

# Deliverable 4.1

## Preliminary contract and financial assessment model

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## I. EXECUTIVE SUMMARY

PPI4Waste aims to achieve resource efficiency, sustainable waste management and sustainable consumption throughout Europe by increasing innovative public procurement through networking, capacity building, and dissemination. The project covers the complete cycle of preparation activities to implement PPI in municipal waste management.

Once the report of targeted improvements (WP2) from the demand side has been achieved, once drafted the market situation as well as the roadmap for improvement on functional requirements, the next step in the methodology to open the path for the undertaking of preparation activities for the procurement implementation and make it ready will be carried through a feasibility plan including different tasks.

**Task 4.1** “Feasibility Plan for a real/concrete public procurement of innovation” aims at carrying out a feasibility plan for the involved core buyers and for the buyer’s group to uptake a collaborative PPI and to reduce risk associated to the uptake of PPI.

This task is subdivided in two different parts. **Task 4.1.a** is about the definition of contract models and financing modelling of different approaches.

This first part is going to be explained in the following sections.

The results and achievements of **Task 4.1.b** will be delivered in D. 4.3: “Common risk management strategy”

## II. OBJECTIVE OF THE PRELIMINARY CONTRACT AND FINANCIAL ASSESSMENT MODEL

As part of Task 4.1, Task 4.1.a aims at defining contract models and financing modelling of different approaches. Both parts are absolutely related, because if some contracting authority wants to buy some product, work or service will have to pay attention not only in the contract, but also in the financial model. Otherwise it will be very difficult for him to achieve their objective in a successful way.

**The definition of contract models includes** firstly a guide or template of contract model; with some clauses specially focus on PPI4Waste objectives. Secondly it contains a review of the arrangements regarding management of Intellectual Property Rights over innovations, legal review with European/National laws and confidentiality.

Finally, the preliminary financial modelling assessment is intended to support the identification of the available financing instruments that support innovation, to approach the definition of all financial cost elements, and the evaluation of different investment scenarios.

The deliverable has been developed using a theoretical-illustrating example approach, which means that we have provided to illustrate the theory and necessary steps to develop a PPI contract model with examples taken from the assessment of needs, performance characteristics and roadmap developed by both Mancomunidad del Sur and Zagreb Holding, simulating a pilot case of PPI.

### III. GUIDE-TEMPLATE OF CONTRACT MODEL FOR PPI4WASTE

This guide-template of contract model (PPI4Waste D.4.1) identifies and explains essential clauses that have to be part of the final tenders of Mancomunidad del Sur (Spain) and Zagreb City Holding (Croatia) if they want to buy innovative solutions that are near the market.

Both of them are focused on improving their waste collection, sorting and recycling systems, obtaining better results through public procurement of innovation. As it is impossible to meet all these demanding challenges at the same time, it has been necessary to focus on some of the needs raised during the development of the roadmap and the knowledge acquired of the State-of-the-Art (henceforth SoA).

This guide will develop the essential and specific clauses of a PPI tender. So it will be necessary for contracting authorities to complete these clauses with the usual clauses of a generic tender.

It is essential:

- To focus on some specific need
- To know the State-of-the-Art (SoA)
- To establish and keep the roadmap

The guide-template for the tenders also takes into account the results obtained in PPI4Waste Project until this moment, especially the identification of common needs and the performance characteristics, used to describe performance-based requirements of the solutions searched by Mancomunidad del Sur and Zagreb City Holding.

References used for preparing this guide or template model are:

- “Guidance for public authorities on Public Procurement of Innovation”, 1st Edition. Procurement of Innovation Platform ICLEI – Local Governments for Sustainability (Project coordinator). [www.innovation-procurement.org](http://www.innovation-procurement.org)
- “Tender Specifications” Public Administration Procurement Innovation to Reach Ultimate Sustainability (PAPIRUS)
- “Procurement strategy” PROBIS Supporting Public Procurement of Building Innovative Solutions.
- “How-To Guide for Implementation of Innovation Oriented Public Procurement (IOPP) Procedures. EU Level” Water PiPP Public Innovation Procurement Policies.

## 1. TENDER PROCEDURE

It is up to the contracting authority to choose the procedure that better complies with the law and matches its will. The Guidance for public authorities on PPI<sup>1</sup> provides some factors that influence in the choice of a procedure:

a) Degree of knowledge about the market

In Mancomunidad del Sur and Zagreb City Holding cases there is a quite good knowledge about the market, helped by the Meet the market events developed during the previous months (D. 3.1).

<sup>1</sup> Guidance for public authorities on Public Procurement of Innovation, 1st Edition. Procurement of Innovation Platform ICLEI – Local Governments for Sustainability (Project coordinator). [www.innovation-procurement.org](http://www.innovation-procurement.org)

b) Need (or not) of research and development work

According to the knowledge about the market, it is also possible to set that the solutions needed by Mancomunidad del Sur and Zagreb City Holding do not exist in the market. So it is necessary to develop some research and development work. But, at the same time, some possible solutions are close to the market, so it is not required a great deal of hard and long work.

c) Possibility of developing specification (or not)

In the WP2 the common needs were set, and in D.3.3 performance indicators approach has been prepared for both Mancomunidad del Sur and Zagreb City Holding, which means that it is possible to develop specifications for both tenders.

d) Need to acquire the solution on commercial scale (or not)

One of the proposals of PPI4Waste is to prepare the market and the contracting entities to achieve some practical results, and not only develop a research work which means that there is a need to acquire the solution on commercial scale.

e) Number of potential suppliers and structure of the market

The number of potential suppliers and structure of the market is high. During the meet the market events a lot of suppliers showed their interest in submitting an offer related to innovative solutions to plastic and biowaste, the two main needed areas of Mancomunidad del Sur and Zagreb City Holding.

f) Time and resources available for the procurement

The time and the resources available for the procurement is enough, but not too high. Lack of resources may be one of the barriers to uptake a PPI at the end of the project, together with lack of long-term strategy.

According to this previous and relevant review of the real and specific circumstances of the contract, related to the market, the need of R&D work, the specifications, the need to acquire a solution on commercial scale, the number of potential suppliers and structure of the market and the time and resources available, the Guidance for public authorities on Public Procurement of Innovation sets a schedule of the best options to acquire innovation through public procurement.

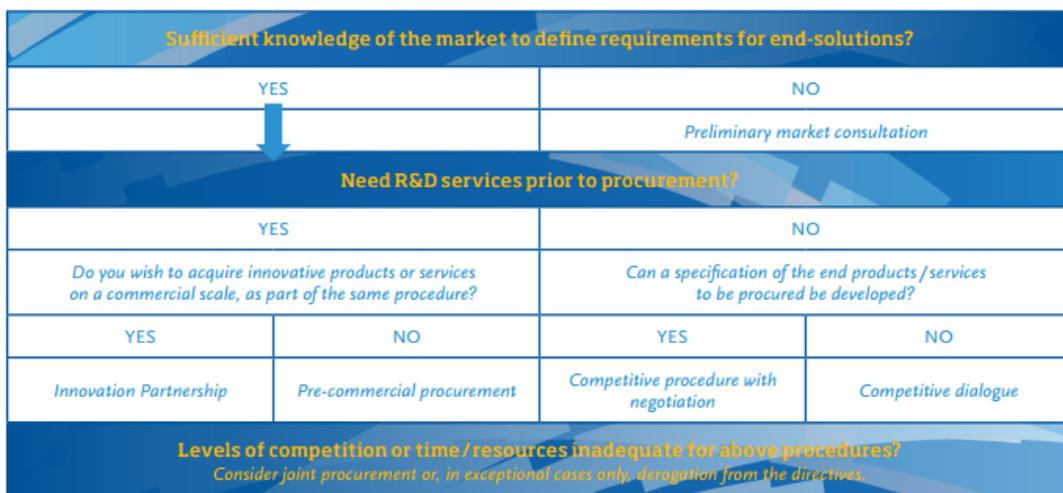


Figure 1. Guidance for public authorities on Public Procurement of Innovation

The options established in the Guidance may be the ideal procedure for each circumstance. However, it is essential to know the experience and the capacity of each contracting authority to choose and develop the procedure that best suits them.

In our case, both Mancomunidad del Sur and Zagreb City Holding opt for an open procedure.

Indeed it is an appropriate procedure because they know the market, so they don't need to dialogue with the candidates in order to set the clauses and specifications of the tender, and they don't need a long phase of research and development of the solutions.

The objective of this procedure is to procure goods, products and services allowing the procurer a maximum choice of potential innovative solutions. It is open for all the economic operators. In this kind of procedure there are no negotiation or dialogue steps. That means that it will be shorter, so the needs will be obtained before than with the other procedures. On the other hand, this kind of procedure requires a better specification of the needs provided by the procurer.

It is important to emphasize that, in Croatia, the new legal act on public procurement sets as compulsory the launch of a **public consultation**. According to that, any economic operator may request to participate and the contracting authority will conduct a dialogue with the candidates. The aim of this public consultation is to develop adequate solutions to the needs of the contracting parties, and to set the basis of which the selected candidates are invited to tender.

## 2. OBJECT OF THE CONTRACT

The contracting authority will need to define the object of the tender. The object of the tender is the good, product or service that will be procured. The definition of the object of the contract is very important, because all the clauses of the tender must be related with it. And if there is something that is against the object, or some specifications or requirements that are unnecessary for the object of the contract, they will be against the law.

There are five clauses that must be part of the tender.

### a) Type and description of the object of the contract/Tender subject

Possible clause for Zagreb City Holding: "The object of this contract is typified as a service contract, and has its object in the development of the optimized biowaste collection system through the implementation of up-to-date technological solutions"

Possible clause for Mancomunidad del Sur: "The object of this contract is typified as a supply contract for the acquisition, installation and commissioning of innovative equipment that improve and enlarge plastic packaging separation in the light packaging separation plant of Pinto (Madrid)"

## b) Lots description

In order to help and incentive SMEs to participate in public procurements it is compulsory to break the tender into lots or, if not, to explain why it is impossible to split it.

The object of each lot must be identified according to the Common Procurement Vocabulary.

Possible clause for Zagreb City Holding: This contract is divided in 4 lots:

1. Collection infrastructure: network of bins and containers
2. Collection fleet: vehicles
3. IT solution
4. Education and information of the waste producers

The bidder may submit a tender for one, more or all the lots.

## c) Use of variants

The use of variants means that the public procurers allow economic operators to submit alternative solutions which meet several minimum requirements included the tender documentation.

Both variant and non-variant offers will be assessed based on the **same award criteria**.

**Benefits** of using variants in PPI:

- enable the procurer to capture unforeseen alternative solution approaches
- the use of variants may result in a more environmentally-friendly/more accessible offer.

Possible clause: "A variant is accepted, which will include a solution different from the basic offer, with the requirements, modalities and technical characteristics set in the Technical Specifications and must include the integrated solution to the basic work or service required.

The variant can not exceed the maximum budget of the contract."

Despite that, according to their previous experience, both Mancomunidad del Sur and Zagreb Cicity Holding prefer not to allow economic operators to submit variants in their offers.

## d) Estimated value of the contract

It could be difficult to calculate in advance the cost of the contract, especially when there are some innovative solutions involved. But it is very important to set an estimated value.

The calculation of the estimated value of a procurement shall be based on the total amount payable, net of VAT, as estimated by the contracting authority, including any form of option and any renewals of the contracts as explicitly set out in the procurement documents.

For the purchase of equipment as in Mancomunidad del Sur, the estimated value of the contract, based on the total amount payable, net of VAT, it shall be taken into account the actual and likely costs of:

- The research, development, and innovation required; ;
- The initial purchase;
- Installation;
- Servicing for the entire contract period;
- Training and other support for the entire contract period; and
- Consumables for the entire contract period.

Mancomunidad del Sur is not bound by the estimated value

### e) Value engineering

Value engineering consists on activities and actions that can be used during contract implementation to **improve or preserve the functions of the innovative solution while reducing the costs.**

Particularly in the case of long term PPI contracts, the use of value engineering can incentivize the economic operator to continue improving its solution and generating cost savings after winning the contract.

The contractor has an incentive to innovate as a result of exploring alternatives to add value (i.e. improve performance and lower the cost) because the cost savings are shared with the contractor).

Possible clause: “As a basis for the improvement of the procedure includes the application of digital technologies, and the awarded company will have to guarantee the technological renewal and the incorporation of new technologies that may arise during the term of the contract.”

## 3. TECHNICAL SPECIFICATIONS

A good definition of technical specifications is needed to ensure broad interest and engagement from the market to deliver the required solutions. Technical specifications describe the minimum requirements that characterize the good, product or service that will be procured (e.g. minimum required functionality and/or performance to be delivered, minimum efficiency improvements / reduction in maintenance costs to be achieved etc.).

Technical specifications serve two **PURPOSES**:

1. “Describe what the procurer wants to buy, so that potential bidders can decide whether the call for tender is of interest to them”
2. Provide ‘measurable requirements against which tenders can be evaluated’.

**GUIDELINES** to ensure compliance with the legal European framework:

- **Be clear and precise** in the description, to encourage economic operators to submit offers;

- Express the requirements in a **technology neutral way** (e.g. avoid reference to proprietary production methods), using outcome based terms by reference to the desired performance or functionalities (e.g. in relation to materials, production methods, packages or use);
- **Do not use requirements that are not directly needed** to fulfill the need, but may restrict competition;
- Ensure that the technical specifications describe not only the requirements for the tangible elements (goods, products or services) to be procured but also for **the intangible elements** of the subject matter.
  - ↳ The desired distribution of the rights and obligations related to IPRs linked to the subject matter needs to be specified up front in the tender specifications to ensure that
    - offers are comparable,
    - the correct market price is paid,
    - and the procurement does not involve illegal State aid
- Take into consideration **environmental, social and accessibility** requirements for people with disabilities as well as data protection requirements deriving from relevant EU or national law;
- Formulate only **verifiable requirements and specify the means of proof** that need to be submitted; ensure that the offers are **comparable**
  - ↳ Prescribing a high degree of technical implementation details will reduce the opportunity for interested bidders to propose innovative solutions.
  - ↳ Nevertheless, the specifications should provide enough information in order to allow the potential bidders to understand what the problem that requires a solution really is and what the functional requirements of the procurers are.
  - ↳ The identified need and means of proof have to be described in such a way to enable objective comparison of the competing solutions proposed by the market.
    - Refer where relevant to available **standards** in order to ensure, for example, needed **interoperability** with other existing technologies.
    - When referring to **labels**, a European standard or, in the absence thereof, to a national standard, **equivalent proof of compliance** with the (specification from the) label/standard should be accepted by the procurer.
      - ↳ Acceptable proof entails: third-party verified evidence, or, in case of non-imputable impossibility to access such evidence or to obtain such evidence within the relevant time limits, other means of proof such as a technical dossier of the manufacturer;

#### TO SUM UP, FUNCTIONAL REQUIREMENTS MUST BE SMART

- **Specific:** Describe the objective clearly and concretely. It must describe a perceptible action, behavior or result linked to a number, amount, percentage or other quantitative data.
- **Measurable:** There must be a system, method and procedure to determine the extent to which the objective has been achieved at a certain moment.
- **Acceptable:** Is there support for what we are doing? Is it in line with policy and the organization's objectives? Are the people involved prepared to commit themselves to this objective?
- **Realistic:** Is the objective achievable?
- **Fixed Timeframe:** A SMART objective has a clear start and end date.

Some of these requirements in Zagreb City Holding are:

- To optimize the collection routes (bin sizes and position depending on the biowaste producers),
- To modernize the vehicle fleet and to introduce dedicated trucks for biowaste collection
- To implement Eco driving and other fuel-reduction methods,
- To monitor air quality and noise in the urban areas,
- Other actions that will lead to environmental-friendly biowaste collection
- To collect biowaste from all producers within the City of Zagreb: citizens, catering services, food and beverage industry, etc.
- To increase the collected biowaste (that collection will eventually result in the overall increase of recycling rate, calculated according to EU regulation 2011/753/EU).
- To implement biowaste collection within the whole area of Zagreb in 5 years.

Mancomunidad del Sur requires:

- To incorporate technological improvements in treatment plants in order to increase the overall effectiveness of plastic materials separation (LDPE, HDPE, PP, PET, PE)
- To solve the technological limitations of optical separators such as limitations of colour, label, metallized surfaces, multi-layer materials or blown errors.
- To increase the capacity rate.

## 4. PROCUREMENT PARTIES

Usually, in a public procurement, there are two parties: the contracting authority and the supplier. PPI could be different, because during the contract execution several economic operators could be part of the contract. The main reason of this difference is that in an ordinary contract the good, product or services are available in the market, so it is possible to identify since the very beginning who is the best supplier, or, in other words, who can offer the best option. However, a PPI is required when the solutions searched are not available in the market, and it is necessary to promote different grades of research and development work, or it is necessary to adapt the good, product or service present in the market. For this reason, during the development of this kind of works it is possible to have different contractors.

In our case, as the products are close to the market, only a minimum effort of research and development must be done before purchasing the product, service or work. For this reason, the pilots will be PPI and no PCP.

Furthermore, it will be necessary to set the minimum guaranties to assure that every contractor is able to do the work needed. For that purpose, legal, economic and professional requirements must be set.

### Contracting Entity

Information about the contracting entity.

Contracting authorities are, in each contract, Zagreb City Holding and Mancomunidad del Sur.

## Economic operators. Conditions for participation

### Legal capacity

Participation in this tender procedure is open on equal terms to all natural and legal persons. These entities shall be entitled to submit bids either individually or by way of an association or consortium comprising several Bidders set up temporarily for the purposes of the contract.

All the economic operators must fulfil the legal requirements set in their national regulation and in European Law to be a legally established enterprise.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Joint tenders (Consortia)

A joint tender means that a tender is submitted by a group of economic operators (consortia). Joint tenders may include subcontractors in addition to the economic operators.

In case the contract is awarded to a joint tender, all economic operators of the group will assume joint and several liability and will have an equal standing towards the contracting entity in executing the contract for the performance of the contract as a whole.

In PPI, joint tenders (Consortia) are very useful to help SMEs to participate in the contracts.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Exclusion grounds

Exclusion criteria are requirements that allow the procurer to exclude economic operators from participating in the procurement procedure on account of their past behaviour (e.g. corruption, money laundering, etc.).

The EU public procurement directives (article 57 Directive 24/2014) set out a list of grounds for exclusion of economic operators from participating to the procurement procedure, which can be used; several exclusion grounds are mandatory while others are optional.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Selection criteria

Selection criteria are requirements related to the suitability of an economic operator to pursue the professional activity, its economic and financial standing and its technical and professional ability to perform the object of the contract.

Public procurement directives (article 58 Directive 24/2014) contain several provisions regarding the formulation of the selection criteria. According to these, the selection criteria should be:

- linked to the object of the contract.
- indicated in the contract notice or contract documents and not be changed during the procurement procedure.

- Sufficiently clear and precise.
- Related to the suitability of an economic operator to pursue the professional activity, its economic and financial standing and to its technical and professional ability to perform the contract

### **Economic and financial solvency**

The tenderer should demonstrate sufficient economic and financial capacity to guarantee continuous and satisfactory performance throughout the envisaged lifetime of the contract, as well as sufficient turnover in relation to the tasks expected under the contract.

### **Technical and professional solvency**

Regarding the technical and professional capacity, the tenderer should demonstrate the technical skills necessary to deliver the requested services.

These clauses will be similar in all kinds of contracts.

Nevertheless, in PPI it is possible to ask for technical solvency related to previous experience in the areas of Research and Development (development of R&D projects related to the sector, % of dedicated resources to R&D and innovation projects, etc...)

### **Minimum and maximum number of bidders**

It is possible to set the minimum and maximum number of bidders.

In the cases of Mancomunidad del Sur and Zagreb City Holding, as both of them have chosen Open Procedure, there are no limits on the number of bidders.

## **5. PREPARING AND SUBMITTING THE OFFERS**

Some clauses must be set in order to regulate the preparation and the way to submit the offers. There are important because they set the rules for the contract, and allow the contractor to know practical and legal issues that are required and the regulation of the contract.

### **Confidentiality (see in Part IV.2)**

- Non-disclose duty of procurers
- Non-disclose duty of providers and collaborators

### **How to submit a tender: place and time limit for receipt of tenders**

It is necessary to provide the information about the place and time limit for receipt of tenders.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Validity period of the offers

Contracting authorities can set a period in which tenderers must maintain their tenders from the final date for the submission of tenders. This implies that the contracting authority must award the contract in the same term, but this term does not affect the execution phase in which the successful tenderer must respect the content of its awarded tender.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Consequences of submitting a tender

Submission of a tender implies acceptance of the terms and conditions set out in the tendering specifications. Under penalty of exclusion, the bid may not contain any reservation in relation to any conditions of any of the tender documents.

The contracting authority shall not reimburse expenses incurred in preparing and submitting tenders.

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

### Data Protection

See Specific section IV: Management of intellectual property rights and confidentiality of this deliverable

### Language of the procedure

This clause will be the same in all kinds of contracts, regardless if they are focused on buying innovative solutions or not.

## 6. AWARD CRITERIA-SELECTION OF BIDS

Award criteria must be clear enough to allow the supplier to know if its offer fulfils with the requirements of the tender.

As a general remark it is important to highlight to potential bidders that selection of bids will not be done only on lowest price.

### Most Economically Advantageous Tender (MEAT)

The assessment criteria on the MEAT can be used to reflect qualitative, technical and sustainable aspects as well as price, rather than on the lowest price.

### Price/economic criteria



**Quality: materials, components, systems, implementation...**

**Whole Life Time Cost:**

- Development of the solution
- Delivery
- Installation
- Use
- Management
- Maintenance
- Disposal
- \* Environmental externalities

All the award criteria must define the subcriteria (if they exist) and the weight of each criterion in the final adjudication of the contract because, as it has been said, the contractor must know if it could obtain the contract or not.

Possible clause for Mancomunidad del Sur:

The contract will be awarded on the basis of the most economically advantageous tender, based on the price and the quality of the bid.

The tables on the following pages contain a detailed description and weight of all award criteria and subcriteria.

The contract will be awarded to the bid with the highest score (rounded to the second position after decimal point). In case bids are evaluated with the same score, the price shall be decisive.

AWARD CRITERIA	WEIGHT	SUBCRITERIA	WEIGHT	CRITERIA OF VALUATION
Energy efficiency	20 %		20 %	Judgement value
Sustainability	10 %	CO2- equivalent value	10 %	Mathematical formula
Installation, maintenance and others	20 %	Installation process and method	10 %	Judgement value
		Maintenance requirements and lifetime	10 %	Judgement value
Overall Equipment Effectiveness (OEE)	25%	OEE= capacity rate x quality rate x availability	25%	Mathematical formula
Economic criteria	25 %	Price	25 %	Mathematical formula

## 7. MANAGEMENT OF IPRs

The management of IPRs will be analyzed above in “Part IV: Management of intellectual property rights and confidentiality”.

## 8. EXECUTION PHASE

In order to obtain solutions which really meet the initial expectations, the public procurer needs to **follow-up and assess** systematically the vendors’ performance during the execution of the PPI contract.

**Payments during the execution** of the contract could be linked to the satisfactory and successful completion of predetermined key performance indicators (KPIs) or milestones that are described in the procurement contract.

The execution phase is essential in order to obtain good results of the PPI. But, the clauses related to the execution of the PPI are similar to the clauses of all kind of contracts.

### General obligations of the contractor

The Contractor shall remain bound by the offer it has presented, whose compliance, in all its terms and conditions, shall be an essential obligation of the contract.

In addition to the obligations established in the tender specifications and in the contract, the contracting authority can set obligations related with: the compliment of national laws and provisions applicable to the sector; specification of the particular persons performing the contract and provide evidence of their registration with and contributions to social security, before the start of the performance of the contract; correct environmental management; confidentiality and data protection; information about subcontracting; having a competent technical manager with medium- or upper-level qualifications as the technical manager responsible for the proper running of its operations and conduct of its staff and liaising with the contracting authority.

### Subcontracting

It helps the participation of SMEs so it is a good practice to promote subcontracting.

### Delivery of the works

Set the place, if it is necessary.

### Phases of the contract:

- Minimum requirements
- Stages and performance terms
- Implementation reports during the execution
- Payment arrangements

### Time for the completion of works – penalty for delays

### Suspensions and extending

### **Working Plan of the contractor's work and timetable**

### **Non-derogation of execution deadline**

### **Modification of the contract**

### **Termination of the contract**

- Normal termination
- Early termination
- Consequence of termination
- Penalties

These clauses will be the same in all kinds of contracts, regardless if they are focused on buying innovative

## IV. MANAGEMENT OF INTELLECTUAL PROPERTY RIGHTS (IPRs) AND CONFIDENTIALITY

### 1. MANAGEMENT OF IPRs<sup>2</sup>

#### The importance of Management of IPRs in PPI

In opposition to traditional public procurement, i.e., where the object of the procurement is not an innovative solution, the management of Intellectual Property Rights (IPRs) is a task to be done by procurers when leading a Public Procurement of Innovative Solutions (PPI) procedure.

In PPI, the needs-based definition of the object of the contract, the performance-based requirements of the procured solutions (instead to specifications-based description of products or services), together with to the use of non-value-for-money award criteria, such as “fostering of innovation”, all these target to a solution which is not yet available in the market, even it is close to it. Hence, it will be necessary to conduct some R&D&I activity (by the provider, but sometimes by the procurer, too), in order to bring the solution to a stage ready to be bought and use by the procurer.

In fact, successful PPI gives rise to outcomes in form of new technical solutions and/or innovative knowledge. Some of such outcomes can be protected by means of IPRs (e.g., copyrights and neighbouring rights, trade secrets, including know-how, design rights, patents) and be commercially exploited in the market beyond the procurement.

Even if in a less intense manner than in PCP, the ruling on IPRs assignment and use fixed in the call for tender is especially relevant for providers, because of the expectation of such a further commercial exploitation (the “business case” of the provider). In other words, providers are not indifferent to IPRs, as they will be in the case of traditional public procurement, where well-known or public domain technology is applied. In fact, issues associated with an inaccurate management (i.e., decisions on ownership and administration) of IPRs may prevent providers from participating in a PPI procedure. This is the so called “vendor back-out” risk: if the procurer retains IPRs coming out from PPI, potential providers will exit of the procedure because of having no incentive to develop an attractive innovative solution which cannot be commercialized later in the market.

Further, on the other hand, the decision about the ownership and administration of IPRs is crucial for the procurer, too. First, in order to avoid the so called “vendor lock-in” risk: if procurer leaves IPRs to the provider and does not grant itself enough access to IPRs, it remains tied to the provider for a specific product and/or service despite of the fact of having paid to develop the innovative solution. Second, price is going to increase if provider cannot exploit the innovative solution in the market (the “business case” of the procurer).

Because all this reasons, it shall be determined in an early stage of the PPI procedure who is going to own and commercially exploit such rights, and who and to what extent is going to have access and to the IPRs and right to use them, i.e., the regulation of the Foreground IPRs shall be clear from the very beginning. Further, the provisions on the management of IPRs shall also include the regulation of both Background, Sideground and Postground IPRs, too.

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<sup>2</sup> For further information, see: Water PiPP Consortium, *How-To Guide for Implementation of IOPP Procedures (EU Level)*, 2016, pp. 8-9, in <<http://www.waterpipp.eu>>; Procurement of Innovation Platform, *Introduction to intellectual property rights in Public Procurement of Innovation*, in: <[www.innovation-procurement.org](http://www.innovation-procurement.org)>; Gimeno Feliu et al., *Guía 2.0 para la compra pública de innovación*, Ministerio de Economía, Gobierno de España, 2015, pp. 58-63 and 66-67, in: <<http://www.idi.mineco.gob.es/>>.

## Sharing IPRs

In order to mitigate the risks identified above and distribute them in a balanced manner, but also to generate a win-win situation for both the procurer and the provider and create the proper incentives, IPRs on the results of PPI shall be shared. Doing so, the procurer ensures use and application of IPRs, while leaves IPRs and the opportunities to commercialise them with the provider. Further, sharing IPR is the way to fulfil one of the major targets of PPI: to inject innovation into the market, by allowing providers to transfer the innovative outcomes in their commercial offer.

Except for the Innovation Partnership (art. 31(6) Directive 24/2014), there is no legal duty to rule IPRs in a call for tender. If there is no decision made on the management of IPRs, generally speaking the situation will be that the provider will own the IPRs resulting from the procurement and retain all the rights on them. In some cases, as contracts of services, the situation will be the opposite one: the procurer will own the IPRs and the rights on them. In any case, such situations do not result into a framework for sharing IPRs. In PPI, both procurers and providers are interested in using IPRs at the present or in the future, but in a different way. A decision on this issue is required: in PPI, decisions shall be made by procurers at the time of designing the procedure.

Hence, the most suitable alternative is to include in the call for tender a framework that allocates the complete ownership of the resulting IPRs to the provider, and so, the decision making power on the strategy for the later exploitation and/or commercialization of the IPRs and the corresponding profits, but granting to the procurer and selected third parties the right to use those IPRs to a certain extent or for certain purposes. The proper allocation of IPRs can be achieved by combining: (i) licensing: if the provider are owners of IPRs, they act as licensors and the procurer acts as licensee; the regulatory framework of IPR license agreements is flexible, and this allows to adapt the conditions of the license (i.e., timeframe of validity, renewal, geographic area or industry in which it applies) to the particular needs of the case; (ii) royalties: payments can be established from the licensee to the licensor for the use of IPRs.

Combining this patterns, free non-exclusive licenses for the own use of the procurer (free of royalties) or open licenses (to the procurer and to third parties under payment of royalties) are accurate IPRs management scenarios.

It exists the option of sharing ownership on the resulting IPRs, too. In this case, the share owned by the procurer shall be kept small (i.e., under twenty per cent), and, despite of the co-ownership, the later exploitation and/or commercialization of the IPRs shall remain in the hands of the provider.

Especially in such cases, some risks related to IPRs may arise: i.e., vendor lock-in due to lack in competence in future procurements because of advantageous position of the provider co-owner of IPRs. In that case, procurer shall keep the right to grant sublicenses to third parties for implementation or development purposes. Or the case of absence of exploitation of IPRs by the provider, which can be faced including a call-back clause in favour of the procurer.

Now, a selection of issues is given that shall be decided when managing IPRs in PPI, and corresponding examples formulated as terms:

## Definition of IPRs

The scope of application of the terms defining the framework for the management of IPRs shall be delimited, in order to avoid conflicts. Regarding the fact that IPRs Law is not uniform in the EU, a broad delimitation of the scope of application is recommended.

Possible clause: “To the extension of this clause, Intellectual Property Rights ("IPRs") shall mean (i) patents, design patents, inventions, utility models, designs, copyrights and related rights, database rights, trademarks, trade names, corporate names and the right to apply for their registration; (ii) domain name rights; (iii) know-how; (iv) applications and renewals concerning any of the aforementioned rights; (v) any other right having an equivalent effect in any country worldwide (vi) licenses or contractual rights on any of the aforementioned rights”.

### Background IPRs

Background IPRs are the different IPRs existing before the R&D&I collaboration that will be necessary to successfully to develop the R&D&I activities, and which shall be brought by the provider and/or the procurer into the procedure. This IPRs can be owned (jointly or not) by the provider or the procurer, or hold under a contract by them, such as a license agreement or material transfer agreement.<sup>3</sup> Regarding Background IPRs, following aspects shall be addressed by means of the corresponding statements:

- *Ownership on Background IPRs brought to the PPI*

Possible clause: “All Background IPRs used or provided for the purposes of this PPI shall remain the property of the party introducing the same or, where applicable, the third party from whom the right to use it has derived. This shall be notified at the beginning of the PPI.”

- *Access rights to Background IPRs in favour of the procurer*

Possible clause: “The procurer will be assigned an irrevocable, unlimited, worldwide, fully paid-up, royalty-free, non-exclusive license until the expiry of the respective IPRs the Background IPRs with protection of claims of third parties, but exclusively for internal purposes”.

- *Background IPRs owned by third parties: licenses in favour of procurer, including commitment to extend licenses of Background IPRs owned by third parties to procurer under similar conditions*

Possible clause: “The provider shall confirm that he has procured from the third party owner of any Background IPR the necessary license or the necessary variation to any pre-existing license required to allow the procurer to use that Background IPR to the extent that it required by the PPI and will be used by the procurer according to the internal purposes”.

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<sup>3</sup> See European IPR Helpdesk, “Ask the Helpline: My company is applying to the SME Instrument (phase 2). We want to make a medical application, that seems to be very innovative, but we do not want to make any mistakes in our SME proposal. Can you indicate us how we should tackle the IP in our proposal?”, in <<https://www.iprhelpdesk.eu/news/ask-helpline-2>>, visited on Dec. 16<sup>th</sup>, 2016; and European IPR Helpdesk, Fact Sheet Background in FP7 projects, June 2015, in <<https://www.iprhelpdesk.eu/sites/default/files/newsdocuments/Fact-Sheet-Background-in-FP7.pdf>> visited on Dec. 16<sup>th</sup>, 2016.

- *Access rights to Background IPRs to third providers appointed by the procurer, including the extension of licenses of Background IPRs owned by third parties to third providers appointed by the procurer under special circumstances*

Possible clause: ““Upon request of the procurer, the provider shall offer to any third provider designated by the procurer a non-exclusive license to use the Background IPRs under fair and reasonable conditions with consideration of the rights of other third parties that do not accrue to the ones of such providers.”

- *Variation of Background IPRs brought by provider to the PPI*

Possible clause: “As soon there is a variation with respect to the notification which shall be done by the provider at the beginning of the PPI, the provider shall notify in writing with full and complete information of any self or third party owned Background IPRs that may in any way affect any use or exploitation rights corresponding to the procurer. These notifications will be provided by the provider with the necessary authorizations at no cost for the procurer and, if necessary, the latter will be reinstated as legitimate user, including as the case may be, the substitution of equivalent solutions or products that do not infringe third party IPRs.”

- *Indemnity clause from claims based on Background IPRs*

Possible clause: “The provider shall indemnify and hold the procurer harmless from any claim exercised by any third party regarding an infringement due to their use of the Background IPRs.”

### **Foreground IPRs**

Foreground IPRs are the IPRs generated during the R&D&I activities. They might include the tangible (e.g. prototypes, micro-organisms, source code and processed earth observation images) and intangible results of a project. Results generated outside a project, i.e., before (Background IPRs), after (Postground IPRs) or in parallel (Sideground IPRs) with the PPI, do not constitute Foreground IPRs.<sup>4</sup> Regarding Foreground IPRs, following aspects shall be addressed by means of the corresponding statements:

- *Ownership, right to access and royalties*

Principle of sharing IPRs:

Possible clause: “Risks and benefits of the IPRs shall be shared between the provider and the procurer [...] pursuant to the provisions of this clause”.

<sup>4</sup> See European IPR Helpdesk: “What does ‘Foreground’ mean in an FP7 project?”, <<https://www.iprhelpdesk.eu/kb/47-what-does-foreground-mean-fp7-project>>, visited on Dec. 16th, 2016.

Possible clause: "Ownership of IPRs generated by the provider during and in the PPI will be assigned to the provider, and therefore the procurer hereto shall not have any ownership rights in connection with such IPRs".  
"The procurer will be assigned an irrevocable, unlimited, worldwide, fully paid-up, royalty-free, non-exclusive license until the expiry of the respective IPRs to use the IPRs protecting the results of the PPI with protection of claims of third parties, but exclusively for internal purposes".

- *Option B. IPRs co-owned by provider and procurer:*

Possible clause: "Ownership of IPRs generated by the provider during and in the PPI will be assigned to the provider and the procurer as co-owners. The procurer will own the IPRs protecting the results of the PPI to (one to twenty) per cent".  
"The provider will exploit and commercialize the IPRs. In exchange, the procurer will be assigned an irrevocable, unlimited, worldwide, fully paid-up, royalty-free, non-exclusive license until the expiry of the respective IPRs to use the IPRs protecting the results of the PPI with protection of claims of third parties, but exclusively for internal purposes".

- *Option B. Royalties (Optional):*

Possible clause: "In addition to the license defined above, the procurer will have the right to earn royalties to the sum of (xxx – not over five) per cent of the incomes obtained by the provider from the exploitation and commercialization of the IPRs resulting from the PPI."

- *ICT: Right to modify SW in favour of procurer, granting access to source code*

Possible clause: "The license in favor of the procurer shall include, as far as it is related to software, a right to immediate access to and to the development, modification, transformation or adaptation of the up-to-date source code."

- *Right to apply for and maintain of Foreground IPRs of provider*

Possible clause: "The provider has the right to apply for and maintain any IPRs which may derive from the PPI."

- *Duty to apply for and maintain of Foreground IPRs of the provider*

Possible clause: "The provider shall at his own expense be responsible for the application, examination, grant, maintenance, management and protection of the Foreground IPRs and in particular, but without limitation, he shall ensure that: the Results of the PPI are identified, recorded and carefully distinguished from the outputs of other R&D&I activities not covered by the PPI; prior to any publication on the PPI, patentable inventions arising from the PPI are identified, duly considered for patentability and, where it is reasonable to do so, patent applications in respect thereof are filed at the relevant Member State or European Patent Office; and all such patent applications are diligently executed and prosecuted having regard to all relevant circumstances."

- *Foreground IPRs call-back provision*

Possible clause: “In the event that the provider does not succeed to exploit the Foreground IPRs by himself within a maximum of three-year period after the end of the PPI, or he is using them to the detriment of the public interest, Foreground IPRs are returned back to the procurer, which shall pay the corresponding compensation. In this regard, the procurer may request information from the provider in order to confirm the effective and adequate exploitation of the Foreground IPRs.”

- *Wave to maintain Foreground IPRs*

Possible clause: “In the event that the provider wishes to waive the right to maintain Foreground IPRs, he shall notify the procurer at least six (6) months prior to expiration of the IPR title. The provider shall transfer the IPR in question to the designee of the procurer.”

- *Access rights to Foreground IPRs to third providers appointed by the procurer, including the extension of licenses of Foreground IPRs owned by third parties to third providers appointed by the procurer under special circumstances*

Possible clause: “Upon request of the procurer, the provider shall offer to any third provider designated by the procurer a non-exclusive license to use the Foreground IPRs under fair and reasonable conditions with consideration of the rights of other third parties that do not accrue to the ones of such providers.”

- *Right in favour of procurer to modify, by its own or by third providers, where convenient, goods and technologies resulting from IPRs*

- *Indemnity clause from claims based on Foreground IPRs*

Possible clause: “The provider shall indemnify and hold the procurer harmless from any claim exercised by any third party regarding an infringement due to their use of the Foreground IPRs.”

### ***Sideground IPRs and Postground IPRs***

Sideground IPRs are generated during the collaboration but in not-project related activities. Postground IPRs are generated in a certain time span after the collaboration.<sup>5</sup>

In any case, Sideground IPRs and Postground IPRs shall remain owned by the provider who generates the results. However, the provider shall grant access to the IPRs protecting side or late improvements of the R&D&I results of the PPI if needed to apply the solution developed in the PPI procedure. Further, he shall incorporate such improvements for free in the execution phase of the PPI.

<sup>5</sup> See European IPR Helpdesk: “What does ‘Foreground’ mean in an FP7 project?”, <<https://www.iprhelpdesk.eu/kb/47-what-does-foreground-mean-fp7-project>>, visited on Dec. 16th, 2016.

- *Ownership and Licence on Sideground and Postground IPRs*

Possible clause: "Ownership of IPRs generated by the provider beside and after the R&D&I activities in the PPI will be assigned to the provider, and therefore the procurer hereto shall not have any ownership rights in connection with such IPRs. The procurer will be assigned an irrevocable, unlimited, worldwide, fully paid-up, royalty-free, non-exclusive license until the expiry of the respective IPRs to use the Sideground and Postground IPRs with protection of claims of third parties, but exclusively for internal purposes".

- *Progress clause/value engineering*

Possible clause: "During the execution phase and without any price increase for the procurer, the provider shall introduce all technical improvements achieved beside or after the R&D&I activities".

## 2. CONFIDENTIALITY

Generally speaking, confidentiality is a relevant issue for providers and procurers in any public procurement procedure. But it is even more relevant in the case of PPI procedures, because of two reasons: On the one hand, a significant amount of sensitive information is flowing during the whole procedure; especially this is the case on trade secrets. On the other hand, sensitive technical information, in the form of “know-how” (which is a kind of trade secret), is one of the possible ways to protect the results of a PPI procedure.

Trade secrets, in the sense of Art. 2(1) of the Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016, on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure, “trade secrets” shall be defined as all information which meets all of the following requirements: (a) it is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question; (b) it has commercial value because it is secret; (c) it has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret.

Prior to deal with the regulation on confidentiality of the call for tender of a PPI procedure, it shall be noted that all activities oriented to identify needs and create technical dialogue shall be accompanied by specific confidentiality clauses, i.e., so called “Non-Disclosure-Clauses” (NDA); furthermore, the dissemination of useful information shall be done in a way which does not imply disclosure, the loss of trade secrets or novelty.

Focusing on the confidentiality issues of the call for tender, the non-disclosure obligations of both the procurer and the provider shall be addressed.

### **Non-disclose obligation of the procurer**

Apart from the obligations regarding privacy and personal data protection, the procurer has the obligation not to disclose confidential information communicated in the offers which has been identified as such by the bidders (Art. 21(1) Directive 24/2014). This obligation includes to keep secret the content of the offers before opening, and has to be fulfilled in the case of access by competitors to the contracting files, not granting access to the documents or the parts of the documents regarded as confidential.

- *Statement of confidential information contained in offers done by providers*

Possible clause: “The procurer shall in principle be bound by the following confidentiality obligations: In respect of any confidential information, especially trade secrets, that it may receive from the provider, the procurer undertakes to keep secret and strictly confidential and shall not disclose any such confidential information to any third party, except: (i) when expressly permitted in writing by the provider; (ii) to the employees, representatives, advisors or personnel of the procurer or any other entity who are actively and directly participating in the PPI; (iii) when required by the current regulations.”

Regarding exception (i) above, the procurer shall give the provider prior notice of the information he intends to share with third parties, before its disclosure. Where in the opinion of the provider, that information includes certain confidential information, they shall notify this circumstance to the procurer.

For this purpose, the provider shall identify the pieces of information regarded as confidential, not being valid an overall declaration of confidentiality of all information received by the procurer from the provider. In any case, it will be regarded as confidential only the information (documents, data sets, other information) that can be regarded as trade secrets and whose disclosure might be regarded as being against the legitimate interest of the provider and, hence, it can harm fair competition between undertakings.”

- *Motivation of awarding decisions*

Possible clause: “The procurer shall not disclose award data well-founded identified as confidential information and whose disclosure might be regarded as being against the legitimate interest of the provider and, hence, it can harm fair competition between undertakings”

**Non-disclose obligation of the provider and his collaborators**

The provider and his collaborators (i.e., subcontractors) have confidentiality obligations, too. Regarding the execution phase of the PPI, these obligations can be concreted as follows:

Possible clause: “The provider and his collaborators have the obligation not to disclose any facts, information, documents or other pieces of information they have access and know because of the execution of the PPI as established by the procurer. This obligation shall be fulfilled during the execution of the PPI and xxx (from two to five) years after finishing the execution of the PPI.

The provider and his collaborator shall properly inform to their employees of the obligation not to disclose, not to communicate or not to sell or transfer any information they have access or know because of their task for the execution of the procurement. Where necessary, the provider and his collaborators shall sign with their employees the corresponding Non-Disclosure Agreement in order to grant the fulfilment of this obligation.

Neither the provider nor his collaborators can keep any documents or information gathered because of the execution of the procurement; in any case, they cannot use such information to any other purpose different to the execution of the procurement. In case of breach of this obligation, the provider and his collaborators will be civil and criminal liable.”

## V. FINANCING MODELLING

A financial assessment is a tool that aims at evaluating the economic viability of an investment. It consists of evaluating the financial condition and operating performance of an investment and forecasting its future condition and performance. Thus, financial assessment is a suitable tool for public procurers to analyze the financial feasibility of an investment during the procuring process from the investment planning up to the award stage and to analyze several project alternatives in order to identify the best scenario or solution.

The elements to include in a financial assessment vary widely according to the type of the investment. In general terms, the main elements to be included in a financial assessment of any investment are the total capital requirements, equity and credit needs and the expected costs and returns of various alternatives. In the case of waste sector, the Guide to Cost-Benefit Analysis of Investment Projects identifies typical elements that could be included in a project investment.

Typical investment costs of waste management projects
<ul style="list-style-type: none"> <li>✓ civil works (including operational buildings, tanks, access ways, etc.)</li> <li>✓ plant and machinery</li> <li>✓ equipment and installations</li> <li>✓ trucks for collection, (re)loading and transport of waste</li> <li>✓ waste bins and containers</li> </ul>
Typical operating cost items of waste management investments
<p><i>Variable costs</i></p> <ul style="list-style-type: none"> <li>✓ energy (electricity, heat)</li> <li>✓ fuels, materials and other consumables</li> <li>✓ emission fees (for emissions to air and water)</li> <li>✓ disposal of waste outputs produced in waste treatment facilities (only in case of projects dealing with individual components of a larger waste management system)</li> <li>✓ transportation costs</li> </ul> <p><i>Fixed costs</i></p> <ul style="list-style-type: none"> <li>✓ technical and administrative personnel</li> <li>✓ maintenance and repair</li> <li>✓ insurance</li> <li>✓ services</li> </ul>
Typical sources of revenues
<ul style="list-style-type: none"> <li>✓ the application of charges to users, either in the form of collection and disposal fees or taxes;</li> <li>✓ the sale of sub-products such as compost, recycled materials, refuse-derived fuel or solid-recovered fuel;</li> <li>✓ the sale of the energy recovered such as heat and electricity, including, as the case may be, green certificates or bonuses for electricity produced from renewable waste fractions.</li> </ul>

**Table 1.** Typical elements in an investment project on waste management. **Source.** Guide to Cost-Benefit Analysis of Investment Projects - Economic appraisal tool for Cohesion Policy 2014-2020. Directorate-General for Regional and Urban policy of the European Commission, 2014.

The financial and economic viability of an investment usually is assessed by means of the **Net Present Value (NPV)** and the **Internal Rate of Return (IRR)**. For instance, both financial indicators are suggested by the Guide to Cost-Benefit Analysis of Investment Projects - Economic appraisal tool for Cohesion

Policy 2014-2020, published by the Directorate-General for Regional and Urban policy of the European Commission.

In the table below, an example of financial analysis is given for a semi-automatic material recovery facility where plastic films are removed by hand at the start of the sorting process and then Polyethylene Terephthalate (PET) and High Density Polyethylene (HDPE) bottles and mixed rigid containers are identified and separated automatically by Near Infra-Red (NIR) sorting technology.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Base Calculations</b>											
<b>Operating Parameters (tonnes)</b>											
% maximum throughput achieved		70%	80%	95%	100%	100%	100%	100%	100%	100%	100%
Total mixed plastic throughput		1,488	1,701	2,02	2,126	2,126	2,126	2,126	2,126	2,126	2,126
PET recovered		434	496	589	620	620	620	620	620	620	620
HDPE recovered		228	260	309	325	325	325	325	325	325	325
Other Rigid Plastics		297	339	403	424	424	424	424	424	424	424
Films recovered		235	268	319	336	336	336	336	336	336	336
Waste to landfill		294	336	400	421	421	421	421	421	421	421
Mixed plastic landfill diversion		80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Useful plastic output from mixed plastic input		1,194	1,364	1,620	1,705	1,705	1,705	1,705	1,705	1,705	1,705
<b>Unit prices (£/te)</b>											
Equivalent commercial MRF gate fee		£32	£40	£48	£56	£60	£64	£68	£72	£76	£80
PET		£200	£200	£200	£200	£200	£200	£200	£200	£200	£200
HDPE		£250	£250	£250	£250	£250	£250	£250	£250	£250	£250
Other Rigid Plastics		£40	£40	£40	£40	£40	£40	£40	£40	£40	£40
Films		£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
<b>MRF landfill cost assumption</b>											
Landfill tax escalator			£8	£8	£8	£4	£4	£4	£4	£4	£4
Tax element		£40	£48	£56	£64	£68	£72	£76	£80	£84	£88
Landfill void element		£10	£10	£10	£10	£10	£10	£10	£10	£10	£10
Transport element		£8	£8	£8	£8	£8	£8	£8	£8	£8	£8
MRF landfill cost assumption		£58	£66	£74	£82	£86	£90	£94	£98	£102	£106
<b>Incremental income from additional mixed</b>											
Gate Fee		47,619	68,027	96,939	119,04	127,55	136,05	144,55	153,06	161,56	170,0
PET		99,537	99,537	99,537	99,537	99,537	99,537	99,537	99,537	99,537	99,53
HDPE		65,209	65,209	65,209	65,209	65,209	65,209	65,209	65,209	65,209	65,20
Other Rigid Plastics		13,605	13,605	13,605	13,605	13,605	13,605	13,605	13,605	13,605	13,60
Films		0	0	0	0	0	0	0	0	0	0
Total Product Sales		178,351	178,35	178,35	178,35	178,35	178,35	178,35	178,35	178,35	178,3
<b>Total income</b>		225,970	424,72	453,64	475,75	484,25	492,75	501,26	509,76	518,26	526,7
Income/te recovered (inc net landfill diversion)		175	295	262	259	263	267	271	275	279	283
<b>Incremental operating costs for new equipment</b>											
Sorter all-in wage cost		85,680	97,920	116,28	122,40	122,40	122,40	122,40	122,40	122,40	122,4
Fuel for mobile plant		2,083	2,381	2,827	2,976	2,976	2,976	2,976	2,976	2,976	2,976
Other costs		1,488	1,701	2,020	2,126	2,126	2,126	2,126	2,126	2,126	2,126
Film baler wire cost		705	805	957	1,007	1,007	1,007	1,007	1,007	1,007	1,007
Bottle/rigid baler wire cost		3,835	4,383	5,205	5,479	5,479	5,479	5,479	5,479	5,479	5,479
Film baler power cost		216	247	293	309	309	309	309	309	309	309
Bottle/rigid baler power cost		844	964	1,145	1,205	1,205	1,205	1,205	1,205	1,205	1,205
Baseload + NIR op power cost		3,699	4,227	5,019	5,284	5,284	5,284	5,284	5,284	5,284	5,284
Extra management cost		30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Landfill disposal cost		17,077	22,208	29,569	34,490	36,172	37,854	39,537	41,219	42,902	44,58
Maintenance cost		29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000
Lease cost (£20/month/'000 over 5 years)		139,200	139,20	39,200	39,200	139,20	7,840	7,840	7,840	27,840	27,84
<b>Total costs</b>		284,826	333,03	361,51	373,47	375,15	265,48	267,16	268,84	270,52	272,2
<b>Operating Cash Flow</b>		-58,856	91,693	92,127	102,27	109,09	227,27	234,09	240,91	247,74	254,5
Processing cost/te recovered (excludes landfill)		224	228	205	199	199	133	133	133	133	133
Margin/te recovered		- £49	£67	£57	£60	£64	£133	£137	£141	£145	£149
<b>Capital Expenditure</b>											
Equipment, buildings and working cap funded by Plant (funded by Lease)		0	0								
Picking station mods		10,000									
NIR sorters for 3 materials		300,000									
Conveyors and feeders		150,000									
Baler for rigids		30,000									
Baler for film		30,000									
Balers for PET and HDPE		60,000									
		580,000	0	0	0	0					
Net Cash Flow		-	91,693	102,27	227,27	240,91	254,56				
Cumulative Cash Flow		-	-547,162	-	-	458,63	960,93				
<b>10 yr IRR (Internal Rate of Return)</b>											
<b>NPV (Net Present Value)</b>											
											9,813

**Table 2.** Financial analysis for a semi-automatic material recovery facility. **Source:** WRAP, 2009, Financial modelling and assessment of mixed plastic separation and reprocessing (WRAP project MDP021. Report prepared by Axion Consulting)

## The new Directive on Public Procurement

The new Directive on Public Procurement<sup>6</sup> introduces several novelties that aim to increase the efficiency of public spending, facilitating public procurement of innovation and to enable procurers to make better use of public procurement in support of common societal goals.

Some of these novelties are linked to matters that can influence the way on how to address financial assessment of an investment. In the light of this context, this report aims to provide guidelines on how to address those matters as part of financial assessment and particularly focuses on the available instruments to support public procurement of innovation, the definition of the cost elements as well as the evaluation of different scenarios in order facilitate the award of tenders.

# 1. AVAILABLE INSTRUMENTS TO SUPPORT PUBLIC PROCUREMENT OF INNOVATION

In order to make a financial modelling assessment, it is necessary to follow different steps, as previously mentioned, and one of these preliminary steps is to conduct an analysis of specific available financial instruments at potential public buyers' disposal, both at national and international level, that could permit them to finance a public procurement of innovation.

In this sense, specific instruments which support innovation from both demand and offer sides have been analyzed as potentially usable for a PPI in waste management.

On one hand, national instruments that support innovation from both sides are analyzed for PPI4Waste pilot partners, and on the other hand, the instruments available at European scale and the effort on synergies among EU financing instruments currently implemented to get innovation into the market.

In Spain, funding for innovation procurement comes from structural funds, as well as specific allocations in budget, whereas in Croatia, the support from central government to finance R&D solutions and projects is lower than in the rest of Member States. In Croatia, most funds for solutions in public procurement are mainly focused on Green Public Procurement (GPP), rather than PPI and PCP, including support for GPP in energy efficiency, sustainable construction, and public traffic, as well as capacity building in GPP. In addition, the country does not have at this moment a specific financial support/instrument available to conduct innovation procurement. Innovation procurement is often associated with higher-than-usual costs (whether perceived or real). Aside from a sufficient level of funds, countries expressed the need for dedicated funds to be used specifically for innovation procurement.

To offer a broader picture of financial instruments/possibilities for procurement of innovation, both European strategies on synergies and articulation of EU funds and the specific Spanish case as good practice of implementation of support measures from the Central Government to leverage the innovation from demand side are analyzed in this section.

### European Level

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<sup>6</sup> DIRECTIVE 2014/24/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.

In the European Union, strategies on optimization of synergies among different funds have been designed in order to ensure and maximize the effects of public funding for innovation and competitiveness.

Different scenarios are possible to fund PPI/PCP actions, aiming at systematizing the practice among Member States, either jointly and/or making use of different funding sources.

Dedicated funds have been directly addressed for example by the PCP and PPI funding in Horizon 2020 offered by the European Commission, with 20% cofund for PPI and 70% cofund for PCP. These PPI/PCP Cofund actions require transnational collaboration, coordinated strategy among procurers and common needs appraisal.

Apart from dedicated funds such as PPI/PCP Cofund actions under H2020, EU funds, notably European Structural Investment Funds<sup>7</sup> (ESI Funds), managed by the countries themselves can play a role in fostering the uptake of PPI in the following main focus areas:

- research and innovation
- digital technologies
- supporting the low-carbon economy
- sustainable management of natural resources
- small businesses

Indeed, a strategic implementation of a PCP and/or PPI should take place in the framework of a holistic approach that involves R&I to achieve the goals set for the development of each region mainly reflected through their Smart Specialization Strategy and provide clear impact on competitiveness, job creation and growth.

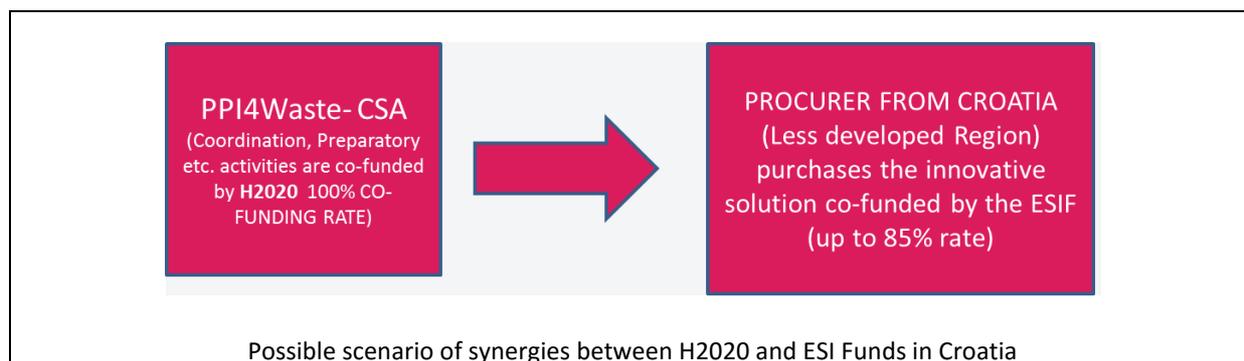
Thus, Smart specialization strategies will set out the frameworks for investments for growth and competitiveness not only from ESIF funds, but also from all funding sources available, which permit better synergies with H2020 programme, for example, or other European Territorial Cooperation Programmes. In this sense, operational programmes can be complemented with coordination, consortium building, networking and preparation activities emerged from H2020, which could be the case for PPI4Waste pilot partners for instance.

In order to activate and achieve synergies at all levels, and to overcome barrier on availability of financial instruments and PPI uptake, it is necessary to start with awareness and deep understanding of opportunities offered by the different programmes, aligning the smart specialization strategies, EU strategies and action plans.

The following box represent a possible scenario for a PPI in waste management for PPI4Waste Pilot partners, for example in Croatia, which is eligible for EUR 8,6 billion under the European Regional Development Fund, the Cohesion Fund and the European Social Fund, among which one of the main prioritized sector is **waste management**.

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<sup>7</sup> ESI Funds include ERDF European Regional Development Funds, ESF European Social Funds, Cohesion Funds, EAFRD European Agricultural Fund for Rural Development, EMFF European Maritime and Fisheries Fund



In the context of synergies among EU funds, such as illustrated in the possible scenario, projects have to respect some basic principles and concepts in order to be managed in a coherent manner. A project (understood as a set of operations that can include different contracts/grant agreements), has to take into account the following basic rules:

**Combined funding of ESIF programmes and Horizon 2020:**

- NO substitution of national/regional or private co-funding to EU projects/programmes under direct Commission management by ESIF money (and vice versa).
  - NO double financing: in no circumstances shall the same costs be financed twice by any budget.
- Synergies among programmes: Synergies mean joint or coordinated efforts to achieve greater impact and efficiency, not only combining ESIF and Horizon 2020 money in the same project!

**Synergies can be achieved through:**

- Bringing together Horizon 2020 and ESIF money in the same project (that could be a single action or a group of coordinated actions/operations, but always provided that there is no double funding of the same expenditure item) in view of achieving greater impact and efficiency<sup>10</sup>;
- Successive projects that build on each other or;
- Parallel projects that complement each other.
- ESIF programmes could also be designed and implemented<sup>11</sup> to take up high quality project proposals from Horizon 2020 or other centrally managed programmes, for which there is not enough budget available in the respective programmes.

Table: Basic principles and concepts for synergies<sup>8</sup>

**National Level**

The tendency to enable synergies between European funds is currently confirmed since the Horizon 2020 reinforces the co-financing for European public procurers that address common challenges by undertaking PCPs or PPIs. In addition, the 2014-2020 programming period has created new opportunities for synergies in the use of ESI funds and Horizon 2020 funds to co-finance PCPs and PPI projects. The example developed in this section is taken from the Spanish case since Spain is directly involved as Pilot partner in the project. In fact, there are other success practices in the EU which

<sup>8</sup> Source: [http://ec.europa.eu/regional\\_policy/sources/docgener/guides/synergy/synergies\\_en.pdf](http://ec.europa.eu/regional_policy/sources/docgener/guides/synergy/synergies_en.pdf)

show the direct link between supporting measures impulsed and articulated by central purchasing bodies to higher levels of implementation of PPI/PCP of Member States.

In Spain, the vast majority of PPI procedures are co-funded by European Regional Development Fund (ERDF) programmes, as this will be detailed in the example of the Spanish case, highlighting the role of EU funds in fostering innovation, but not only, since the Spanish case illustrates the key role of the Government, which articulates specific instruments to support and generate PPI/PCP procedures from both offer and demand side

The aggregation of both the role of central purchasing bodies as leading actors allied with the use of EU funds are key for the commitment to implementing strategic of public procurement in Spain.

### Example of the Spanish Case

As previously mentioned, in Spain, funding for innovation procurement comes from structural funds, as well as specific allocations in budgets. The current Programme 2014-20 allocates EUR 300 million within the pluri-regional Programme for innovation procurement. To reach the target of 3%, the Ministry of Economy and Competitiveness (MINECO) and the Centre for the Development of Industrial Technology (CDTI) developed a set of elements to promote innovation procurement and support the implementation of the legal framework.

Importantly, two funding instruments for PPI called INNODEMANDA and INNOCOMPRA were set up to promote innovation from demand side and SME's participation in public tenders of innovation.

INNODEMANDA consists in funding the cost of R&D of an economic operator, whereby the contracting authority and the supplier enter in an agreement about performance, deadline and other conditions, whereas INNOCOMPRA supports regional public bodies to generate PPI procedures.

The INNOCOMPRA programme, implemented through FID (Fostering Innovation through Demand) Agreements, directly targets Public buyers. This programme uses EU Structural Funds, ERDF, to co-finance innovation procurements at regional level. For this, co-ordination between national and regional administrations is essential, either for promotion of innovation procurement or for complementing financial support mechanisms (EU Structural Funds, ERDF). **INNOCOMPRA may finance projects** for the construction of R&D infrastructures, R&D projects as such, and projects of an environmental nature, with expenditures considered to be eligible, for example, supply of innovative goods and services that is to say with characteristics that are not commercialized at large scale in the market.

Conditions:

- Eligible expenditures: development, validation and testing; preparation costs, management, evaluation of bidders
- Share of innovative solutions has to represent at least 70% of the financed budget
- Budget of the operation above Eur 5M

## 2. THE DEFINITION OF THE COST ELEMENTS

The Directive on Public Procurement introduces the concept of most economically advantageous tender which means that public authorities shall use a cost-effectiveness approach, such as life-cycle costing, to assess the price or cost of supplies or the remuneration of services. In this way, life-cycle costing approach appears as a new approach that shall be used for public bodies in the identification of the element cost of any investment.

The Article 68 of the Directive establishes that life-cycle costing shall, when relevant cover parts or all of the following costs over the life cycle of a product, service or works:

**(a)** costs, borne by the contracting authority or other users, such as:

- (i) costs relating to acquisition,
- (ii) costs of use, such as consumption of energy and other resources,
- (iii) maintenance costs,
- (iv) end of life costs, such as collection and recycling costs

**(b)** costs imputed to environmental externalities linked to the product, service or works during its life cycle, provided their monetary value can be determined and verified; such costs may include the cost of emissions of greenhouse gases and of other pollutant emissions and other climate change mitigation costs.

In addition, in order to ensure transparency and equal treatment, the Directive entails procurers to ensure that the rules for LCC calculation are clear in tender documents, providing that the method has to be based on objectively verifiable and non-discriminatory criteria.

In order to facilitate a wide application of life-cycle costing, the European Commission commissioned a study<sup>9</sup> aiming to develop a **life cycle costing calculation tool**. The tool provides a calculation instrument of direct and indirect costs for a number of electricity-using products.

On the other hand, the Directive establishes that whenever a common method for the calculation of life-cycle costs has been made mandatory by a legislative act of the Union, that common method shall be applied for the assessment of life-cycle costs. Nevertheless, this approach remains quite rare within the public sector procurement. Currently, the only one case is the Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles.

In the case of public procurement of innovation, there are several peculiarities that should be considered when applying life cycle costing for financial assessment, which are described as follows:

### **Public procurement of innovations process may entail research tasks**

PPI can include R&D in the contract although it should not represent the major part of the contract. In this sense, on one hand, R&D can then be a cost element to be evaluated in the financial assessment phase, and on the other hand, innovation can be one of the potential awarding criteria in a PPI in waste management. Indeed the Directive 2014/24/UE determines that the most economically advantageous tender can be assessed based on criteria that can include innovative characteristics of the solution.

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<sup>9</sup> [http://ec.europa.eu/environment/gpp/pdf/LCC\\_tool\\_user\\_guide\\_final.pdf](http://ec.europa.eu/environment/gpp/pdf/LCC_tool_user_guide_final.pdf)

Innovation criteria could involve, for example:

- R&D content necessary to be included during the execution of the contract
- Volume or percentage of R&D dedicated to the development and design of the solution to adequate it to procurer's needs in the contract

In this case, the R&D content shall be evaluated and monetized when possible, bearing in mind that the assessment of cost will be based on objectively verifiable and non-discriminatory criteria.

### **Public procurement of innovation is based on “buy functional requirements or specifications”**

Public procurement of innovation is based on “buy functional requirements or specifications” whereas in common public procurement the technical characteristics of products or services are usually highly specified in tenders. This is a highly relevant matter in applying life cycle costing and in financial assessment because the procurer would not know the full technical characteristics until providers deliver their offers and then it is difficult to identify the whole cost elements until that stage.

#### The case of the pilot project of Mancomunidad del Sur – Plastic packaging separation

Plastic packaging separation in sorting plants is a practice widely implemented in European countries that have separate collection systems for light packaging. As consequence, the configuration of sorting processes and equipment is, generally speaking, standardized, usually, according to the treatment capacity. In this way, in a common procurement tender the technical characteristics of process and equipment should be described in-depth. However, in a public procurement of innovation process, the need (object of the contract) should be expressed on the basis of functional requirements in order to not limit the ability and creativity of potential suppliers to provide innovative solutions to the challenge<sup>10</sup>.

As far as response to the tender is concerned, two main possibilities may happen: The market may offer either **incremental innovations** or **disruptive innovations**, to meet the functional requirements and performance characteristics established by the buyer.

In the case of an incremental innovation, the market may offer an innovative system based in the “existing standardized processes”. In this way, innovation may be, for instance, about:

- Innovative software tools governing one or several stages of plastic sorting using advance algorithms in order to optimize the performance of the whole process.
- Innovative solutions to solve some weakness of the current sorting systems. In this way, and according to the deliverable D2.4 State of the Art of Emerging Solutions, some innovations may be addressed to enable the identification of black plastic, packaging labelled, dirty packaging, etc. by means of novelty methods.

On the other hand, the market could offer a disruptive innovative solution further of the existing “standardized” processes.

For each case, the life cycle cost analysis would be quite different and it will not be possible to construct a model until the procurer knows the full technical characteristics of each option.

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<sup>10</sup> Edquist, C. & Zabala-Iturriagagoitia, J.M. 2012. Public Procurement for Innovation as Mission-Oriented Innovation Policy. Research Policy 2012; 41. 1575-1769.

Following, an approach to assess the life cycle cost of “innovative NIR equipment” is drawn, representing an incremental innovation of the current solution used, where direct costs through the life cycle phases have been identified. NIR equipments are electrical equipment, based on optical technology, which enables plastic packaging and other plastic wastes to be separated by type<sup>11</sup>, similar to the pilot case of Mancomunidad del Sur.

### Direct cost

Not all categories of cost will be relevant for every contract; depending on the type of contract, whether it is a supply or service contract, and its duration. Type of contract will determine cost categories; once the needs are identified, cost categories can be assessed in the different life cycle phases, in order to take a broad and long-term view of value for money of the investment.

<i>Life Cycle Phases</i>	<i>Direct cost</i>
<i>Acquisition</i>	Purchase Price Administrative/Engineering Installation Training Conversion Transportation
<i>Use</i>	Direct Labour Utilities Consumables Waste-handling Lost Production Spare Parts Maintenance
<i>Maintenance</i>	<u>Scheduled Maint.Cost</u> Material & Labor Costs Cost of PM Schedules Cost of Repair Fixed Labor Cost For Brkdn Life of Equipment  <u>Unscheduled Maint. Cost</u> Material & Labor Costs Unscheduled Brkdn. Costs Average Cost of Repair Cost of Repair Parts/Year Life of Equipment
<i>End of life</i>	Conversion Costs Decommission Costs Salvage Costs Cleaning of Site Waste/By-product Disposal

**Table 3.** Identification of direct cost through the life cycle phases of process equipment<sup>12</sup>.

<sup>11</sup> WRAP, 2010, Good Practice Guidance - Near Infrared sorting of household plastic packaging (WRAP project MDP033. Report prepared by Axion Consulting)

<sup>12</sup> Adapted from Life Cycle Cost & Reliability for Process Equipment. H. Paul Barringer. 8th Annual ENERGY WEEK Conference & Exhibition. Houston, Texas, January 28-30, 1997.

### Costs imputed to environmental externalities

The estimation of cost of environmental externalities is a complex process that entitles the **identification of environmental impacts** as well as its **monetization**. This task could acquire special complexity in public procurement of innovation where the environmental performance of innovations could be less known in comparison with solutions widely implemented. The table below describes several initiatives and tools that could be useful for purchasers when exploring the way to identify and monetize the environmental externalities of products or service, in view to consider a PPI in waste management.

<p><i>Product Category Rules (PCRs)</i></p>	<p>Product category rules constitute the framework for estimating and reporting product life cycle environmental impacts, typically in the form of environmental product declarations (EPD) and product carbon footprints. Nowadays, a large number of PCRs have been developed by several national and international initiatives for a variety of products some of them related to “Electrical machinery and apparatus”.</p>
<p><i>Environmental Products Declarations (EPD)</i></p>	<p>According to the International Standard Organization (ISO), the environmental products declarations (EPD) present <b>quantified environmental information on the life cycle of a product</b> to enable comparisons between products fulfilling the same function. Such declarations;</p> <ul style="list-style-type: none"> <li>✓ are provided by one or more organizations,</li> <li>✓ are based on independently verified life cycle assessment (LCA) data, life cycle inventory analysis (LCI) data or information modules in accordance with the ISO 14040 series of standards and, where relevant, additional environmental information,</li> <li>✓ are developed using predetermined parameters, and</li> <li>✓ are subject to the administration of a programme operator, such as a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization.</li> </ul>
<p><i>Product Environmental Footprint (PEF)</i></p>	<p>The Product Environmental Footprint (PEF) is a multi-criteria measure of the environmental performance of a good or service throughout its life cycle. PEF information is produced for the overarching purpose of helping to reduce the environmental impacts of goods and services. European Commission published at 2013 the Guide that provides a method for modelling the environmental impacts of the flows of material/energy and the emissions and waste streams associated with a product throughout its life cycle. One of the of this guide is to establish a common methodological approach to enable Member States and the private sector to assess, display and benchmark the environmental performance of products, services and companies based on a comprehensive assessment of environmental impacts over the life-cycle.</p>

<i>Green Public Procurement (GPP) criteria</i>	GPP criteria are environmental criteria that address environmental impacts and are designed to be used in procurement procedures. GPP criteria identify under life-cycle approach the main environmental impact for a group of products or services.
<i>Environmental Technology Verification</i>	ETV is neither a label nor a certification scheme; it ensures that the claims are as structured and complete as possible so as to present a clear assessment of the entire technology's potential and value, but it does not evaluate the technology's performance against standard or pre-defined criteria. The information provided, in the form of a Statement of Verification, gives the possibility for direct and objective comparison between different technologies reducing the risk on adopting new technologies and encouraging informed and sound investments.
<i>Life cycle costing calculation tool</i>	The main feature of this tool is the evaluation of direct costs throughout the product life cycle in support of public procurement procedures. The tool provides, in addition to direct costs, <b>complementary information on the evaluation of environmental externalities (indirect costs)</b> . The tool has been developed in line with <b>Art. 68 of Directive 2014/24/EU</b> . The <b>evaluation of environmental externalities</b> is limited to the <b>use phase</b> of products; therefore, the tool does not provide comprehensive and life-cycle based information on the environmental profile of such products.
<i>Guide - The Economic Appraisal of Investment Projects at the EIB</i>	This guide presents the economic appraisal methods that the EIB (the Bank) uses in order to assess the economic viability of projects. This guide includes a section which briefly summarises the Bank's approach to date towards integrating environmental externalities into its economic appraisal techniques. It presents the <b>unit values of environmental externalities</b> currently used by the Bank as well as the main methodology through which <b>environmental externalities have been integrated into project appraisal at the Bank</b> .

**Table 4.** Useful initiatives and tools to identify and monetize the environmental externalities of products or service in view to a PPI in waste management<sup>13</sup>

In the next paragraphs, the key aspects to be taken into account in order to conduct an environmental assessment in each of the life cycle phases are described at general level, aiming at monetizing the environmental externalities **of electrical machinery and apparatus** such as an NIR equipment, which could be the example of potential incremental innovation close to the example of object of the contract proposed by Mancomunidad del Sur.

### Manufacturing / Production

As the technical specifications of the LCC tool commissioned by the Commission points out, considerable efforts would be necessary in order to get good data, avoiding uncertainties, on manufacturing of purchased products. This fact represents a risk when environmental assessment aims to compare products, negatively affecting tendering procedure because of the difficulty to

<sup>13</sup> Prepared by the authors.

verify this kind of information (in the current version of the tool, the calculations of externalities related to manufacturing are not available).

In case procurers are trying to assess environmental impact of the manufacturing stage they may use the following tools in order to get information about environmental externalities of products and its monetization.

**Useful tool to identify environmental impacts:** PCR, EPD, PEF, Green Public Procurement (GPP) criteria.

**Useful tool to monetize environmental impacts:** Life cycle costing calculation tool references, Guide - The Economic Appraisal of Investment Projects at the EIB.

### Use and maintenance

LCA studies on plastic packaging waste identify energy consumption as one of the main environmental aspects in sorting plants. This is because sorting plants processes entire the use of a number of equipments, the majority of which are energy related products/equipments. NIR equipments are one of these types of equipments which contribute significantly along their phase of use to the environmental impact of sorting plants. In this way, externalities associated to energy consumption should be the main aspect to be considered in the phase of use. Additionally, externalities associated to consumables should be assessed if relevant.

The following tools can be used by procurers in order to get reliable information about the stage of use and maintenance of products and its monetization.

**Useful tool to identify environmental impacts:** PCR, EPD, PEF, Green Public Procurement (GPP) criteria.

**Useful tool to monetized environmental impacts:** Life cycle costing calculation tool references, Environmental Technology Verification.

### **End of life**

The end of life stage is, together with manufacturing, the life cycle stage where more relevant uncertainties can be produced in environmental assessment. In this case, one of the main reasons of uncertainties is because the future processes are unknown as consequence of continuous innovation in waste technologies and management.

The following tools can be used by procurers in order to try to get reliable information about the stage of end of life of products and its monetization.

**Useful tool to identify environmental impacts:** PCR, EPD, PEF, Green Public Procurement (GPP) criteria.

**Useful tool to monetized environmental impacts:** Life cycle costing calculation tool references, Environmental Technology Verification.

### 3. EVALUATION OF DIFFERENT INVESTMENT SCENARIOS

Once environmental impact and the approach to monetize it have been assessed, public procurers will evaluate different investment scenarios for waste management procurement.

For this purpose, the calculation of the Net Present Value is considered the main technique for evaluating the different alternatives of an investment project<sup>14</sup>.

The net present value (NPV) represents the present amount of the net benefits (i.e. benefits less costs) flow generated by the investment expressed in one single value with the same unit of measurement used in the accounting tables and enable the integration of environmental externalities into the financial assessment. Following it is shown an example from European Bank of Investment in integrating environmental externalities into NPV.

The guide **Economic Appraisal of Investment Projects at the EIB**<sup>15</sup> described in a simplistic way an example about the method used by the EIB in integrating environmental externalities of road, rail and urban transport projects appraised by the Bank.

To simplify matters, the example assumes a single pollutant (carbon), associated only with the operating phase of a project.

The net present value (NPV) of the investment is given by:

$$NPV(r) = \sum_{t=1}^T \frac{B_t - C_t - EXT_t}{(1+r)^t} - C_0$$

Where:

$C_0$  = capital investment in year zero

$B_t$  = benefits (B) over the life of the asset (to year T)

$C_t$  = net of fixed and variable operating costs

$r$  = discount rate

$EXT_t$  = external cost. In this case:

$$EXT_t = V_t \times E_t$$

in which i.e. the annual emissions (E) multiplied by the value (in euros) per unit of emissions (V).

In this way, by means of NPV calculation, procurers can compare alternatives within and investment project projects under a life cycle approach including environmental externalities when possible. Following it is shown an example from the LIFE CYCLE COST HANDBOOK Guidance for Life Cycle Cost Estimation and Analysis about the usefulness of NPV in comparing alternatives of investment.

<sup>14</sup> LIFE CYCLE COST HANDBOOK - Guidance for Life Cycle Cost Estimation and Analysis.

<sup>15</sup> The Economic Appraisal of Investment Projects at the EIB. Projects Directorate, 2013.

The example given by the Life Cycle Cost Handbook - Guidance for Life Cycle Cost Estimation and Analysis compares two projects, Project A and Project B, that are described as production facilities which provide an equally acceptable product over a 20-year useful life.

Project B requires a shorter and less expensive construction span, but runs at a higher operating cost, is expected to be more expensive to disposition (i.e., develops a higher environmental liability), and has no salvage value. Project B yields an excess capacity than can generate \$5 million per year revenue stream.

Capital Project A							
Element	Estimated Cost						
Capital Project Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Project Management	6,000,000	7,000,000	8,000,000	5,000,000	2,850,000	-	28,850,000
Design	25,000,000	15,000,000	-	-	-	-	40,000,000
Procurement	5,000,000	20,000,000	5,000,000	-	-	-	30,000,000
Construction	-	15,000,000	40,000,000	85,000,000	30,000,000	-	170,000,000
Title III	-	-	3,000,000	3,000,000	2,500,000	-	8,500,000
Transition to Ops	-	-	-	5,000,000	35,000,000	-	40,000,000
	36,000,000	57,000,000	56,000,000	98,000,000	70,350,000	-	317,350,000
<b>Operations and Maintenance Cost</b>							
Annual O&M (Assume 20 years @ \$50,000,000/year)						50,000,000	1,000,000,000
Periodic Capital Replacements (Assume \$20,000,000 each in year 10, 15, and 20)						-	60,000,000
<b>Final Disposition Cost</b>							
Deactivation/Decommissioning in year 26							50,000,000
Salvage Value							(5,000,000)
<b>Total-Life Cycle Cost (net of all costs less salvage value)</b>							<b>1,422,350,000</b>
Capital Project B							
Element	Estimated Cost						
Capital Project Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Total	
Project Management	3,500,000	7,000,000	5,500,000	-	-	16,000,000	
Design	17,000,000	13,000,000	-	-	-	30,000,000	
Procurement	4,000,000	15,000,000	-	-	-	19,000,000	
Construction	-	60,000,000	70,000,000	-	-	130,000,000	
Title III	-	4,000,000	3,000,000	-	-	7,000,000	
Transition to Ops	-	-	-	30,000,000	-	30,000,000	
	24,500,000	99,000,000	78,500,000	30,000,000		232,000,000	
<b>Operations and Maintenance Cost</b>							
Annual O&M (Assume 20 years @ \$58,000,000/year)					58,000,000		1,160,000,000
Periodic Capital Replacements (Assume \$20,000,000 each in operating year 7 and 14)					-		40,000,000
<b>Revenue</b>							
Annual income from excess production					(5,000,000)		(100,000,000)
Assume \$5M/year for operating life of plant							
<b>Final Disposition Cost</b>							
Deactivation/Decommissioning							95,000,000
Salvage Value							-
<b>Total-Life Cycle Cost (net of all costs less revenue)</b>							<b>1,427,000,000</b>

According to the Handbook a simple comparison of life-cycle cost indicates the alternatives are nearly equivalent, although Project A appears to be the more desirable from a cost standpoint, \$1,422,350,000 for Project A versus \$1,427,000,000 for Project B. However, comparing capital project A and B on an NPV basis Project B becomes the best cost alternative on a NPV basis, \$920,113,000 to \$922,670,000, as shown in the above table.

In a context of strong restrictions of public budgets, and encouragement of launching innovation on the market, public procurers are expected to look for financial efficiency of the innovation purchased, and provide to procure needs reducing overall costs. In this sense, life cycle costing allows a more realistic appraisal of the total cost of a solution, as shown in the different examples in this section, making necessary a previous appraisal of environmental impact and approach for its monetization.