2%	0.0 - 10.0	0 - 2
Other environmental impacts		**5%**		**0 - 5**
	Environmental management plan (EMP)	2%	0.0 - 10.0	0 - 2
	Architectual design and visual impact	1%	0.0 - 10.0	0 - 1
	Odour control measures	1%	0.0 - 10.0	0 - 1
	Noise control measures	1%	0.0 - 10.0	0 - 1
Each of the above tender evaluation criteria for Technical Assessment is given points from 0-10 according to the following applicable weight point system:				
10	Excellent			
9	Very good - Substantially better than expected/described			
8	Good - Above expectation			
7	Satisfactory - Responsive			
6	Almost satisfactory			
5	Unsatisfactory - Below expected level			
3-4	Unsatisfactory - Clearly below expected level			
1-2	Non-responsive			
0-1	Unsatisfactory			
Environmental assessment		**Weight:**	**Point:**	**Score (= Weight x Point x 10):**
Wastewater treatment efficiencies		**20%**		
	Treatment efficiency of BOD		0.0 - 10.0	
	Treatment efficiency of total nitrogen		0.0 - 10.0	
	Treatment efficiency of total phosphorous		0.0 - 10.0	
	Treatment efficiency of lead and its compounds		0.0 - 10.0	
	Treatment efficiency of mercury and its compounds		0.0 - 10.0	
	Treatment efficiency of nickel and its compounds		0.0 - 10.0	
	Treatment efficiency of Di(2-ethylhexyl)phthalate (DEHP)		0.0 - 10.0	
	Treatment efficiency of naphthalene		0.0 - 10.0	
	Treatment efficiency of nonylphenols and octylphenols		0.0 - 10.0	
	Treatment efficiency of benzo(a)pyrene (to represent the Polycyclic Aromatic hydrocarbons (PAHs)		0.0 - 10.0	
	Treatment efficiency of tramadol and primidone		0.0 - 10.0	
	Treatment efficiency of pathogens		0.0 - 10.0	
Energy performance requirements		**6%**		
	Total energy consumption per m3 wastewater		0.0 - 10.0	
	Energy consumption for aeration systems (kg oxygen transferred to the water per kwh used)		0.0 - 10.0	
	Sludge dewatering equipment (kwh per tons sludge dewatered)		0.0 - 10.0	
Treatment efficiencies of flue gas treatment		**3%**		
	Treatment efficiency (energy consumption per ton sludge)		0.0 - 10.0	
	Treatment efficiency of nitrogen dioxide		0.0 - 10.0	
Others		**1%**		
	Total use of water		0.0 - 10.0	
	Consumption of precipitation chemicals		0.0 - 10.0	
The tender evaluation criteria for treatment efficiencies are given points from 0-10 according to the point system:				
10	50% under legislative level			
9	45% under legislative level			
8	40% under legislative level			
7	35% under legislative level			
6	30% under legislative level			
5	25% under legislative level			
4	20% under legislative level			
3	15% under legislative level			
2	10% under legislative level			
1	5% under legislative level			
0	Level according to legislation			
The environmental criteria regarding water consumption and consumption of precipitation chemicals are awarded points according to the same scheme:				
10	50% under this level			
9	45% under this level			
8	40% under this level			
7	35% under this level			
6	30% under this level			
5	25% under this level			
4	20% under this level			
3	15% under this level			
2	10% under this level			
1	5% under this level			
0	Level according to average level at similar wastewater infrastructure in the country/municipality/region etc.			

5 GPP Criteria

5.1 Introduction

The GPP criteria for waste water infrastructure projects are presented in the following pages, covering both sewerage systems and waste water treatment plants[9]. The Background Report describes the legal framework, EU environmental policies and modalities of public contracts for waste water infrastructure and water specific regulations with relevance for the green procurement of waste water infrastructure.

The criteria are divided into criteria for the consultancy service contract (5.2) and construction contracts covering design, construction and operation,[10] separately or together, depending on the type of contract (5.3) as indicated below:

- 5.2 GPP criteria for consultancy services (consultancy service contract)
- 5.3 GPP criteria for design, construction and operation, separately or together (construction contract)
  - 5.3.1 Energy performance requirements
  - 5.3.2 Water consumption
  - 5.3.3 Waste water treatment efficiencies
  - 5.3.4 Treatment efficiency for flue gas treatment
  - 5.3.5 Contract performance clauses.

The following GPP criteria for other product groups[11] may be relevant to include in tenders for the administrative buildings of a waste water infrastructure:

- Office buildings (to be adopted by mid-2013)
- Indoor lighting
- Heating systems (to be adopted by mid-2013)
- Sanitary tap ware (taps and showerheads)
- Office IT equipment
- Toilets and urinals
- Paints and varnishes (to be adopted in mid-2013).

[9] No separate paragraph deals with sewerage systems, but sewerage related criteria are covered under the criteria Energy performance requirements and under Water Consumption, and are also dealt with under Section 6, LCC considerations.

[10] Contract for design, construction and operation may be executed separately or combined depending of the form of contract

[11] http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

5.2 GPP criteria for consultancy services (Selection and award criteria)

GPP criteria

Introduction

The appointment of the successful tenderer/consultant for the waste water infrastructure project consists typically of a two-step approach.

Firstly, the criteria for selection of consultants (engineers, planners and architects) cover the requirements for pre-qualification, in order to be eligible to submit a proposal for the consultancy services. The criteria for pre-qualification are normally the consultants' experience with implementing similar waste water infrastructure projects in terms of size and complexity. Secondly, the successful tenderer is appointed for the contract based upon defined award criteria.

The award criteria comprise the GPP related criteria used in the tender evaluation to define the GPP related score of the consultant's tender for the requested consultancy services, plus other award criteria such as cost. The GPP related award criteria constitute only one part of the overall award criteria to appoint the successful tenderer.

Selection criteria

Ability of the tenderer

- The consultants (engineers, planners and architects) shall demonstrate that suitably qualified and experienced personnel will undertake the works/services. The consultant should describe the composition and qualifications of the team that is to undertake the services.

Depending on the specific waste water infrastructure project, qualifications and abilities can include experience and technical capacities as regards one or more of the following fields/areas:

- Planning and design of waste water infrastructure (specific items within sewer systems, waste water treatment and sludge treatment should be specified)
- Incorporation of energy-efficient process equipment
- Environmental impact assessment and environmental management including incorporation of measures to
- Reduce the total environmental impacts from discharge of waste water into the receiving water bodies
- Perform a Life Cycle Assessment (LCA) and prioritisation of environmental impacts

• Set up and calculate Life Cycle Cost (LCC).	
Verification	The tenderer shall supply a list of comparable projects recently carried out (number and time frame of projects to be specified by the contracting authority), certificates of satisfactory execution and information on the qualifications and experience of staff. Where relevant, tenderers may also submit a copy of their environmental management system, whether third-party certified (e.g. EMAS, ISO 14 001) or in-house to attest to their technical capacity.

Award criteria

GPP related criteria for awarding the consultancy service contract include:

- *Approach:* The consultant should describe how he intends to implement the project overall in order to achieve the project objectives, especially the Consultant's environmental understanding of the project, such as understanding of the environmental legal framework, local environmental conditions, environmental impact assessment, etc.
- *Methodology*: The consultant should describe the specific methods to:
  - Identify alternative solutions
  - Estimate the financial LCC of the alternatives
  - Assess the environmental impacts using an LCA approach
  - Collect data on unit costs for environmental impacts to be included in the LCC
  - Compare alternative technological options/alternatives
- *Organisation and team*: The consultant should describe the organisation, qualification and experience of the team that is to undertake the services.

The award of a consultancy contract is typically based on giving technical points for each of the qualitative criteria and weighting the technical points and the price offered. The contracting authority could also specify the budget available and award the contract to the tenderer providing the best proposal.

Indicative weightings for the qualitative criteria would be:

- Cost 25%

- Approach 15%
- Methodology 20%
- Organisation and team 30%.
- Time schedule for the work 10%

Verification	The tenderer's proposals must clearly set out their understanding of the project, the proposed methodology and the project management and organisation.

Explanatory notes

The selection and award criteria above are indicative and can be expanded/reduced according to the project context.

Normally, "standard" terms of reference for the selection of consultants include very detailed requirements of the consultant's professional experience. For instance a requirement could be: "The consultant should provide minimum 3 references of projects with similar complexity each with a project cost of at least 5 million EUR, and all projects should be executed within the last 5 years".

"Organisation and team" means how the Consultant will plan his overall organisation in relation to the organisation of the Client, and which project human resources (project team) will be provided detailing the team's professional qualification against the requirements in the tender documents, e.g. minimum years of professional experience within waste water treatment, environmental management experience, specific technical qualification, etc.

5.3 GPP criteria for construction contract (Selection and award criteria)

GPP criteria

Introduction

The appointment of the successful tenderer for the waste water infrastructure project consists typically of a two step approach.

Firstly, the companies to be invited to submit tenders for the project are normally selected through a pre-qualification procedure. GPP selection criteria for this stage relate to the experience of the contractor in implementing similar wastewater infrastructure projects in terms of size and environmental complexity. Secondly, the successful tenderer is appointed for the contract based upon defined award criteria.

The award criteria assess the quality and cost (possibly calculated on the basis of Life Cycle Costing explained elsewhere in this document) of the contractor's tender for the design/construction/ operation of the project. The below GPP related award criteria constitute only one part of the overall award criteria to appoint the successful tenderer.

The construction contracts are defined to cover:

- Construction and/or operation of waste water treatment plants, sewage systems and sludge treatment plants with reduced energy, water and chemicals consumption and, possibly, a higher level of waste water treatment than required by law; or
- Renovation and/or operation of waste water treatment plants, sewage systems and sludge treatment plants with reduced energy, water and chemicals consumption and, possibly, a higher level of waste water treatment than required by law.

Selection criteria

Experience of the contractors

Depending of the specific waste water infrastructure project, the selection criteria can include experience and technical capacities from one or more of the following fields/areas:

- Experience in construction of waste water infrastructure with focus on reduction of environmental impacts (specific items within sewer systems, waste water treatment and sludge treatment should be specified)
- Experience in operation of waste water infrastructure with focus on reduction of environmental impacts (specific items within sewer systems, waste water treatment and sludge treatment should be specified)
- Experience in environmental management of a construction site.

Verification	The above mentioned experience and technical capacity must be documented by a list of previous relevant projects of similar nature and size within the last five years. Possible means of proof of experience in environmental management of a construction site include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or international standards concerning certification based on environmental management standards. Other means of evidence provided by the company that can prove the required technical capacity will also be accepted.

Award criteria

Award criteria should assess the contractors' approach and methodology related to the environmental aspects of the project as it is demonstrated in their suggested methods to handle environmental issues during construction. Contractors should be asked to provide an environmental management plan (EMP) for the construction of the waste water infrastructure and operation of the facilities with a focus on reduction of environmental impacts.

Environmental Management Plan – Tenderers should submit a draft environmental management plan outlining their understanding of the environmental issues arising during construction and how these will be handled. At a minimum, this should address:

- The materials to be used and how this will be sourced, transported and stored on site. Special attention should be given to the handling of hazardous materials.

- Energy and water use on site
- Reduction of waste and recovery/recycling of materials

These award criteria shall be incorporated in an evaluation model where economic, technical and environmental criteria are incorporated with different weights. The weighting between the different items will depend on local conditions and the priorities of the contracting authority. An example of an evaluation model is given in Section 4.5.

Verification: The quality and comprehensiveness of the environmental management plan will be assessed, together with any supporting documentation.

Explanatory notes

Judging the experience of the construction company requires experience from the contracting authority. It may be appropriate to bring in external expertise and set up a jury that combines common knowledge to assess the experience statements of competing companies. The selection and award criteria above are indicative and can be expanded/reduced according to the project context.

5.3.1 Energy performance requirements

Core GPP criteria

Technical Specifications

The waste water infrastructure must fulfil the requirements for energy consumption and efficiency for the total energy consumption for the entire waste water treatment plant/infrastructure (see explanatory notes).

Energy consumption	The overall energy demand of the waste water facility is not higher than a defined level:[12] Unit, waste water treatment plants: kWh/p.e. or kWh/m^3 waste water treated. Unit, sewage system: kWh/m^3 transported waste water. Unit, sludge treatment plants: kWh/tonne sludge or kWh/m^3 sludge.
Energy efficient training	Before the plant goes into operation, employees involved in the operation of the plant, including those working with process equipment, must receive training from the contractor regarding the energy management of the plant or the equipment delivered (depending on the type of contract). The training must cover an explanation of the overall energy management, monitoring of energy consumption and how to improve the energy efficiency to ensure continuous minimum energy consumption for the required processes.
Verification	General considerations for verification of the energy consumption depending of the project phase are described in Section 5.5

[12] See explanatory note below for indicative values and relevant considerations to set this level.

	below. The tenderer must provide documentation and give guarantees for the annual energy consumption at the plant verified by summarising the effect (kW) multiplied by the expected average daily operation hours for each item of equipment and the motors. The verification must be based upon both factory tests for the equipment delivered and on-site tests when the equipment is installed. If operation of the plant is included in the tender the verification shall be done through installed kWh-meters for the entire plant. The sanctions for non-performance related to the guaranteed energy consumption shall be clearly described in the tender documents. The tenderer must outline the content of the training in energy management.

Award criteria

Points will be awarded for:

Lower unit energy consumption than demanded in the technical specifications, based on the overall energy demand for the entire waste water facility.

Assessment: The valid and responsive tender with the lowest proposed unit energy consumption will receive full points, with each other valid and responsive tender receiving points as follows:

Tender B Points = Maximum points available x (Unit energy consumption of tender A/Unit energy consumption of tender B)

Where tender A is the valid and responsive tender with the lowest proposed unit energy consumption.

Verification: Assessment will be based upon the technical information submitted by the tenderer to support the proposed unit energy consumption. The unit energy consumption proposed by the successful tenderer will be incorporated as a condition of the contract, with agreed testing parameters.

Comprehensive GPP criteria

Technical Specifications

The waste water infrastructure must fulfil the requirements for energy consumption and efficiency for the total energy consumption for the entire plant and for some individual treatment facilities or equipment depending on the type of tender. Additional demands for energy efficiency could be related to % of on-site production of power and heat, standards for control and monitoring of energy consuming equipment and use of localised renewable energy sources.

Energy consumption	The overall energy demand of the waste water facility is not higher than a defined level: Unit, waste water treatment plants: kWh/p.e. or kWh/m^3 waste water treated. Unit, sewage system: kWh/m^3/m head transported waste water. Unit, sludge treatment plants: kWh/tonne sludge or kWh/m^3 sludge.
Energy efficient process equipment	Establish minimum standards which the contractor must comply with for specific process equipment, for example (see explanatory notes): • Aeration systems/blowers [kg oxygen transferred to the waste water per kWh used] • Total pump efficiency [%] • Mixers [kWh per m^3 tank volume] • Sludge dewatering equipment [kWh per tonne sludge dewatered] • Sludge dryers [kWh per tonne sludge dried] • Gas utilisation equipment (boilers and generators) [kWh per m^3 gas] • Sludge incinerators [kWh per m^3 sludge incinerated].

Energy source	A minimum of [X] % of energy demand must be provided by localised renewable energy sources (l-RES). l-RES means renewable energy source generating capacity within the plant site itself (e.g. solar panels, biomass boilers, wind turbines etc.).
Energy efficient training	Before the plant goes into operation, employees working with the operation of the plant, including process equipment, must receive training from the contractor regarding the energy management of the plant or the equipment delivered (depending on the type of contract). The training must cover an explanation of the overall energy management, monitoring of energy consumption and how to improve the energy-efficiency to ensure continuous minimum energy consumption for the required processes.
Verification	General considerations for verification of the energy consumption depending on the project phase are described in Section 5.5 below. The tenderer must provide documentation and give guarantees for the annual energy consumption at the plant and for the energy consumption for specific equipment depending on the type of tender verified by summarising the effect (kW) times the expected average daily operation hours for each item of equipment and the motors. The verification must be based upon both factory tests for the equipment delivered and on-site tests when the equipment is installed. If operation of the plant is included in the tender the verification shall be done through installed kWh-meters for the entire plant and for selected large energy-consuming equipment like blowers, main pumps, sludge dewatering equipment, sludge dryers etc. The sanctions against non-performances related to the guaranteed energy consumption shall be clearly described in the tender documents. Furthermore the tenderer must outline the content of the training in energy management.

Award criteria

Points will be awarded for:

Lower unit energy consumption than demanded in the technical specifications, based on the overall energy demand for the entire waste water facility and for some selected specific process equipment (aeration systems/blowers, mixers, sludge dewatering equipment, sludge dryers, gas utilisation equipment, sludge incinerators).

Assessment: The valid and responsive tender with the lowest proposed unit energy consumption will receive full points, with each other valid and responsive tender receiving points as follows:

Tender B Points = Maximum points available x (Unit energy consumption of tender A/Unit energy consumption of tender B)

Where tender A is the valid and responsive tender with the lowest proposed unit energy consumption.

Verification: Assessment will be based upon the technical information submitted by the tenderer to support the proposed unit energy consumption. The unit energy consumption proposed by the successful tenderer will be incorporated as a condition of the contract, with agreed testing parameters.

Explanatory notes

General note	See Section 4 as regards the best phase for including each of the proposed environmental criteria, depending on the contract chosen.
Localised RES (l-RES) percentage	The appropriate minimum % of l-RES will largely depend on the climatic conditions and the experience with l-RES installation. Typically this should be between 5-20%.
Energy consumption performance indicators	Typical values for energy consumption for well-operated waste water treatment are 20-40 kWh/PE/year. The value depends, however, of many factors like type of treatment (primary/secondary/tertiary/additional), treatment technology, hereunder especially if the plant has gas utilisation with power production, size of plant, composition of incoming waste water etc. Good total energy efficiency for waste water pumps is typically 60-70%, corresponding to an energy consumption of approx.

	4.5-4 W per m^3/h per m head. For mixing of large water volumes in process tanks, digester etc. a good energy efficiency is 2-3 W per m^3 volume. For minor tanks the energy efficiency is 3-6 W per m^3 volume. Efficient energy consumption for sludge dewatering is approx. 40-60 kWh/tons dissolved solids (centrifuges). Other sludge dewatering equipment can have lower energy consumption. For sludge drying and sludge incineration, the energy consumption will be very type and equipment dependent. The choice of net, final or primary energy[13] demand will depend on the indicators used for defining energy performance provided in national legislation. When evaluating the incoming bids, contracting authorities must verify the correct use of the applicable calculation method. This might need external/internal expert input.
Examples on standards for factory tests	ISO 9906:2012 specifies hydraulic performance tests for customers' acceptance of roto-dynamic pumps (centrifugal, mixed flow and axial pumps) and also include standards for electrical power measurements. EN60034-30:2009. Rotating electrical machines - Part 30: Efficiency classes of single-speed, three-phase, cage-induction motors (IE-code)

[13] Net energy: Energy that is available to consumers for use in appliances and systems.
Final energy: Energy consumption measured at the final use level.
Primary energy: Energy consumption measured at the natural resource level/primary energy content.

5.3.2 Water consumption

Core GPP criteria

Technical Specifications

The overall drinking water consumption of the waste water facilities (excluding water consumption in office/administration buildings)[14] as specified in the tender documents is not higher than as follows:

- Waste water treatment facilities: x m^3 water used per 1000 m^3 waste water treated
- Sewerage systems - cleaning of installed pipes: x m^3 water used per 100 m installed pipes[15]

Verification	General considerations for verification of the water consumption depending of the project phase are described in Section 5.5 below. The tenderer must provide documentation and give guarantees for the annual water consumption at the plant verified by summarising the water consumption for all major water-consuming facilities. In addition water consumption for minor water consuming equipment and for cleaning shall be estimated based on experience. For renovation and installation of sewerage pipes the bidder must indicate the number of flushes and indicate the water consumption per 100 m pipe installed, and specify the expected use of e.g. grey water and rain water.

[14] For drinking water consumption in office/administration buildings (taps and showerheads, toilets and urinals), new EU GPP criteria are being developed (to be adopted in 2013).

[15] See explanatory notes below for some typical values.

	If operation of the plant is included in the tender the verification shall be done through installed water meters for the entire plant. The sanctions for non-performance related to the guaranteed energy consumption shall be clearly described in the tender documents. The sanctions for non-performance related to the guaranteed water consumption shall be clearly described in the tender documents.

Award criteria

Points will be awarded for water saving measures that go beyond the above mentioned specifications in the tender documents for core criteria.

Assessment: The valid and responsive tender with the lowest proposed unit drinking water consumption will receive full points, with each other valid and responsive tender receiving points as follows:

Tender B Points = Maximum points available x (Unit drinking water consumption of tender A/Unit drinking water consumption of tender B)

Where tender A is the valid and responsive tender with the lowest proposed unit drinking water consumption.

Verification: Tenderers should demonstrate the expected drinking water savings from any proposed measures, with reference to previous projects and/or independent technical assessments. The overall drinking water consumption proposed by the successful tenderer will be incorporated as a condition of the contract, with agreed testing parameters.

Comprehensive GPP criteria

Technical Specifications

The tenderer must fulfil the specific requirement regarding drinking water consumption saving measures, specified in the technical specifications excl. water consumption in office/administration buildings. These could be specification of maximum water consumption for example for the following treatment units:

- Cleaning of grids, membranes etc. at the waste water treatment plant (m^3 water used per 1000 m^3 waste water treated)
- Scrubber in relation to a sludge incinerator (m^3 water used per Nm^3)
- Cleaning of installed pipes (m^3 water used per 100 m installed pipes)
- For water consumption in office/administration buildings (taps and showerheads, heating systems, toilets and urinals, paints and varnishes), new EU GPP criteria is being developed (to be adopted in 2013).

Verification	General considerations for verification of the water consumption depending of the project phase are described in Section 5.5 below. The tenderer must provide documentation and give guarantees for the annual water consumption at the plant and for the water consumption for specific equipment depending on the type of tender verified by summarising the water consumption for all major water consuming facilities. In addition water consumption for minor water consuming equipment and for cleaning shall be estimated based on experience. Tenderer must provide technical data sheets for the maximum drinking water consumption used per 1000 m^3 treated waste water that verify compliance with the specifications, and specify the expected use of e.g. grey water and rain water. The tenderer must point out the installations at the wastewater treatment plant where drinking water is not used for cleaning. For renovation and installation of sewerage pipes the bidder must indicate the number of flushes and indicate the water consumption per 100 m pipe installed, and specify the expected use of e.g. grey water and rain water. If operation of the plant is included in the tender the verification shall be done through installed water meters for the entire plant.

Award criteria

Points will be awarded for drinking water savings measures that go beyond the minimum requirements specified for comprehensive criteria, and which are not addressed in the other award criteria below. Verification: Tenderers should quantify the expected drinking water savings from any proposed measures, with reference to previous projects and/or independent technical assessments. The overall drinking water consumption proposed by the successful tenderer will be incorporated as a condition of the contract, with agreed testing parameters.	
1. For the use of rainwater and grey-water use	
Tenderer must provide a proposal on how to maximise the use of rainwater and grey-water. Points will be awarded based on the proposals submitted. The proposals will be rated according to the following criteria: • Design and quality of the technology including adaptability to the building design • Estimated percentage of overall water supply/use from rainwater and grey-water sources • Maintenance costs and durability of the product (installation and maintenance costs).	
Verification	The tenderer must provide calculation and documentation for the amount of rainwater and grey-water used at the waste water facility.

2. Use of water for sewer pipe installation and rehabilitation	
The tenderer must provide a proposal of how to reduce the consumption of fresh water for the flushing of pipes before and after installation. The proposals will be rated according to the following criteria: • The number of flushes before and after installation • Estimated water consumption in percent of a water consumption of [x[16]] m^3 per meter installed pipe	
Verification	The tenderer must provide calculation and documentation for the use of water for pipe installation.

Explanatory notes

Rainwater and grey-water use – specifications or award phase	It is also possible to set minimum percentages of overall water supply from rainwater and grey-water sources. However, the potential will vary considerably according to climatic conditions.
Water consumption performance indicators	The GPP criteria for water consumption is mainly relevant for countries/regions with water scarcity and that the high price for water in some member states are in itself an incentive to reduce drinking water consumption and to use water efficient equipment. Water consumption for waste water equipment depends very much on actual technologies. Below are given typical values for some equipment. Further information can be found in different waste water handbooks. Screens. Very dependent on technologies. Some systems like micro screens use continuously backwashing. Water consumption 0-5% of throughput waste water.

[16] The public authority must insert the average or lower water consumption used for flushing pipes after installation based on experiences from other similar projects.

	Chemical scrubbers for odour control. Water consumption 2-3 l/sec per m^3 airflow/s.

5.3.3 Waste water treatment efficiencies

Core GPP criteria

Technical Specifications

The waste water treatment plant must fulfil the effluent standards specified in the Urban Waste Water Directive or the standards specified in national regulations, where these are more stringent.

Demands on effluent standards	The effluent standards in the Urban Waste Water Directive are stated in the Technical Background Report, Section 2.7.2. Standard effluent standards are: < 125 mg COD/l < 25 mg BOD/l < 35mg SS/l < 15 mg Total nitrogen/l (sensitive areas) < 2 mg Total phosphorus/l (sensitive areas) Effluent standards vary depending on the responsible water authority, and for some waste water treatment plants, there could be stricter national values for the above parameters and/or additional effluent standards for e.g. pathogens, heavy metals, organic hazardous substances etc.
Verification	General considerations for verification of the waste water treatment efficiencies are described in Section 5.5. Tenderers must provide documentation to prove that the offered technology can fulfil the required effluent standards and should be asked to sign a specific process performance guarantee.

	The fulfilment of the effluent standards shall be verified through a sampling and analysing program according to the requirements stated in the UWWTD or in national standards. The sanctions for non-performance shall be clearly described in the tender documents, along with the methodology to be used for controlling the wastewater treatment plant performance.
Demands on maximum chemical consumption	g precipitation chemicals (typically iron or aluminium salts) per m^3 treated waste water, or g precipitation chemicals per kg total phosphorus in the inlet.
Verification	The tenderer must provide verified calculations about the consumption of precipitating agent(s) per m^3 treated waste water, or kg total phosphorous in the inlet. The assumptions and results from these calculations must be identical to the input information for design of the waste water treatment plant.
Award criteria	
Points will be awarded for: Higher waste water treatment efficiency than demanded in the technical specifications. Verification: Tenderers should quantify the expected impact on treatment efficiency from any additional proposed measures, with reference to previous projects and/or independent technical assessments. The overall efficiency proposed by the successful tenderer will be incorporated as a condition of the contract, with agreed testing parameters.	
1. Improved treatment efficiency for BOD, total-nitrogen and total phosphorus	
Unit	< xx mg BOD/l < xx mg total nitrogen/l < xx mg total phosphorus/l

Verification	Tenderers must provide documentation to prove the guaranteed effluent level of BOD, total-nitrogen or total-phosphorus (mg/l). The fulfilment of the effluent levels shall be deemed to be verified through a sampling and analysing program. The volume of sampling depends on the size of the plant and shall be specified in the tender documents. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year. For BOD the maximum number of samples which fail to conform shall be stated. For total-N and total-P the annual mean of the samples shall conform to the guaranteed value. Points may be awarded in proportion to the effluent content in µg/l guaranteed (e.g. zero points for content equal to the required effluent standards and ten points for 0 mg/l).
2. Reduced use of precipitating agent(s) per kg removed phosphorous	
Unit	g precipitation chemicals (typically iron or aluminium salts) per m^3 treated waste water, or g precipitation chemicals per kg total phosphorus in the inlet.
Verification	Tenderer must calculate and document the consumption of precipitating agent(s) per kg total phosphorous in the inlet by indicating the percentage between the ratios between the traditional uses of precipitating agent(s) divided by the national legal concentration of phosphorous in the outlet from the waste water treatment plant. The tenderer must provide the documentation for the calculation of the ratio between the traditional uses of precipitating agent(s) divided by the national legal concentration of total phosphorous in the outlet from the waste water treatment plant. Points will be awarded for: Lower unit precipitation chemicals consumption than demanded in the technical specifications, based on the required phosphorus removal for the entire waste water facility. Assessment: The valid and responsive tender with the lowest proposed unit precipitation chemicals consumption will receive

	full points, with each other valid and responsive tender receiving points as follows: Tender B Points = Maximum points available x (Unit precipitation chemicals consumption of tender A/Unit precipitation chemicals consumption of tender B) Where tender A is the valid and responsive tender with the lowest proposed unit precipitation chemicals consumption.

Comprehensive GPP criteria

Technical Specifications

Same as core criteria.

Award criteria

The comprehensive criteria for the waste water treatment efficiency are - ***in addition to the core criteria (see above)*** - treatment efficiencies for heavy metals, pharmaceuticals, priority substances and pathogens (see explanatory notes).

Relevant indicator substances include the following heavy metals:

- Cadmium and its compounds
- Lead and its compounds
- Mercury and its compounds
- Nickel and its compounds.

and the following selected among the organic priority substances and pharmaceuticals:

- Di(2-ethylhexyl)phthalate (DEHP)
- Naphthalene

- Nonylphenols and octylphenols **- Benzo(a)pyrene (to represent the Polycyclic Aromatic hydrocarbons (PAHs)** - Tramadol and primidone (pharmaceuticals) The substances in **bold** are the priority hazardous substances for which an obligation to cease discharges into surface waters exist. It may therefore be relevant to focus particularly on these substances. In some cases, there are demands for the discharge of pathogens on the grounds of bathing water requests for the receiving water body. In this case, it is relevant to use the comprehensive criteria for pathogens.	
1. Improved treatment efficiency for heavy metals	
Points may be awarded in reverse proportion to the effluent content of heavy metals in µg/l guaranteed (e.g. zero points for content equal to the inlet concentration and ten points for 0 µg/l).	
Verification	Tenderers must provide documentation to prove the guaranteed effluent level of heavy metals (µg/l). The fulfilment of the effluent levels shall be verified through a sampling and analysing program. The number of samples depends on the size of the plant and shall be specified in the tender documents. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year. The maximum number of samples which fail to conform shall be stated.
Note for contracting authority	For assessment of the discharge of heavy metals, it is proposed to select the above mentioned indicator substances for which documentation of waste water treatment plant performance could be required.
2. Improved treatment efficiency for organic priority substances	
Points may be awarded in reverse proportion to the effluent content of organic priority substances (di(2-ethylhexyl)phthalate (DEHP), naphthalene, nonylphenols and octylphenols or Polycyclic Aromatic hydrocarbons (PAHs) in µg/l guaranteed (e.g. zero points for content equal to the inlet concentration and ten points for 0 µg/l.).	

Verification	Tenderers must provide documentation to prove the guaranteed effluent level of organic priority substances (di(2-ethylhexyl)phthalate (DEHP), naphthalene, nonylphenols and octylphenols or Polycyclic Aromatic hydrocarbons (PAHs) in (µg/l). The fulfilment of the effluent levels shall be deemed to be verified through a sampling and analysing program. The number of samples depends on the size of the plant and shall be specified in the tender documents. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year. The maximum number of samples which may fail to conform shall be stated.
Note for contracting authority	For assessment of the discharge of hazardous organic priority substances, it is proposed to select the above mentioned indicator substances for which documentation of waste water treatment plant performance could be required.
3. Improved treatment efficiency for pharmaceuticals (tramadol and primidone)	
Points may be awarded in reverse proportion to the effluent content of tramadol and primidone in µg/l guaranteed (e.g. zero points for content equal to the inlet concentration and ten points for 0 µg/l).	
Verification	Tenderers must provide documentation to prove the guaranteed effluent level of tramadol and primidone (µg/l). The fulfilment of the effluent levels shall be verified through a sampling and analysing program. The number of samples depends on the size of the plant and shall be specified in the tender documents. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year. The maximum number of samples which fail to conform shall be stated.
Note for contracting authority	Tramadol and primidone are used as indicator substances for discharge of pharmaceuticals.
4. Improved treatment efficiency for pathogens	

Tenderers must provide documentation to prove the guaranteed effluent level of E.coli and enterococci pathogens (nos/100 ml). Points may be awarded in proportion to the effluent content in nos/100 ml guaranteed (e.g. zero points for content equal to the required effluent standards and ten points for 0 nos/100 ml.).	
Verification	The fulfilment of the effluent levels shall be verified through a sampling and analysing program. The number of samples depends on the size of the plant and shall be specified in the tender documents. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year. The maximum number of samples which fail to conform shall be stated.
Note for contracting authority	E.coli and enterococci are used as indicator substances for discharge of faecal contamination.
Explanatory notes	
Priority substances in WFD	In principle, all the current 33 and the proposed 15 new priority substances in WFD can occur in urban waste water. However, in reality many of them will rarely be detectable or at least only be present at very low levels, because of their origin or their properties and, hence, for such substances, it will not be relevant to establish requirements for performance of WWTPs in relation to lowering their concentrations in the effluent. In consideration of the context and objectives of the GPP criteria, only a few indicators from the list of relevant hazardous substances have been included here, for which documentation of WWTP performance could be required. Volatile substances are omitted because typically, they will be removed from the water phase by stripping during the treatment processes or shortly after discharge, and also substances posing special analytical challenges (e.g. brominated flame retardants) are left out.
Definition of the quality of waste water	It is important to mention that precise definition of the quality of waste water at the inlet is very important and should be clearly defined in the tender documents, which must also clearly describe the standard to which each of the criteria should be

	analysed.
Note for contracting authority	It is recommended to encourage the recovery of rare resources in compliance with national regulations. Options for recovery of rare resources should be included in the LCC/selection modelling in order to assess the "best value for money". For example, recovery of phosphate can be costly and in some cases difficult to sell at present. Phosphate can be recovered e.g. by settling as struvite ($MgNH_4PO_4$, also known as magnesium-ammonium-phosphate) or settling as calcium phosphate. Most of the recovery methods have some disadvantages, e.g. *struvite* is frequently contaminated, particularly with metals and medicines and the method is also relatively costly, and settling as calcium phosphate can produce a raw material to be used in a phosphor factory, but it is also relatively costly and is only partly recovered according to experience from the Netherlands[17]. Similar experience is found in Denmark and at other treatment plants in Europe.

[17] http://www.phosphaterecovery.com/recovery/recovery-at-sewage-treatment-plants/settlement-as-calcium-phosphate/89

5.3.4 Treatment efficiency of flue gas treatment

Core GPP criteria

Technical Specifications

The sludge incineration plant must comply with the Directive on Incineration of Waste (2000/76/EC) and the BREF document for Waste Incineration from August 2006

Emission standards	*[The emission standards in the Directive on Incineration of Waste are stated in the Technical Background Report, Section 9.2.6.]* Typical emission standards (24 hour average) are: < 40 mg SO_2/ Nm^3 < 100 mg NO_X/ Nm^3 < 8 mg HCl/ Nm^3 < 5 mg dust/Nm^3 For some incineration plants, stricter national values may apply for the above parameters and/or additional emission standards for e.g. mercury, PAHs, cadmium, zinc etc.
Verification	General considerations for verification of the flue gas treatment efficiencies are described in Section 5.5. Verification of the fulfilment of the guaranteed emissions standards shall be done according to the requirements specified in the directive on incineration of waste (2000/76/EC) or according to national standards. The sanctions for non-performance shall be clearly described in the tender documents, and also the methodology to be used

	for controlling the flue gas treatment performance.

Award criteria

Points may be awarded in reverse proportion to the emission content of SO_2, NO_X, HCl and dust (mg/Nm^3) guaranteed in mg/Nm^3 (e.g. zero points for content equal to the required emissions standards and ten points for 0 mg/Nm^3).

Verification	Tenderers must provide documentation to prove the guaranteed emissions standards of SO_2, NO_X, HCl and dust (mg/Nm^3). The fulfilment of the emission levels shall be deemed to be verified through a sampling and analysing program. The number of samples depends on the size of the plant and shall be specified in the tender documents Both average daily and half-hourly emission limits shall be fulfilled for SO_2, NO_X, HCl and dust.

Comprehensive GPP criteria

Technical Specifications

Same as core criteria.

Award criteria

The comprehensive criteria for the treatment efficiency of the flue gas filter are - *in addition to the core criteria (see above)* - treatment efficiencies for more substances e.g. mercury etc.

Example: The concentration of mercury and its compounds (as Hg) must not be higher than 0.05 mg/Nm^3 measured by a non-continuous sample.

The specification for the treatment efficiency of the flue gas filter must incorporate the following compounds:

• Mercury • PAHs • Total cadmium and thallium (and their components expressed as the metals) • Zinc Points may be awarded in reverse proportion to the emission content of mercury, PAHs, total cadmium, thallium and zinc guaranteed in mg/Nm^3 (e.g. zero points for content equal to the required emissions standards and ten points for 0 mg/Nm^3).	
Verification	Tenderers must provide documentation to prove the guaranteed emissions standards of mercury, PAHs, total cadmium, thallium and zinc (mg/Nm^3). The fulfilment of the emission levels shall be deemed to be verified through a sampling and analysing program. The volume of sampling depends on the size of the plant and shall be specified in the tender documents The emission limits for heavy metals shall be fulfilled over a sampling period of minimum 30 minutes and maximum 8 hours.

5.3.5 Contract performance clauses

Core GPP criteria

The general environmental clause is as it is explained in Section 4.1.4 often of a general nature and supplemented with detailed requirements in the Environmental Management Plan (EMP). The essential elements of the EMP are typically as follows:

- The identified environmental impacts and targets, which may differ according to circumstances, but which would be defined in EIA's or other planning documentation for the project. Impacts/targets that would be recurring in most projects concerning construction or operation would be water and energy use, use of renewable/reused materials, materials recycled/recovered, impact on flora or fauna, impact on local traffic and noise/odour emissions.
- The key performance indicators defined for measuring the impacts. On this point there are various methodologies available and illustrative examples are provided in the table below.
- The concrete performance levels required for addressing these various impacts.

The contract should allow for regular updating to take account of needs for higher performance levels or even new types of environmental impacts. This would, as regards operating contracts, in any case be a natural consequence of any required environmental management plan with progressively higher targets for the private operator.

The key performance indicators and performance levels regarding for example water and energy use can be relatively straightforward to establish. Essentially, it would be a matter of setting a certain level of consumption expressed in quantitative terms (for example kWh when it comes to energy). The following table shows types of performance indicators relevant for both the construction and operation phase, and levels that should be used for impacts that are less obvious:

Type of impact	Key Performance Indicators	Performance Levels
Odour	The plant shall not cause troublesome odour problems inside or outside the plant.	The concentration of hydrogen sulphide (H_2S) shall be less than xx ppb at the boundary of the site and xx ppb within the site.

Noise	Maximum acceptable noise level.	Daytime (08 to 20 hrs) max xx dB(A) Night time (20 to 08 hrs) max xx dB(A)
Local traffic	Percentage change in road traffic to and from the site during rush hours over a certain period.	A certain maximum percentage in traffic increase.

Other areas, such as waste management, include more scope for using different performance indicators. An EMP could in this respect include for example the following:

- An overall indicator of x tonnes of waste generated annually during operation or per €100k construction value coupled with an indicator for reducing waste generation by x % over a certain amount of years.
- A maximum of x tonnes of waste sent to landfill and a minimum of x tonnes of waste being reused or recycled.
- A minimum of x % of materials used during construction/operation derived from reused or recycled material.

Verification	The verification of contract performance clauses can for obvious reasons not be covered at the tendering phase, but only in the course of the actual execution of the contract. The means for verification would be the monitoring/reporting routines established in the contract and other contractual measures for performance control. They should be applied to ensure that measurement according to the KPIs is correct, and that the performance is in accordance with the various impact levels established in the EMP.

Comprehensive GPP criteria

The performance clauses should focus on the same environmental impacts as the core clauses but set at higher levels. In addition the possibility for adjusting the criteria over the duration of the project may be included. This would be relevant especially in projects of a longer duration. Thus, for example the maximum percentage of waste going to land fill generated during operation could be set at a high level from the outset and/or made subject to periodic upwards adjustments depending on for example development in waste regulation or increased availability of waste management facilities within the region in question.

Verification	Monitoring /reporting routines according to the general performance control procedures of the contract should be applied to

	ensure that measurement according to the KPIs is correct and that the performance is in accordance with the various impact levels established in the EMP.

Explanatory notes

When it comes to the specific contract clauses on environmental performance there are many options. There are in practice examples of specific clauses concerning design life, water and energy use and odour discharges. However, to ensure effective and comprehensive coverage of all aspects of environmental impacts identified, the approach of a general clause coupled with an environmental management plan as outlined above, is increasingly being used. This approach will facilitate any adjustments of the performance requirements over time.

To back up monitoring and reporting contractual obligations, it is crucial to establish contractual sanctions that can be triggered even in minor cases of infringement by the builder/operator of these obligations, including those relating to environmental performance. The traditional sanctions regarding compensation and termination have little effect in long-term contracts. Compensation normally requires proof of neglect and will normally involve a costly judicial procedure. It would only be relevant in case of significant infringements and would typically signify a rupture of the co-operation between the parties. Termination is equally a sanction that would only be relevant in case of significant infringements. None of these sanctions are adequate to address the minor deviations from established performance levels that may occur. It has therefore become normal in WWTP contracts to set up a system of smaller fines, also known as liquidated damages.

The fines are often linked to a system of minus-points, whereby a certain amount of performance failures concerning for example excessive energy use over a certain period triggers a certain number of minus-points. If such minus–points reach a certain level over a period, for example annually, then fines or reduction in payments are applied. Such a system can be built around any performance indicator of the contract to be “activated” in case of any shortcoming. A system of graduated sanctions is a logical complement to verifiable performance criteria and monitoring/control procedures.

Contract clauses concerning environmental protection include, in addition to specific performance clauses, also clauses of a more general nature for the purpose of safeguarding environmental concerns. One example is a step-in right for the public party allowing it to unilaterally arrange for remedial action to be paid for by the private party in case of immediate and serious danger to the environment. Another general provision requires the private party to indemnify the public party for any liability in case of breach of environmental legislation. Furthermore, there could, as regards investment obligations, be clauses to cover needs for reinvestments arising out of new environmental requirements rather than just wear and tear. As regards environmental liability, there could be contractual terms requiring compulsory insurance for the private party to cover any environmental liability.

5.4 Verification of GPP criteria

The specific verification method for each of the individual GPP criteria is described in the sections above. In this section more general consideration is given to verification of the GPP criteria.

Verification of energy consumption

Methods for verification of the energy consumption vary depending on the project stage.

In the initial phase the calculation of the energy consumption will typically be based on benchmark figures from other similar plants expressed in annual kWh consumption per person equivalence (PE) or per m^3 pumped or treated. For new innovative technologies, where similar plants are not available, it could be necessary to use figures from pilot tests or other kind of tests.

In the preliminary design phase, where the main process equipment is defined, calculations can be made based on benchmark figures and experience for the energy consumption defined from calculation of air supply needed for aeration, m^3 wastewater pumped and pumping head, tonnes of sludge dewatered, etc. In addition to the energy consumption from the main process equipment, which typically counts for between 80-90% of the total energy consumption, a miscellaneous energy consumption of 10-20% should be included covering minor equipment, lightning, IT equipment etc. The calculation will typically be expressed in annual kWh consumption.

In the detailed design phase and tender stage where the precise equipment is specified and known, the calculation of the energy consumption can be verified by summarising the effect (kW) times the expected average daily operation hours for each item of equipment and motors.

In order to compare the different solutions and offers it is very important that the contracting authority specify in the tender documents the exact conditions for the calculation of the energy consumption made by the tenderer, i.e. at which flows, pollution loads, temperature, etc. the calculations shall be done. There are no established standard in this field, but a widely used method is to measure the annual energy consumption based on average design flows (m^3/day) and average design pollution loads (kg COD/day, kg SS/kg Total-N/day, kg Total-P, etc.), but if there is high seasonal variations in the hydraulic flow, pollution loads or temperature it can be relevant to make calculations of energy consumption on an monthly basis and hence summaries over the year.

In the operation phase it is possible to measure the energy consumption by installation of kWh-meters for the entire plant and for selected large energy consuming equipment like blowers, main pumps, sludge dewatering equipment, sludge dryers etc. The energy consumption should typically be measured continuously, noted for each day and summarised over a year for comparison with the agreed and guaranteed consumption. The sanctions for non-performance related to the guaranteed energy consumption shall be clearly described in the tender documents.

Verification of water consumption

Methods for verification of the water consumption depend as for the energy consumption of the project stage.

In the initial and preliminary design phase calculation of the water consumption will typically be based on benchmark figures from other similar plants expressed in m^3 water used per 1000 m^3 wastewater treated, m^3 water used per 100 m pipeline installed etc.

In the detailed design phase and tender stage where the precise equipment is specified and known the calculation of the water consumption can be verified by summarising the water consumption for all major water consuming facilities, like screens, sludge dewatering equipment, wet scrubbers etc. In addition water consumption for minor water consuming equipment and for cleaning can be estimated based on experience. In order to compare the different solutions and offers it is very important that the contracting authority specify in the tender documents the exact conditions for the calculation of the water consumption made by the tenderer. As for energy consumption (see above) there are no established standard for determine the water consumption, but the most commonly used method is to measure water consumption based on average design flows (m^3/day)

In the operation phase it is possible to measure the water consumption by installation of water meters for the entire plant and for selected large water consuming equipment. The water consumption shall typically be measured continuously, noted for each day and summarised over a year for comparison with the agreed and guaranteed consumption. The sanctions against non-performances related to the guaranteed water consumption shall be clearly described in the tender documents.

Verification of waste water treatment efficiencies

Tenderers must provide documentation to prove that the offered technology can fulfil the required effluent standards and may be asked to sign a specific process performance guarantee.

Precise definition of the quality and quantity of waste water expected at the inlet is very important and should be clearly defined in the tender documents as part of the design basis.

The tender documents must describe clearly the standard to which each of the GPP criteria should be analysed. The concentration of substances concerned in the effluent and/or the percentage of removal for these substances will need to be considered.

The fulfilment of the effluent standards shall be deemed to be verified through a sampling and analysing program according to the requirements stated in the UWWTD or in national standards.

In the UWWTD the minimum number of samples depending on the size of the WWTP is stated. Sampling should be flow-proportional 24-hour samples collected at regular intervals during the year.

For BOD and all parameters stated in the comprehensive criteria the maximum number of samples which fail to conform shall be stated. For total-N and total-P the annual mean of the samples shall conform to the guaranteed value.

The sanctions for non-performance shall be clearly described in the tender documents, and also which methodology will be used for controlling the wastewater treatment plant performance.

The tenderer must provide verified calculations about the consumption of precipitating agent(s) per kg phosphorous in the inlet. The assumptions and results from these calculations must be identical to the input information for design of the wastewater treatment plant.

Verification of emissions from flue gas

Tenderers must provide documentation demonstrating that the offered technology can fulfil the required emissions standards.

Verification of the fulfilment of the guaranteed emissions standards shall be done according to the requirements specified in the directive on incineration of waste (2000/76/EC) or according to national standards.

All emission limit values shall be calculated at a temperature of 273,15K and a pressure of 101,3kPa after correcting for the water vapour content of the waste gases.

According to the directive both average daily and half-hourly emission limits shall be fulfilled for SO_2, NO_X, HCl and dust whereas the emission limits for heavy metals shall be fulfilled over a sampling period of minimum 30 minutes and maximum 8 hours.

The sanctions for non- performance shall be clearly described in the tender documents.

6 LCC considerations

This section describes the LCC concept and provides guidance on how to apply the LCC concept. There are mainly two ways of using LCC linked with waste water infrastructure projects: firstly, in the planning and feasibility stage, and secondly at tendering stage.

What is important to consider is that:

- There are some challenges in applying LCC regarding the verification of the data to be used. This requires consideration before applying the concept.
- LCC is very useful in the planning and feasibility phase as part of selecting the best overall solution and technology.
- If LCC is used at tendering stage, there could be the risk of double counting if certain elements are included as a GPP criterion and also in the LCC calculation. This can be avoided by ensuring any monetised externalities are additional to the minimum requirements set out in the technical specifications, and are not addressed by any other award criterion.

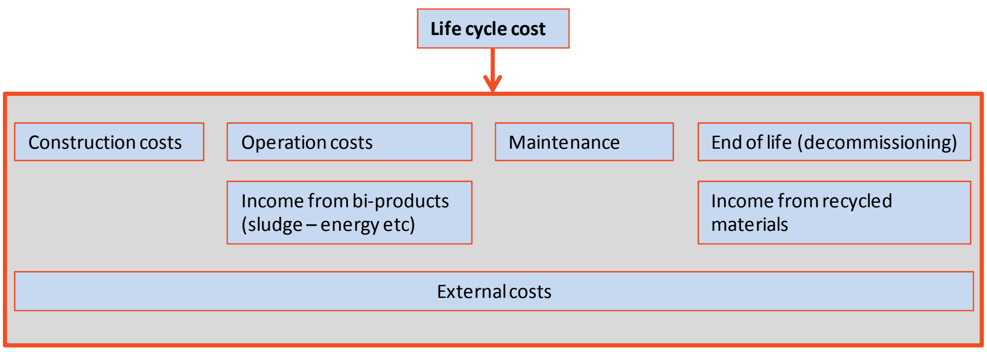
6.1 LCC concepts

Life-cycle cost analysis (LCC) is an approach to assessing all relevant costs over the lifetime of a project (see Figure 6-1). There are different definitions of LCC, and there are also other concepts of cost assessments that are closely linked to LCC. For example, total cost of ownership (TCO) and cost-benefit analysis (CBA) are assessment concepts that cover many of the same aspects as LCC.

We will use the following definition of LCC in this guidance:

- The conventional LCC techniques most widely used by companies and/or governments are based on a purely financial valuation. Four main cost categories are assessed: investment, operation, maintenance and end-of-life disposal expenses, less any relevant income.
- The environmental LCC methodology takes into account the above four main cost categories **plus external environmental costs**.

Figure 6-1 Elements covered by life cycle costs (LCC)

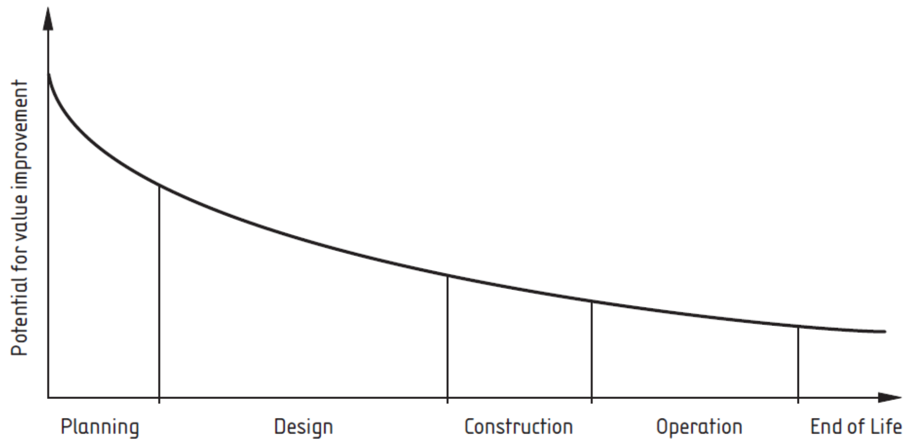


6.2 The benefit of using LCC

Life-cycle costing of waste water infrastructure can be a good means of minimizing environmental impacts through GPP while keeping costs low. Estimations of life-cycle costs suggest that often the total operational costs exceed the initial investment costs. Hence, it is important to compare a more expensive investment with lower operational costs or a longer life time against an alternative with lower initial investment costs but higher operational costs.

The value of undertaking LCC at different phases of the project cycle is shown below. Figure 6-2 shows that, at the investment planning phase, where more options are available, there is high potential for value improvement. Further down the project cycle, there is less freedom to choose and hence less improvement potential.

Figure 6-2 Value improvement potential from LCC at different project cycle phases



Source: ISO/DIS 15686-5.2 Part 5: Life cycle costing

The fact that the potential benefit is largest in the initial phases does not mean that the use of LCC should be restricted to those phases. LCC can be more simple and easy to apply in the later phases, so the costs of undertaking the LCC also decreases from the planning phase to operation phase. For more details see the Technical Background Report.

6.3 LCC process

General considerations

LCC considerations can be included in all types of contracts for waste water infrastructure, equipment or for consulting services. As said before, linked with waste water infrastructure projects, it is possible to:

- Use LCC in the initial phase to consider relevant solutions including alternative technologies; and
- Use LCC in the tendering phase for works

If LCC is used in the initial phases to assess alternative technologies and solutions, it is typically prepared by a consultant (external or internal technical/financial adviser) when doing the feasibility study. This consultant should have the necessary expertise to collect the relevant data and undertake the LCC (see section 5.3 procurement of consultancy services).

If LCC is used in tendering for works or equipment, a detailed LCC calculation model should be developed by the contracting authority or by the consultant hired for the tender preparation phase. The LCC model should be easy to follow for the contractors bidding for the construction work. Whether the tendering is based on the FIDIC Red, Yellow or Silver Book or Golden Book the tenderers should prepare input to the LCC calculation based on specific calculation principles that are developed by those preparing the tender documents. The actual completion of the LCC calculations will be done by the contracting authority in the tender evaluation phase based on the input provided by the tenderers. This approach insures that the bids are comparable with regard to the estimated LCC.

Specific considerations

In this document, indications are given on how an LCC could be done, either by only including the financial life-cycle costs of a project (conventional approach), while the environmental approach also incorporates external costs. The latter must be monetised for inclusion in the calculation. In the case of waste water infrastructure, these potential external costs could be the emission of nutrients, hazardous materials, the emission of GHGs, traffic disruptions from construction etc.

Table 6-1 Conventional and environmental LCC approach

Level of approach	**Included cost elements in the LCC**
Conventional LCC approach (financial LCC)	Investment costs + operational costs + maintenance costs + decommissioning costs
Environmental LCC approach (including environmental and other external costs)	Investment costs + operational costs +maintenance costs + decommissioning costs + external costs

The decision whether to conduct a purely financial LCC or to include the external costs has to be taken on a case-by-case basis depending on the exact nature of the project, the willingness to tackle environmental externalities and on the availability of data on potential external costs (see decision tree in Section 4.4).

Table 6-2 LCC elements by type of waste water infrastructure

Type of facility	Main alternatives to consider in LCC	Life cycle	External effects	Other considerations
Collection system	Use of different materials, dig or no-dig technology	Construction phase important Operational costs are typically low - life time of collection system is important	Embedded energy in materials Traffic disruptions during construction phase	
Waste water treatment systems	Alternative treatment technologies Level of treatment	Construction and operational phases are important	Embedded energy in materials Discharges of pollutants could be important and should be considered. This includes the following: - CO_2 emissions; - Emission of nutrients; - Hazardous substances; - Air pollutants - Traffic disruptions	Cost of land acquisition/use could be important Decommissioning could be relevant
Sludge treatment	Alternative treatment technologies	Construction and operational phases are important	Embedded energy in materials Energy consumption/ production in operational phase	Cost of land acquisition/use could be important Income from sludge treatment/disposal should be included

The important elements of the LCC as part of GPP of waste water infrastructure compared to traditional cost analysis in procurement are:

- Inclusion of the operation phase where life time of the infrastructure and its components is important; and
- Inclusion of the environmental impacts, where the challenging element is to define the prices on the specific environmental impacts.
- Though the consideration of the operational costs is not specific to the use of GPP, it is often important from an environmental perspective. Lower operational costs are often linked with less environmental impacts (e.g. lower energy consumption), so undertaking a financial LCC and selecting a solution/technology with the lowest LCC would often also be a solution with fewer environmental impacts than just the solution with the lowest initial investment costs.

6.4 Guidance on the LCC elements

The following sub-sections offer more practical guidance on how to assess the LCC elements. A section on the financial costs is followed by guidance on the assessment of the external costs.

This section is aimed at the consultant/technical adviser who is preparing material for the tendering for works and equipment. In the initial phases all the estimates will be provided by the consultant/technical adviser doing feasibility studies etc and also for the initial phases the guidance on how to assess each LCC element will be relevant.

6.4.1 Assessment of the financial LCC costs

The core LCC assessment is suggested to include the following LCC elements:

Life cycle stage	**Description of financial costs**
Construction	Land acquisition Materials Equipment Civil works
Operation	Consumables (e.g. chemicals) Spare parts Energy Fees for disposal of sludge Staff costs (salary rates provided)
Decommissioning	Due to the special nature of WWTP infrastructure, the decommissioning cost is likely to be irrelevant to include in core criteria. The material input in WWTP infrastructure is typically not easy to recover and recycle and hence has no high decommissioning value. Depending on the individual case, it might, however, be advisable to include decommissioning costs in the life cycle cost analysis.
Total LCC	Total financial costs of construction elements, operation and equipment based on life time and discount rate provided.

Providing an estimate of the construction costs is a standard procurement element.

The operational and maintenance elements that the tenderers can provide estimates for relate to:

- Consumables (e.g. chemicals)
- Energy
- Spare parts
- Man power (optional).

The tenderer should provide the following information:

Components	Name/description	Quantity	Price quote
Consumables	e.g. type of chemicals	e.g. kg per year	e.g. price quotes from the suppliers of the consumables
Energy	e.g. electricity	e.g. No of kWh per year	Procurer will have to specify price
Spare parts	e.g. replacement of pump	e.g. no of pumps of type xx every 10 year	e.g. suppliers price quote
Man power	Monitoring of operation	e.g. 1000 hours per year	Procurer will have to specify price

Operational cost is less of a standard element, and it can be difficult to provide a reliable estimate. If the project is a renovation or upgrading of existing facilities, the specific need for man power cannot be estimated by the tenderers. The procurer should decide whether to exclude man power requirement or whether specific operational functions related to the construction elements can be defined, and if that is the case, then the tenderer provides an estimate of the number of hours for those functions.

Lifetime of material and equipment could be based on the following assumptions which are expert estimates as there are no data sources for life times. Please note, that products with different durability might have quite different lifetimes and this list hence only provides rough estimates. Furthermore, if the lifetimes of specific types of equipment vary significantly, then the equipment category might be divided into individual elements and components.

Equipment category	Approximate lifetime in years
Pipes	60
Buildings, tanks	40
Equipment (e.g. pumps, mixers, blowers etc.	15

The tenderers could be asked to specify the lifetime of individual components of the infrastructure and provide the basis for their estimated lifetimes. During the tender evaluation, sensitivity analysis should be undertaken to test if the ranking of alternative bids based on the LCC depends on the lifetime estimates provided by the tenderers. If the ranking is sensitive to the tenderer's estimates of lifetimes, the procurer could ask for additional information to support the estimated lifetimes.

Discount rate: 5% (this is the rate recommended by the European Commission for the programming period 2007-2013 in the Guide to Cost Benefit Analysis of Investment Projects). However, depending on specific macroeconomic conditions, the sector and the nature of the investor (e.g. PPP projects) a different discount rate might be applicable.

6.4.2 Estimation and monetisation of external elements of the LCC

The comprehensive LCC approach should include the following external cost elements as described in the table below. These would be included in the calculation in addition to the financial costs outlined above.

Table 6-3 External cost elements in LCC

Life cycle	Cost element	Description
Construction	External	External costs of disruption during construction, e.g. traffic disruption (if relevant) CO_2 embedded in construction materials
Operation	External	Emission of organic water pollutants (BOD) Emission of nutrients (nitrogen and phosphorus) Emission of priority hazardous substances Emission of hazardous substances in flue gas Emission of CO_2
Decommissioning	External	The material input in WWTP infrastructure is typically not easy to recover and recycle and hence has no high decommissioning value. Depending on the individual case, it might, however, be advisable to include decommissioning costs in the life cycle cost analysis.

The estimations of external environmental costs are presented in Table 6-4.

Table 6-4 Estimation of external effects - approach and data sources

Externality	Estimation approach	Data sources
CO_2 emissions	Cost of alternative reduction (based on EU GHG reduction scenarios or national marginal costs for achieving national reduction target)	The regulation on Energy Performance of Buildings includes recommended values (REGULATION (EU) No 244/2012). National assessments of marginal reduction costs could also be consulted and national Ministries of Energy or Environment would typically be the relevant source.
BOD and emission of nutrients (N and P)	Cost of alternative reduction	River Basin Management Plans and the associated Programme of Measures.
Hazardous substances	Cost of alternative reduction/removal	Require specific assessment of local costs.
Air pollutants	Cost of alternative reduction	CBA of EU air quality and air emission legislation include costs per kg of pollutant for each Member State.
Traffic disruptions	Damage costs	Specific local assessment unit value of travel time from national transport planning institutions.

For the calculation of the external costs the following information could be used:

Traffic disruptions

External costs from traffic disruptions due to waste water infrastructure works should be estimated using the value of travel time savings (VTTS) methodology. The value of travel time savings describes the opportunity cost of the time that travellers spend on their journey. Delays in travel times due to waste water works will cause external costs proportional to the VTTS. The VTTS is measured in Euros per person-hour or per vehicle-hour, and VTTS values for different Member States are dependent on a number of factors, wage levels being one of them. The national Ministry of Transport could be consulted regarding estimates for VTTS as well as the Harmonized European Approaches for

Transport Costing and Project Assessment (HEATCO). To calculate the external costs caused by traffic disruptions to estimate the VTTS, input data is needed for the average additional travel time due to the construction works, the number of disruption days and the volume of traffic.

GHG emissions

External costs from emission of CO_2 and other greenhouse gases can be calculated using a unit price/cost per CO_2-equivalent. It is recommended to apply the same approach as required for Energy Performance of Buildings (EPBD) according to REGULATION (EU) No 244/2012. Here the CO_2 -equivalent cost is based on the long term ETS scenarios. The reference scenario includes the following minimum values:

Carbon price evolution	2020	2025	2030	2035	2040	2045	2050
Reference (frag. action, ref. fossil f. prices)	16,5	20	36	50	52	51	50
Effect. Techn. (glob. action, low fossil f. prices)	25	38	60	64	78	115	190
Effect. Techn. (frag. action, ref. fossil f. prices)	25	34	51	53	64	92	147

Source: Annex 7.10 to http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2011:0288:FIN:EN:PDF

The lowest scenario specifies a value of EUR 20 /tonne CO2-equivalent until 2025, EUR 36/tonne up to 2030 and EUR 50 /tonne beyond 2030. For the EPBD calculations, it is not possible to use values lower than the one from this scenario. If national agreed prices for CO_2 equivalents are higher than the above they should be used instead of the above values. Member States may have estimated the marginal cost of achieving the national target for reduction of GHG emissions as being higher.[18]

Values based on EU scenarios or national reduction costs could be revised as the new reduction targets are agreed or policies are updated. Hence, it is recommended to consult with the national authority responsible for meeting national GHG reduction targets for updated values at the time the LCC calculation is being made.

Emissions of BOD and nutrients

For the calculation of the external costs of BOD, nitrate and phosphorus emissions the following table can be used. The values for outlet concentrations are provided by the bidding contractor and can be used for calculation of the discharge amount per year. The marginal cost for alternative reduction should be based on data from a RBMP or similar, where cost-effectiveness assessments of BOD and

[18] As an example: The UK Department of Energy & Climate Change recommends an approach based on the abatement costs needed to meet the UK's emissions reduction targets. It calculates estimates of abatement costs that will be needed to reach the emission limits that each country has agreed to meet. Based on this approach, the estimated costs for the UK lie between 30 and 75 Euros per tonne of CO_2 in 2020.

nutrient removal have been made. The costs are the marginal reduction costs at the level of BOD and nutrients removal, where the objectives for the relevant water body are achieved.

	Estimated discharge	Marginal cost for alternative reduction	Total external costs
	Kg/year	**EUR per kg**	**EUR per year**
BOD			
N			
P			
Total			

As the local conditions vary, there are recommended values to be applied. It is important to consult with the RBMP responsible authority to investigate the relevance of including these emissions and the appropriate unit costs to apply.

Emission of priority hazardous substances

Emissions of priority substances could be included in the LCC, if it has been determined to be an environmental problem that should be addressed at this particular point source, and if there are unit costs available to calculate the costs. Source control is the most cost-effective way to reduce emissions of hazardous substances. As mentioned in Section 3, there could be situations, where it is a local problem that needs to be addressed in a short term perspective.

The tender material should include the inlet concentrations, and the tenderer should provide the treatment efficiency by substance. In the tender evaluation process, the LCC will be estimated based on the data on treatment efficiency provided by the tenderers. The unit costs should be based on the alternative removal costs. If for example the emissions are up-stream to a water supply intake, the costs could be based on the treatment costs at that water supply.

Table 6-5 LCC of priority hazardous substances

Examples of substances	Estimated discharge	Unit costs by substance	Cost of discharge
	Kg/year	**EUR per kg**	**EUR per year**
Cadmium			
Lead			
Mercury			
Nickel			
Di(2-ethylhexyl)phthalate (DEHP)			
Nonylphenols			

Examples of substances	Estimated discharge	Unit costs by substance	Cost of discharge
	Kg/year	EUR per kg	EUR per year
Octylphenols			
Benzo(a)pyrene			
Total			

Air emissions

If the project includes sludge treatment, the emissions of hazardous substances in the flue gas from sludge incineration could also be included in the LCC. The format for the cost assessment will be that the tenderers provide data on the flue gas emissions and the LCC costs are estimated during the tender evaluation process.

Table 6-6 LCC of priority hazardous substances

Examples of substances	Estimated emissions	Unit costs by substance	Cost of emissions
	Kg/year	EUR per kg	EUR per year
SO_2			
NO_X			
HCl			
Dust			
Mercury			
PAHs			
Cadmium and thallium (and their components)			
Zinc			
Total			

The costs of the emissions should be the marginal costs of alternative measures to reduce the emissions. For air emissions, updated values used for assessment of the EU's policy on air quality could be used. See for example on hhtp://ec.europa.eu/environment/air/pollutants/cba.htm

6.5 LCC model

If, in the tendering for works or equipment, an LCC approach is chosen, the tender material should include an LCC model where the bidding contractors provide input on financial costs and for the external effects, provide typical data in physical units (kWh, km of road affected, kg of emissions etc). The model could look like the following:

Table 6-7 Illustration of LCC model

Life cycle phases	Cost element	Unit	Unit price	LCC
Construction	Construction costs	Monetary	Not applicable	
	External impacts during construction	Physical (km roads affected, emissions etc)		Physical unit times unit costs
Operation	Operation costs	Monetary	kWh Man power Chemicals	
	Maintenance costs	Monetary + frequency recurrence	Man power Equipment	
	External Impacts during operation	Physical (emissions)		Emissions times unit costs
Decommissioning	Demolition costs	Monetary	Not applicable	
	Cost of disposal of demolition waste	Quantity of materials		Physical unit times unit costs
	Income from recycled material	Quantity of materials		Physical unit times unit price

Note: Blue colour: Data provided by tenderer. Rose colour: Data provided by the contracting authority

6.6 Further guidance on LCC

The concept of LCC derives from the engineering or quantity surveying tradition, while CBA originates from economics. Existing guidance material on how to do cost assessment and how to do cost-benefit analysis will be relevant to consult, especially the DG REGIO CBA guide.

Elements covered by different type of guidance:

Table 6-8 References to LCC

Type of assessment	Where to find guidance
Costing of investment	National quantity surveying/engineering costing guidance and manuals
Costing of operation	National quantity surveying/engineering costing guidance and manuals
Costing of external costs	CBA guidance and specific elements included in this guidance

Discount rates, price levels, financial or economic prices	CBA guidance (e.g. DG REGIO CBA guide)

7 Relevant European legislation and information sources[19]

7.1 Public Procurement legislation

Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors, currently under reform

Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, currently under reform

7.2 Horizontal environmental legislation

Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (EIA)

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

7.3 Water specific legislation

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (WFM directive)

Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy (EQS-directive)

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[19] The focus of the list is on EU environmental and procurement regulation of direct relevance for GPP. However, infrastructure projects also bring other EU policies into play. Thus, the financing or the provision of infrastructures may imply an advantage to the operator within the meaning of the EU state aid rules, and therefore constitute a state aid. Financing of such infrastructure therefore is in principle subject to state aid control. In this respect and for the purpose of guidance, reference can be made to the analytical grids prepared by DG COMP regarding infrastructures, which were submitted to Member States on 1.08.2012 , see specifically Infrastructure Analytical Grid # 7 – Water services, Ref. Ares(2012)934142 - 01/08/2012. The Analytical Grid provides guidance on cases where financing or other advantages for an operator would not normally be considered state aid, for example due to absence of any potential for competitive effect.

Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration

Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality

Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (UWWT directive)

7.4 Waste, energy-saving legislation and regulation of relevance

Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture

7.5 Other sources

Communication (COM (2008) 400) “Public procurement for a better environment”

EPA 832-R-10-005. Evaluation of Energy Conservation Measures for Waste Water Treatment Facilities. September 2010

Pump Life Cycle Costs: A Guide to LCC Analysis for Pumping Systems is the result of collaboration between the Hydraulic Institute, Europump, and the US Department of Energy’s Office of Industrial Technologies (OIT). DOE/GO-102001-1190 January 2001

New sustainable concepts and processes for optimisation and upgrading municipal waste water and sludge treatment:
http://www.eu-neptune.org/Publications%20and%20Presentations/D4-3__NEPTUNE.pdf

Directive on incineration of waste (2000/76/EC):
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0076:EN:NOT

BREF document for Waste Incineration from August 2006:
http://eippcb.jrc.es/reference/BREF/wi_bref_0806.pdf)

KN-03-13-234-EN-N