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Revision of Green Public Procurement Criteria for Road Design, Construction and Maintenance

Procurement practice guidance document

Elena Garbarino, Rocío Rodriguez Quintero, Shane Donatello, Oliver Wolf (JRC)

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Joint Research Centre

Contact information
Name: Elena Garbarino
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: JRC-IPTS-ROADS@ec.europa.eu
Tel.: +34 954488318
http://susproc.jrc.ec.europa.eu/road/

JRC Science Hub
https://ec.europa.eu/jrc

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Abstract
Procurement guidance document supporting the GPP criteria proposal for Road Design, Construction and Maintenance
The development of GPP criteria for Road design, construction and maintenance aims at helping public authorities to ensure that road projects are procured and implemented with higher environmental standards. The aim of this document is to provide simplified guidance to procurers and project teams on how to procure an environmentally improved road. The guidance has been structured to reflect the distinct phases of activity that may be involved, as well as the most common forms of contracts that are used.

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1 Introduction

The aim of this document is to provide simplified guidance to public authorities and project teams to procure an environmentally improved road. The guidance has been structured to reflect the distinct phases of activity that may be involved, as well as the most common forms of contracts that are used.

1.1 Selecting and using the GPP criteria

The criteria provide contracting authorities with the opportunity to set requirements that address the most significant opportunities for environmental improvements along the life cycle of Roads. They provide procurers with a basis for selecting tenderers according to their competencies, set technical specifications at different levels of ambition, as well as encouraging tenderers to bring forward innovative design solutions.

Briefing note 1. How the EU GPP criteria are structured and can be used

EU GPP criteria aim at facilitating public authorities the purchase of products, services and works with reduced environmental impacts. The use of the criteria is voluntary. The criteria are formulated in such a way that they can be, if deemed appropriate by the individual authority, integrated into its tender documents. The criteria are divided into selection criteria, technical specifications, award criteria and contract performance clauses. For each set of criteria there is a choice between two ambition levels:

- *The Core criteria are designed to allow easy application of GPP, focussing on the key area(s) of environmental performance of a product and aimed at keeping administrative costs for companies to a minimum.*
- *The Comprehensive criteria take into account more aspects or higher levels of environmental performance, for use by authorities that want to go further in supporting environmental and innovation goals.*

It should be borne in mind that the procurement of roads is a particularly complex issue which necessarily results in the fact that, for both core and comprehensive levels of ambition, the inclusion of green criteria does require - when compared to standard solutions - increased expertise, verification effort and, at least for some of the criteria and depending on the procurement route and the experience of the design team and contractors, higher upfront costs.

The criteria reflect the types of GPP criteria described in the Buying Green handbook (EC, 2011):

- *Selection criteria*. When assessing ability to perform a contract, contracting authorities may take into account specific experience and competence related to environmental aspects which are relevant to the subject matter of the contract. They may also exclude operators who are in breach of environmental law in some cases, and - for service and works contracts only - ask specifically about their ability to apply environmental management measures when carrying out the contract.
- *Technical specifications*. These constitute minimum compliance requirements that must be met by all tenders. They need to be related to characteristics of the work, supply or service being purchased itself – and not to the general capacities or qualities of the operator. It is also very important that they are clear, understood by all operators in the same way and possible to be verified.
- *Award criteria*. These can be used to stimulate additional environmental performance without being mandatory and therefore without foreclosing the market for products not reaching the proposed level of performance.
- *Contract performance clauses*. These specify how a contract must be carried out. For supply contracts, the main opportunity for the use of environmental clauses is often to specify how the goods will be delivered.

1.2 Reflecting different procurement routes

Designing and procuring road infrastructure with a reduced environmental impact, whether may it be new construction, rehabilitation or reconstruction, is a complex process. As was highlighted by the SCI (Sustainable Construction and Innovation through Procurement) Network in their guide for European Public Authorities, the form of procurement chosen can have a significant influence on the outcome (Clement *et al.*, 2012). This is

because each type of contract brings with it distinct interactions between the contracting authority (National Road Administrations NRAs or regional/local authorities), the design team, the contractors and the asset managers. Moreover, each type of contract has advantages and disadvantages when seeking to procure a road with an improved environmental performance.

It is therefore important to identify the main points in the sequence of procurement activities where GPP criteria should be integrated. This guidance is structured to reflect the key activities and decision points in the procurement process, as well as some of the common contract forms that are used in the European Union. Specific reference is made to the International Federation of Consulting Engineers' (FIDIC) contracts for construction works (Red Book), design and build (Yellow Book) and design, build and operate (Gold Book).

1.3 The structure of this guidance

The process of constructing a new road or carrying out maintenance and rehabilitation activities tends to entail a sequence of distinct procurement activities. The established contract will relate to distinct phases of activity as the project proceeds. This guidance document has been structured in order to reflect these activities, focussing on some of the key issues in seeking to integrate EU GPP criteria into procurement. The activities covered are the following:

- Preliminary scoping and feasibility;
- Detailed design and performance requirements;
- Construction and major extensions;
- Use of the road;
- Maintenance and operation;
- End of life, i.e. road decommissioning.

The procurement procedures foreseen in the Public Procurement Directive (2014/24/EU) include open procedure, restricted procedure, competitive procedure with negotiation, competitive dialogue and the new innovation partnership. In detail, the restricted procedure comprises a two-stage process: in the first stage, companies need to pre-qualify before being allowed to submit a tender and a short list is established. In a second stage, the identified suppliers are invited to respond to an Invitation to Tender (ITT). The competitive dialogue is used for more complex procurement contracts. It is similar to the negotiated procedure because it allows for dialogue between the contracting authorities and providers during the stages of the procurement process. It enables contracting authorities to develop specifications with the input of tenderers.

The manner of involving the private sector for construction of roads depends on prevailing national practices for outsourcing. Numerous procurement and contract models are applied in the Member States for road construction projects. According to the SCI-Network, there are generally three main types of procurement models for infrastructure projects:

- **Separation of design (D) and build contracts (B)** where the design is prepared by the contracting authority in-house or by a consultant(s) selected via a tendering process. Often the tender documents are also prepared by the contracting authority or the consultant(s). The constructor is chosen via a tendering process where interested or invited construction companies are competing to win the contract to construct the tendered project. This is the most typically used contract type in the public sector. The interaction between the contracting authority and the construction company is usually reduced. The advantage of this procurement model is that the contracting authority has close control of the project and process. A disadvantage of this contractual setup consist on it being more affected than other contracts by claims of the contractor, as interventions of the contracting authority could result in a deviation to the scope of works.
- **Combination of design and build (DB)** the main contractor takes responsibility for both design and construction, and will either use in-house designers or employ consultants to carry out the design. The contractor tenders against a client brief, and will often follow an initial concept design prepared in-house by the contracting authority or by consultants appointed to advise the contracting authority. The contractor will both develop the design and complete the works. In this type of procurement model, the interaction between the contracting authority and the contractor is stronger but this procurement model reduces the public authority's control over the process.

- **Design, build and operate (DBO)** and **Design, build, finance and operate (DBFO)**. These types of contracts are used in a variety of ways in the Member States. The contract types differ from design and build by including operation and maintenance and project financing.
- In case of separation of design and build contracts (B) and combination of design and build (DB), maintenance and operation, activities will be procured by means of separate contracts, as described in section 2.5. In this case, different typologies of contracts are employed, as frameworks, joint ventures or single/multiple providers.

Depending on the procurement route adopted, some of these contracts may be awarded to the same contractor, but in most cases they are let separately. Some contracts may be integrated in a DB or a DBO arrangement, with the detailed design process, the main construction contract and even asset management all potentially co-ordinated by one contractor. Specifically, different procurement routes and contract types could be applied in case of large scale and long terms road infrastructure projects. Information have been collected from HM Treasury & Infrastructure UK (2013), HA Highway Agency (2009) and WRAP (2005). In detail, contract types that seem to be widely applied for road infrastructure are:

- Delivery consortia for long term capital investment programmes of low to medium value projects.
- Development/delivery partners for publicly procured mega-projects and major infrastructure enhancements.
- Alliancing for low to medium value projects with long term capital investment programmes.
- Framework contracts for the selection of a number of suppliers in advance of either directly awarding work or competing in a subsequent mini-competition, if more than one supplier is appointed.
- Public Private Partnership (PPP), also called Private finance initiative (PFI). According to CEDR (2009), PPPs are contractual agreements between public and private partners for the development or management of a project aimed at delivering a public service, whereby a substantial part of the financing and the risks is shared between the public (contracting authority) and private (concessionaire) parties. PPPs may aim to increase the availability of financial resources, increase the efficiency of a project or reduce its costs, simplify the development of the project, reduce the lead-time and/or optimise the whole LCC of the project. In general, PPP contracts are widely used in the road sector (IRF, 2013; IISD, 2012). The private party is being responsible for design, construction, maintenance, operation, and financing. Sometimes, operation is kept by the contracting authority, *e.g.*, in the Netherlands. A concession contract between the contracting authority and the private party provides for obligations of the parties and the respective risk allocation. In hard-toll projects the user pays for the use of the road via a toll, whereas in availability/ performance based projects the contracting authority pays for the availability of the road including quality criteria. The most typical example of PPP schemes is the BOT (Build, Operate, and Transfer). Nevertheless, the basic BOT principle can be extended to include additional clauses that may include subsidies during operation, initial contributions, or loans from the contracting authority. Other usual types of PPP include DBFO with shadow tolls or finance by contractor. There are different levels of public and private involvement in terms of risk and funding depending on the type of PPP scheme in question. There might be intermediate setups which contain combinations of parts of both models. Both in brownfield (existing) or greenfield (newly to be built) projects, the construction period, in which operation and maintenance obligations are to be executed by the private party, is followed by the exploitation phase for a considerable amount of years (mostly 15-25 yrs.), in which the concessionaire operates and maintains the road. For the construction works, the concessionaire usually subcontracts the construction works out of the concession contract to a DB contractor on a 'back-to-back' basis. The operation and maintenance works can also be subcontracted to an operation and maintenance contractor or be executed by the concessionaire itself.
- Early Contractor Involvement (ECI). It is another important form of contract that allows supplier engagement at an early stage in a project, to draw in industry experience to the design and preparation stages. ECI contracts remain an option for major road schemes where there is significant scope for input from the supply chain. Suppliers' knowledge and abilities to influence project decisions could have a substantial impact in terms of project timing, quality and cost.

2 Guidance on procurement by the phase of activity

The following sections describe the common procurement activities for a road. For each activity the key issues to consider when seeking to use the EU GPP criteria are briefly discussed and summarised.

The sequence of the activities is intended to reflect those of typical projects, starting from early decisions on the route and project definition and extending all the way through to the construction and maintenance (and operation) of the road.

The project implementation phases bring together various competencies of the contracting authorities, decision makers, the many project's stakeholders, the consultant(s) and/or the contractor(s) to reach the best way to identify the road project terms of defined objectives. The process can be viewed as acting through a number of logical stages as described below. An overview of the different phases for development and implementation of a road project and the related procurement phases is shown in Figure 1.

Early inclusion of GPP criteria requirements into contracts is vital to ensure that sustainability considerations are fully integrated into the project and to limit additional costs.

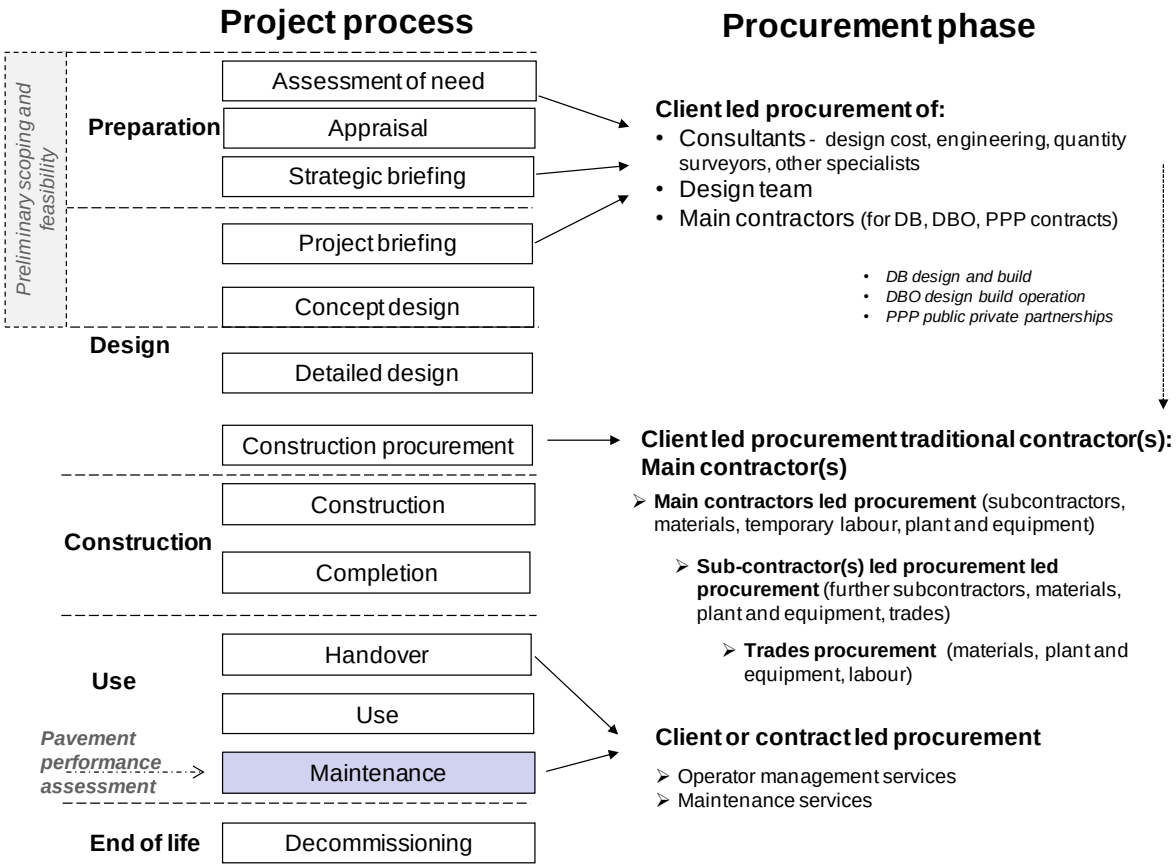

Figure 1: Project process and procurement phases for road infrastructure (based on information provided in Berry and McCarthy (2011) Harmer *et al.*, 2012, SUNRA project).

2.1 Preliminary scoping and feasibility

In the following sections, the different procurement process phases are described, according to the flowsheet shown in Figure 1. It is a general description that has to be adapted case by case to the characteristics of each project. The expertise that may be needed at this stage is briefly discussed in Briefing Note 2.

Briefing note 2. Putting the team together: preliminary stages

At the preliminary stage, the aim should be to draw upon internal expertise to support the procurement process. Using internal expertise through in-house led technical departments will ensure greater ownership over the project. The internal project team will also then be more informed when managing external contractors, being able to maintain better control over the environmental specifications it requires.

Where possible, personnel with relevant expertise should be identified and assigned to the project. This might include, for example, expertise in capital projects, finance, maintenance and environmental management. Some contracting authorities may also have in-house engineers and designers.

Experience also suggests that the involvement of the supply chain, pavement maintenance and asset management managers can help to ensure that the road infrastructure is designed to meet their needs and is practical to operate and maintain.

Preliminary appraisals and outline designs may be carried out in-house with support from external consultants to make up for gaps in expertise. Support to be procured could include environmental impact assessments, transport assessments, LCC, sustainable design, *etc*.

2.1.1.1 Assessment of the need

The need for building new/reconstructing existing road infrastructure is decided at a strategic level. A road project is formulated in terms of overall objectives and it is discussed typically at a political level and may be part of a master plan developed in discussion with different public authorities and supply chain stakeholders with relevant knowledge and interests in the project. The exchange of ideas, opinions and experience between relevant parties for tackling issues such as identifying the optimal alignment, solving technical problems and improving service levels is crucial to create a set of defined and realistic project objectives. Integrating sustainability into the needs' assessment is triggering reflections about the broader impact of the infrastructure. This starts with the question whether a new road or major reconstruction is required at all, whether it is the most appropriate solution and how it should integrate with other transport modes. The needs' assessment can also identify the parameters within which it is appropriate to build a new road, *e.g.*, its size, service life and potential future improvements.

2.1.2 Strategic briefing

At the so-called 'strategic briefing' phase (see Figure 1), the contracting authority invests resources in investigating different options on how to best develop the project in order to meet existing needs. In this phase, strategic aims of the project should be clearly set out, with the aim of creating a clear brief for the internal project team, including the procurer. A consultant could be brought in or the contracting authority could pass the project to its technical in-house department (*i.e.*, the technical department in the NRAs or regional/local authority). The project definition should include the environmental priorities of the contracting authority, as reflected in policies and plans, at a corporate level and in local planning policies.

At the feasibility stage, the general project outline is examined in detail by studying relevant design options, assessing which are feasible and selecting the best solution for implementation. At this stage, each project option is examined in terms of construction methods and service life costs and environmental, social and economic impacts. Typical elements to be considered in the feasibility study may be estimated construction costs for each option, Life Cycle Costing (LCC) for each stage of the project including build and operation, Cost Benefit Analysis (CBA, including externalities), a preliminary Life Cycle Assessment (LCA), development /assessment of financial strategy, risk analysis and mitigation for each solution under consideration.

2.1.3 Project briefing

A preferred option is developed and a so-called 'project briefing' is prepared for the design team. The contracting authority can set the parameters for this process and incorporate environmental considerations, to be taken into account by the designer. This may be done through a further procurement process for a design team, a design and build team, as a technical brief to in-house staff or as part of a contract management process with a consultant.

2.1.4 Concept design

Before moving into the detailed design phase (see Section 2.2), an options appraisal is usually carried out in order to inform the business case for the project.

It is required to develop a 'concept design' as part of the feasibility study in sufficient detail including inputs (materials, alignment and transport requirements) for the CBA, LCC and LCA analyses and for the Strategic Environmental Assessment (SEA) and the Environmental Impact Assessment (EIA) of design concepts and options. The concept design covers further work to assure the contracting authority that risks are reduced and costs estimates are more accurate, and also to provide design-build contractors with sufficient information to understand the proposal. The concept design takes a first view on the contracting authority's requirements that will include among others:

- The functional requirements (like capacity, size, quality of the works, *etc.*) laid out in a sufficiently comprehensive way to ensure that they are understood in the same manner by all tenderers;
- The design requirements to be requested to the contractor;
- A presentation of the physical conditions on site, or specifications to tenderers as to which investigations they should carry out as part of their tender, and existing permissions. This could include land acquisition plans, site availability, access roads, topographic, soil and ground conditions, utilities, *etc.*;
- Possible environmental constraints during construction;
- Permissions required to be obtained by the contracting authority or the main contractor or the DB contractor or the DBO contractor (*e.g.*, construction permit).

2.1.4.1 Establishing environmental performance objectives

It is recommended that the contracting authority evaluates its actual needs and possibilities for incorporating environmental issues at each step of the procurement process. 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, maintenance and operation) will also determine choice and formulation of GPP criteria. Therefore, it is important that both minimum technical requirements and possible areas of focus for award criteria are established during this preliminary phase. This will ensure their clear communication throughout the tendering process and will help build a common understanding. Initially the focus could be dedicated to a few key strategic environmental targets, for example related to pavement performance or construction materials. Further environmental targets may be added in further procurements steps.

2.1.4.2 Environmental planning considerations

According to IRF (2013), the SEA (according to the Directive 2001/42/EC) should be a fundamental component of road-network planning, as it can help in ensuring legality and consistency, understanding environmental impacts at the strategic level, improved collaboration and efficiency in decision-making, positive effects on subsequent project assessments, transparency and public participation.

The earlier in the procurement cycle design changes to the road alignment are considered, the more potential economic and environmental savings can be obtained. To benefit from the possible reductions in energy consumption and GHG emissions during construction of major roadworks, design should not be separated from the opportunity to optimise the length of the road, earthworks and materials transportation. The length of the road is vital to the total impacts caused by a road. The reason is that the use phase is typically the most significant parameter and causes the largest environmental impact for road with a considerable traffic volume. Typically the road alignment is decided upon at the feasibility stage and assessed by the EIA (according to Article 4(2) Annex II of the EIA Directive 2011/92/EU). Thus, it is assumed that the length of the road is decided before the GPP criteria come into play. It is recommended that the contracting authorities are aware of the importance of this parameter and include this knowledge when choosing the alignment of the road construction that it has to be assessed by means of a preliminary LCA (Liljenström C., 2013; Faith-Ell C., 2005).

The environmental impacts associated with the extraction and transportation of large volume, high weight materials such as aggregates may be a consideration, and can be incorporated into the tenders' documents. This should always be done based on an understanding of the market conditions and, when using award criteria by establishing and clearly specifying in the ITT weightings that will ensure effective competition and reward bids that offer the best overall environmental performance. This is particularly the case if it is chosen to link criteria on recycled content with CO_2 emissions from aggregate transportation.

2.1.4.3 Early assumptions about capital and life cycle costs

At this stage, initial assumptions about the cost of environmental improvements can be integrated into the cost planning for the project. LCC, done before tendering, can be used as a technique to inform decisions on the cost and benefit of requiring specific GPP criteria (see the description of LCC in Briefing note 3 below).

Reference road concepts used internally to appraise the possible costs may be included in the ITT for design teams and construction contracts. Provided that they include a bill of construction materials, they could be used as the basis for comparative assessments of environmental improvement options for the construction.

Briefing note 3. Life Cycle Costing (LCC)

LCC is a technique that *'enables comparative cost assessments to be made over a specified period of time, taking into account all relevant economic factors both in terms of initial capital costs and future operational and asset replacement cost'* (Langdon, 2007). It is particularly relevant to achieving an improved environmental performance because higher initial capital costs may have to be incurred in order to achieve lower life cycle running costs. LCC exercises should be carried out with reference to ISO 15685-5.

Applying LCC requires specialist technical skills that should be procured by the contracting authority (if it does not exist in-house) to support initial appraisals and development of the ITT for main construction contract. Cost consultants should be able to offer this expertise.

LCC is particularly important in DBO arrangements, which can be structured in order to incentivise the contractor to minimise long-term operating costs. *Further information about LCC is available on the EU GPP website:* http://ec.europa.eu/environment/gpp/lcc.htm

2.2 Detailed design and performance requirements

The contracting authority will have determined what needs to be considered in this process at the project brief stage and the concept design stage.

2.2.1 Specifying the design brief and performance requirements

2.2.1.1 Under conventional contracting arrangements

In a conventional contracting arrangement, a design is procured for the road project and then a contractor is procured to construct this design (separated D and B contract, also referred to as an 'employer design' contract[1]). A brief is therefore required setting out the contracting authorities design requirements. The brief forms the basis for the ITT for a design team.

2.2.1.2 Under integrated design and build arrangements

Where design and construction are to be procured together (in DB[2] and DBO contracts[3]) the contracting authorities performance requirements assume greater importance. This is because they will form the basis

1 Under the International Federation of Consulting Engineers (FIDIC) this would be equivalent to a Red Book contract.

2 Under the International Federation of Consulting Engineers (FIDIC) this would be equivalent to a Yellow Book contract.

3 Under the International Federation of Consulting Engineers (FIDIC) this would be equivalent to a Design, Build and Operate contract.

for the ITT for the main construction contractor *or* the DB contractor *or* the DBO contractor and their design team. It is therefore important in these two types of contracts that GPP criteria are fully addressed within the performance requirements. It may be necessary to procure expertise at this stage in order to prepare the performance requirements. Where the design and build are to be integrated in one contract, there will tend to be less direct control over the final design. The performance requirements to be communicated to potential contractors are therefore important in formally specifying GPP requirements.

Briefing note 4. Putting the team together: developing performance requirements and designs

As the project enters the detailed design stage, the contracting authority may wish to procure an external project manager with experience of innovative construction projects. The project manager's role could include supporting the development of the brief and/or the performance requirements as the basis for the ITT. (S)He could also support the procurer by helping to troubleshoot issues or barriers to the delivery of GPP requirements.

Experience suggests that the core design team will require experience and expertise in a number of key areas which are identified in more detail in the GPP Selection Criteria:

- Engineers: Knowledge and experience of designing and specifying environmentally improved road infrastructure.
- Specialist environmental consultants: Knowledge and experience in providing advice on innovation in areas such as materials sourcing, waste management and certification schemes, as well as the capacity to carry out specialised environmental analysis such as LCA.
- Cost consultant: Knowledge and experience of environmentally improved specifications and construction systems, as well the capacity to carry out specialised cost analysis such as LCC.

It is important that experience and expertise is verified by references from clients and/or recognised certifications and qualifications. The selection criteria should be included in the ITT for all forms of contract.

The reform of the public procurement directives explicitly states (Art. 66) that the organisation, qualification and experience of staff assigned to performing the contract (where the quality of the staff assigned can have a significant impact on the level of performance of the contract) can be a criterion for awarding a contract. For complex contracts as road construction and maintenance it can usually be expected that the quality of the project manager, the design team and the main contractor can have a significant impact on the performance of the project. It has to be noted that the educational and professional qualifications of the service provider or contractor or those of the undertaking's managerial staff may only be evaluated once in a tender procedure, either at selection stage or as an award criterion.

2.2.2 Commencing detailed design

Detailed design is carried out by a design team, the members of which can either be individually selected or called in from a framework contract. The process then varies according to the type of contract, which would usually take the following forms:

- In a *conventional contract (*separated D and B contract also referred to as employer design contract), where there is a separation between the designer and the construction contractor, the design team is instructed by the technical lead department of the contracting authority (*i.e.*, the technical department in the NRA or regional/local authority) or by consultants who are accountable to the contracting authority.
- In a *DB or a DBO contract,* the design team is usually controlled by the DB or the DBO contractor, although it may be possible to 'novate' (transfer) design team employed by the contracting authority to the chosen contractor.

As it was described in section 2.2.1.2, the core design team will generally include project manager, cost consultant, consulting engineers (civil, structures and services) and specialist environmental consultants. Technical tools used by this team to meet GPP requirements will include LCA software (see the Briefing note 5 for LCA below).

Briefing note 5. Life Cycle Assessment (LCA)

LCA is a tool that can be used to analyse the environmental impacts of different road designs and specifications. It is specified in the GPP criteria as a means of quantifying improvements in the environmental impacts of roads. LCA analysis for roads should be carried out in accordance with ISO 14040 and ISO 14044.

Using LCA requires specialist technical skills that should be procured as part of the design team. This technical capability should go hand in hand with practical knowledge and experience of the available improvement options, their material composition, their availability in the supply chain and their cost and design implications.

If a GPP requirement to carry out an LCA of a road design is included, the technical expertise within the internal team and the procurement panel also becomes important. This is because bidders will need to follow pre-defined rules and guidance in order to ensure that they are comparable. Moreover, LCA reports submitted as part of bids will need to be subject to a critical review by an expert evaluator.

2.2.3 Preparation of the tender documentation in a conventional contract

The detailed design forms the basis for the ITT which will be used to procure the main construction contractor. It is therefore important that it incorporates GPP requirements. This could include requirements relating to:

- Design performance, such as structural parameters, rolling resistance, noise and drainage;
- Material specifications, such as specific combinations of the main materials and products identified by LCA analysis;
- Execution of the contract, including waste management.

The contracting authority may also require the bidder to carry out an LCC analysis, or to provide information that allows the contracting authority to make its LCC calculation. Bids may then be compared on the basis of the 'Most Economically Advantageous Tender' (MEAT) considering life cycle costs. This should include the long-term cost of maintenance, utilities and waste management. It is recommended that LCC is assessed as a global figure (*i.e.*, all lifetime costs added together) and not as separately weighted award criteria.

Contracting authorities could compare and select alternative types of pavement structure and materials through the use of alternate bids or DBO models. Alternate bid is a process developed by the Federal Highway Association in the US (FHWA, 2012; Wimsatt et al., 2009). It is used only in few MSs, such as France and the Netherlands. A new guideline on *choice of pavement*s has been also published in Sweden by Trafikverket (Torbjörn, 2014).

2.3 Construction or major extensions

2.3.1 Selecting the main construction contractor

2.3.1.1 Conventional contracts

In a *conventional contract* (separated D and B contract also referred to as employer design contract), it is important that the contractor has a clear understanding of the GPP performance requirements and has the capability to implement them. The potential to include GPP criteria should already have been explored earlier in the process by the design team, but the nature of the contract will still allow for contractors to identify cost effective and innovative options.

2.3.1.2 Integrated Design and Build (DB) contracts

In an *integrated DB contract*, the contractor will have been selected at an earlier stage on the basis of their capabilities and their design team's response to the contracting authorities' performance requirements. The main advantage of this contract form is that it integrates the design team and the construction contractor,

which can help to minimise risk and uncertainty in delivering innovative specifications. It also affords the contractor greater flexibility in meeting the performance requirements, but this places a strong emphasis on ensuring that performance requirements are carefully defined.

2.3.1.3 Design, Building and Operate (DBO) contracts

In *a DBO contract* which includes project financing, many of the risks associated with the project are transferred to the contractor, who is usually responsible for the road asset over a 30-40 year timeframe. The contracting authority sets out its road asset performance assessment in a specification.

The advantage of DBO arrangements is that asset management and the asset performance monitoring are integrated within the contract. LCC therefore becomes an important consideration because the contractor will seek to minimise running costs. This can be further incentivised in how the operating fee is structured. The disadvantage is that the contractor will seek to minimise upfront investment costs. GPP requirements such as those relating to construction materials should therefore be prioritised during contractor selection. The DBO consortium's knowledge and experience of how to appraise and manage the supply chain to meet GPP requirements is important. DBO contractors that are experienced in meeting environmental specifications may, for instance, have developed cost-effective construction systems.

2.3.2 Quality of the completed road

A number of GPP criteria require the contractor to monitor performance and report on progress as the road work progresses. For example, the rolling resistance and the low-noise pavements performance parameters have to be tested for compliance with the design claims after the construction, before the road opening and few months after the opening. Furthermore, criteria on inspection of water pollution control components and storm-water retention capacity in drainage systems and for wildlife passages are also proposed. It is therefore important that requirements such as these are clearly communicated in the Invitation To Tender (ITT) and that agreement is reached on any interim monitoring as construction progresses.

2.4 Use of the road

Monitoring is performed during the use phase of the road. According to Sjögren *et al.*, (2012) - He-road project - road asset management is a holistic approach that integrates the strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their life cycle. A road asset management includes pre-investigation, planning, design, building, daily operations, planned maintenance, improvement and decisions on recycling or removal (Figure 2). Furthermore, the road user perspective has become a target area to be considered.

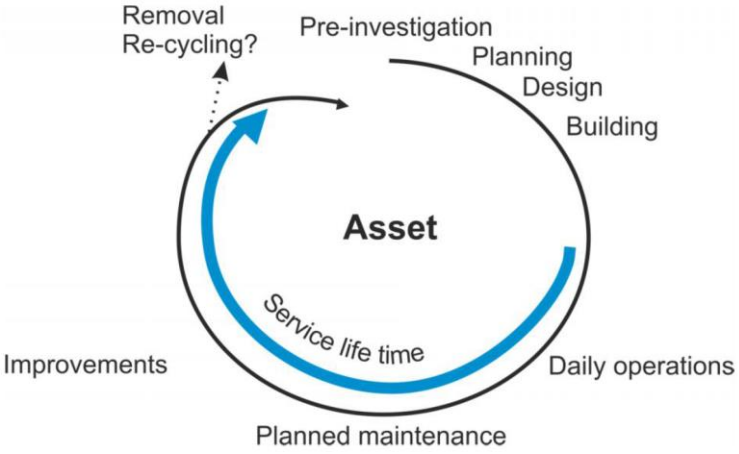

Figure 2: The life time stage of an asset (Sjögren *et al.*, 2012).

2.5 Maintenance and operation

The interventions for maintenance are different from those of major projects, with the work in this area often identified in programmes for particular areas or regions. Figure 3 shows the typical intervention points for network maintenance.

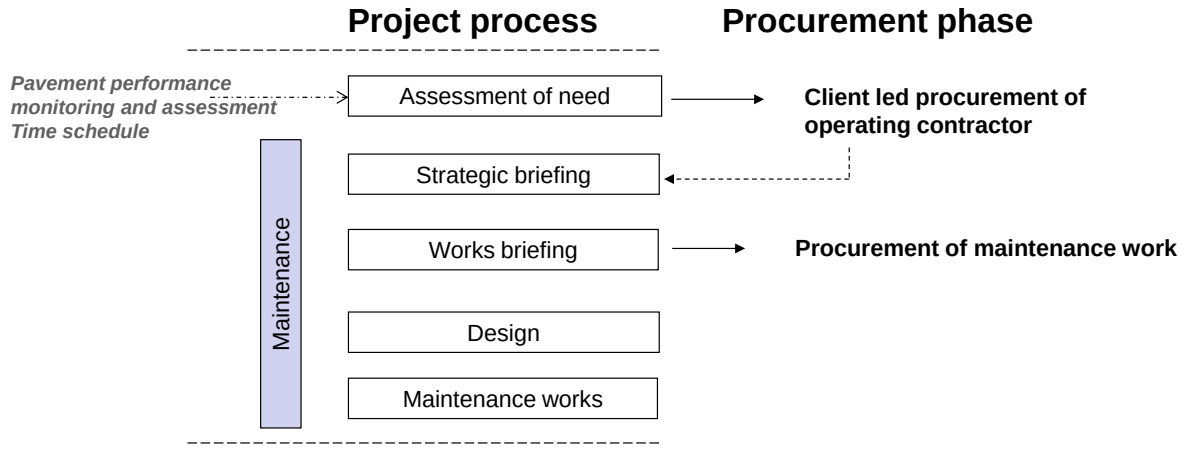

Figure 3: Project process and procurement phases for maintenance (based on information provided in Harmer *et al.*, 2012 – SUNRA project).

2.5.1 Assessment of need

The contracting authority identifies the need for maintenance for the network. This assessment is usually based on the condition of the network and the available finance to maintain and enhance the network. Including a holistic sustainable approach to the needs' assessment should ensure that the contracting authority gets full value for the allocated funds. To this aim, an operating contractor may be brought in.

2.5.2 Strategic Briefing

The contracting authority invests resources to investigate the programme of works. Within the programme of work, there will be small works and maintenance projects that need to be prioritised. The contracting authority should work with the maintenance teams (whether internal or external) to prioritise the works. Maintenance works are planned according to budget prioritization, shared cost collaboration.

2.5.3 Project Brief

A technical description of routine maintenance or planned maintenance is developed in this phase. A project will be developed based on recommendations from the strategic briefing. Any options to improve performance should be integrated in this phase.

2.5.4 Design and Construction

In routine maintenance, the intervention points are limited to the contract management actions of the client. These can vary from assessment of targets, required processes or required awards. Contractor value engineering and project management should deliver sustainability outcomes identified in design and through construction processes. The delivery of the programme is monitored by the contracting authority to ensure performance targets are met.

The maintenance management of road may be carried out by the contracting authority or may be let as a separate contract to a specialist company. This would usually include the operation of road, the maintenance of the water drainage systems and the demolition waste management plan. A pre-demolition audit allows for identification of the key infrastructure materials, which will arise from maintenance and rehabilitation activities. The relevant GPP requirements should therefore be incorporated into the ITT. Performance measurement and management, linked to incentivised continual improvement, are key contract principles.

According to HMEP (2013), procurement routes and contract models that seem to be widely applied for road maintenance and rehabilitation are:

- Managing Agent Contractor. The contracts have usually a limited time (for example 5 years) and can be extended dependent upon performance.
- Private funding. It consists in a long-term contract between a contracting authority and a private sector organisation to provide a service to or on behalf of the authority. It is based on a concession agreement that usually requires construction and maintenance and rehabilitation of road infrastructures, including debt finance. The private sector organisation is then paid a tariff for the provision of the service. This contract could be used for toll roads.
- Single Provider. It is a single contract with a single service provider to deliver for example all road-related services for a defined time period. The contracting authority retains a small team to manage the contract with the selected service provider. This arrangement requires a long-term commitment between the parties.
- Multiple Providers. It is: a contract with multiple service providers to deliver the various road-related maintenance services for a defined time period. The contracting authority retains a team to manage the contract with the various providers. This option offers the benefit of ensuring that specialist organisations deliver specific elements of road maintenance service, such as street lighting.
- Framework. It consists in assuming more than one provider with similar skill set to allow mini competitions to be held for appointment against work packages. The contracting authority enters into a series of framework contracts for the provision of particular services. The frameworks may cover individual disciplines, *e.g.*, surface dressing or may include a number of multi-discipline design services. Frameworks can be single provider frameworks or include more providers. The maximum duration of a framework under European Union Regulations is 4 years (HMEP, 2013).
- Joint Venture (Public/Private). A joint venture company (arrangement between private organizations with its own legal identity) enters into a contract for the provision of the services with the contracting authority.
- In-house. The contracting authorities deliver services via in-house teams (*i.e.*, the technical department of the NRA or the regional/local authority). This model allows for internal provision of the road services by the authority and staff remaining within the employment of the authority. It is possible to procure some elements of the service via contracts with external organizations, whether it is a single service area or multiple service area (in-house with top up).

2.6 End of Life (EoL), i.e. road decommissioning

The EoL phase of the entire road infrastructure (decommissioning) requires the permanent demolition of pavement courses and ancillary elements, such as water drainage systems, noise barriers, culverts, *etc.*, in order to terminate the function of the road. It is an unusual phase.

A range of works contracts may be required for the road decommissioning and they may be let as a separate contract to a specialist company. The GPP criteria require that contractors carry out a pre-demolition audit in order to identify the key construction materials and to determine what can be re-used, recycled or recovered. The materials, products and elements identified shall then be itemised in a Demolition Bill of Quantities. A waste management plan shall identify how recovery for re-use or recycling will be maximised.

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