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**COMMISSION STAFF WORKING DOCUMENT**

**EVALUATION**

# Ex post evaluation of major projects in environment financed by the European Regional Development Fund and the Cohesion Fund between 2000 and 2013

{SWD(2020) 44 final}

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## GLOSSARY

| LIST OF ABBREVIATIONS | |
|---|---|
| B/C ratio | Benefit/cost ratio |
| CBA | Cost-benefit analysis |
| BWD | Bathing Water Directive |
| CF | Cohesion Fund |
| CPR | Common Provisions Regulation |
| DG REGIO | Directorate-General for Regional and Urban Policy |
| DWD | Drinking Water Directive |
| EC | European Commission |
| EIA | Environmental Impact Assessment |
| EIB | European Investment Bank |
| ENPV | Economic net present value |
| ERDF | European Regional Development Fund |
| ESIFs | European Structural and Investment Funds |
| ERR | Economic rate of return |
| EU | European Union |
| FNPV/C | Financial net present value of the investment |
| FNPV/K | Financial net present value of national capital |
| FRR/C | Financial rate of return on investment |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| GNI | Gross national income |
| ISPA | Structural Pre-Accession Instrument |
| JASPERS | Joint Assistance to Support Projects in European Regions |
| MFF | Multiannual financial framework |
| NPV | Net present value |
| NUTS | Nomenclature of Territorial Units for Statistics |
| O&M | Operating and maintenance |
| P&R | Protection and remediation |
| SCF | Standard conversion factor |

| | |
|---|---|
| SDR | Social discount rate |
| UWWTD | Urban Wastewater Treatment Directive |
| WFD | Water Framework Directive |

## 1. INTRODUCTION

Cohesion policy is the EU's key investment tool. Enshrined in Articles 174-178 of the Treaty on the Functioning of the European Union (TFEU), it aims to strengthen economic, social and territorial cohesion by reducing disparities in the level of development between regions.

Cohesion policy relies notably on three Funds:

- the European Regional Development Fund (ERDF);
- the Cohesion Fund (CF);
- the European Social Fund (ESF).

Environmental infrastructure projects are financed by the ERDF and the Cohesion Fund, as follows:

- the ERDF invests in growth-enhancing sectors to foster competitiveness and create jobs in EU regions and cities. ERDF actions are designed to address territorial, economic, environmental and social challenges, with a focus on sustainable urban development; and
- the Cohesion Fund invests in environment and transport networks in Member States with a Gross national income per inhabitant below 90% of the EU average ('cohesion countries'[1]). It aims to reduce economic and social disparities and to promote sustainable development.

In 1997, the Treaty of Amsterdam introduced a requirement to integrate environmental protection provisions into all the Union's policies and activities. Following the entry into force of the Treaty of Lisbon (1 December 2009), this requirement was incorporated in the TFEU, Article 11 which provides that:

> 'Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development.'

As the EU's main investment tool, cohesion policy contributes to and acts in synergy with several EU sectoral policies. The European Structural and Investment Funds (ESIFs)[2] strongly support infrastructure projects that contribute to compliance with the environmental *acquis communautaire* and its broader sustainable development goals. In return, by reducing economic, social and territorial disparities between Member States and regions, and by supporting growth and competitiveness, environmental infrastructures contribute to the achievement of the core goals of cohesion policy.

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1 Spain, Greece, Portugal and Ireland were eligible under the CF from 1 January 2000 (Ireland, with average GNP above 101%, was ineligible as of 1 January 2004). From 1 May 2004 (with EU enlargement), all new Member States (Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia) qualified. The current (2014-2020) cohesion countries are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

2 In the current programming period, the ERDF, the Cohesion Fund and the ESF, together with the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund.

Cohesion policy is implemented on the basis of programming periods that generally last seven years in parallel with the EU's multiannual financial framework (MFF). This report covers the 2000-2006 and 2007-2013 periods.

**Large-scale environmental projects**

Large-scale environmental infrastructure projects often involve significant investments and can account for a substantial proportion of the resources allocated to operational programmes (OPs). In both programming periods, projects for an eligible cost of over €50 million[3] were subject to specific rules for 'major' projects, including an assessment procedure and specific approval from the European Commission. In 2000-2006, cohesion policy support was granted to 844 major projects in the environmental sector[4]. Of 945 major projects in 2007-2013, 234 were environmental in nature[5].

**Purpose and scope**

The Financial Regulation[6] requires the Commission to carry out *ex post* evaluations of all programmes and activities that entail significant spending, in order to improve future decision-making. This requirement is explicitly reflected in the general regulations[7] for the ERDF/Cohesion Fund programmes[8] for each programming period.

*Ex post* evaluations for the periods in question were finalised in 2010[9] and 2016[10]. While both covered environmental projects, neither focused specifically on major environmental infrastructure projects. Given the long-term nature of such projects and the fact that their effects take longer to materialise, it was in fact too early to evaluate them.

This staff working document aims to fill that knowledge gap. It presents an *ex post* evaluation of major environmental projects[11] implemented in 2000-2006 and 2007-2013 with ERDF and Cohesion Fund co-financing. A similar document assessing the impact of large infrastructure projects in the transport sector has just been adopted. This document follows the same logic and methodology, adjusted to the specificities of the environmental sector.

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3 The threshold was initially €25 million (Council Regulation (EC) No 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Regulation (EC) No 1260/1999).

4 European Commission (DG REGIO) data.

5 DG REGIO, Major projects monitoring (October 2016); COWI (2019), Integration of environmental concerns in cohesion policy funds (ERDF, ESF, CF), Final report.

6 Commission Financial Regulation (2012), Chapter 7, Art. 30(4): 'In order to improve decision-making, institutions shall undertake both *ex ante* and *ex post* evaluations in line with guidance provided by the Commission. Such evaluations shall be applied to all programmes and activities which entail significant spending and evaluation results shall be disseminated to the European Parliament, the Council and spending administrative authorities'.

7 Article 43 of Council Regulation (EC) No 1260/1999 of 21 June 1999 laying down general provisions on the Structural Funds (the General Provisions Regulation for 2000-2006); Article 49(3) of Council Regulation (EC) No 1083/2006.

8 Cohesion Fund support was project-based in 2000-2006. In 2007-2013, it was programmed jointly with the ERDF in national programmes.

9 https://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2000-2006/

10 SWD (2016) 318 final. *Ex post* evaluation of the ERDF and Cohesion Fund 2007-2013.

11 The ERDF and the Cohesion Fund finance a number of activities and projects in other areas. Consequently, the evaluation will have a narrower scope than would have been the case for an evaluation of the funds.

As regards the scope of the assessment, 10 major projects from the two programming periods were selected. In order to be able to capture long-term effects as well as possible, only projects that had been in operation for at least five years were considered for selection. The selected projects are not meant to be statistically representative. The choice of projects followed an analysis[12] of all major projects undertaken in both periods, taking account of data availability, available project documentation, interviews with managing authorities and web/desk research.

The aim was to select illustrative examples that could provide interesting and generally valid insights into the long-term effects of large-scale environmental infrastructure projects. In this respect, the analysis provides an opportunity to draw lessons for future ERDF and Cohesion Fund support for such projects.

Overall, the 10 cases represent more than € 689.73 million of total (national plus cohesion policy) investments, out of which the ERDF and the Cohesion Fund accounted for € 291.79 million of support.

Overall, the list of selected projects[13] is balanced across:

- sectors (drinking water, wastewater and waste treatment, remediation);
- countries (Bulgaria, Croatia, France, Italy, Malta, Poland, Romania, Slovenia, Slovakia and Spain) – despite a prevalence of projects from EU-13 countries[14], a good coverage of EU-15 countries[15] is also ensured; and
- programming periods (five projects for each period).

Table 1 gives an overview of the case studies. They are presented in more detail in Annex 4.

12 See section 3.3 and Annex 3 for details.

13 The total EU contribution to the projects is € 286 million.

14 The EU-13 Member States (which joined the EU in 2004 and after) are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

15 The EU-15 (which were already Member States before 2004) are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

*Table 1. Overview of case studies*

| PROJECT | MS | SUB-SECTOR | FUND | PERIOD |
|---|---|---|---|---|
| **Sofia integrated water project** | **BG** | Water and wastewater | Cohesion Fund (ISPA[16]) | 2000-2006 |
| **Malta South sewage treatment plant** | **MT** | Wastewater | Cohesion Fund | 2007-2013 |
| **Sochaczew sewage management** | **PL** | Wastewater | Cohesion Fund (ISPA) | 2007-2013 |
| **Craiova sewerage network** | **RO** | Water and wastewater | Cohesion Fund (ISPA) | 2000-2006 |
| **Water supply and sewerage system** | **HR** | Water and wastewater | Cohesion Fund (ISPA) | 2007-2013 |
| **Favara di Burgio aqueduct** | **IT** | Water | ERDF | 2000-2006 |
| **Aguilas desalination plant** | **ES** | Water | ERDF | 2000-2006 |
| **Purchase of a multifunctional ship** | **EE** | Waste management / risk reduction | ERDF | 2007-2013 |
| **Celje waste management centre** | **SI** | Waste management | Cohesion Fund | 2000-2006 |
| **Sète-Marseillan lido protection** | **FR** | Protection and remediation | ERDF | 2007-2013 |

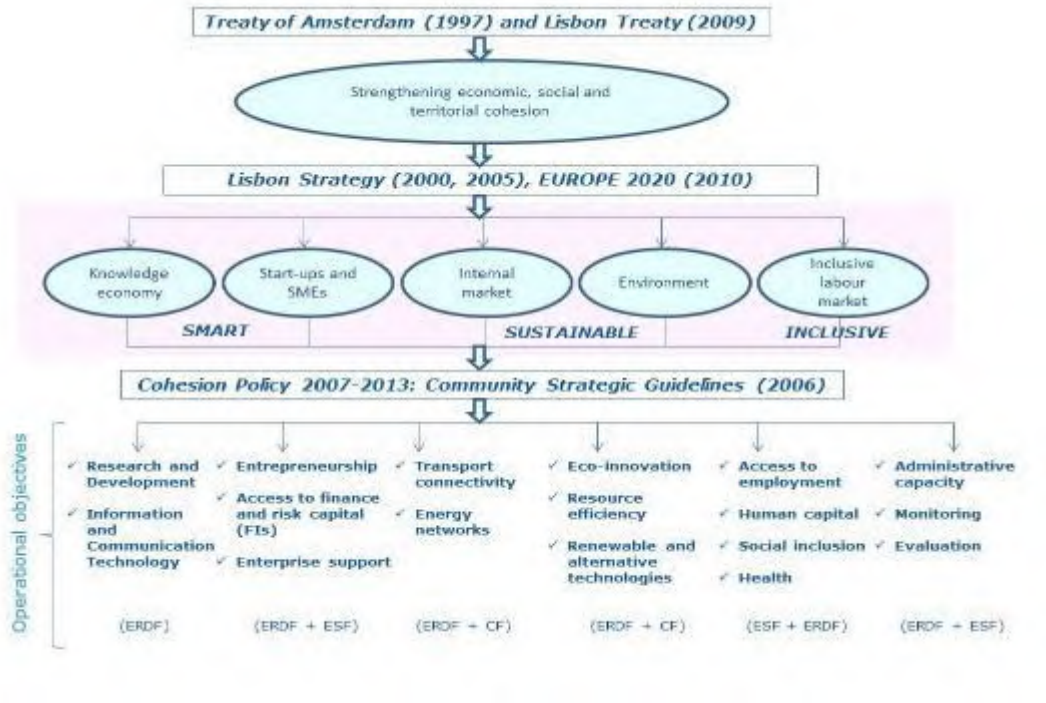
## 2. BACKGROUND TO THE INTERVENTION

### Goals and intervention logic of cohesion policy

The objectives of cohesion policy are enshrined in the Treaty. Article 174 of the Treaty on the functioning of the EU stipulates: '[i]n order to promote its overall harmonious development, the Union shall develop and pursue actions leading to the strengthening of its economic, social and territorial cohesion. The Union shall also aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions'.

[16] Structural Pre-Accession Instrument.

***Figure 1. Cohesion policy – hierarchy of objectives***




Source: SWD (2016)318 final. *Ex post* evaluation of the ERDF and Cohesion Fund 2007-2013

The objectives of cohesion policy can be ordered on three levels[17] (see Figure 1):

- General – achieving economic, social and territorial cohesion. Disparities in levels of development can be seen, *inter alia*, in terms of:
  - economic goals (e.g. innovation, entrepreneurship);
  - social goals (e.g. inclusion, health); and
  - territorial goals (e.g. access to quality environmental services);
- Strategic – achieving smart, sustainable and inclusive goals, as defined in the Lisbon Strategy and Europe 2020. These are not just a link between economic, social and territorial cohesion on the one hand and individual investment objectives on the other, but also a link to the Union's overriding priorities and goals; and
- Operational – individual policy themes, which contribute to cohesion by:
  - reducing social, economic and territorial disparities (see above); and
  - strengthening social, economic and territorial cohesion overall.

**Shared management — a key feature of cohesion policy**

The ERDF and Cohesion Fund are delivered under shared management[18]. Programmes are not run directly by the Commission; instead they are implemented in partnership with the Member States. The principles and priorities of cohesion policy are distilled through a process of discussion between the Commission and Member States. However, the day-

[17] SWD(2016) 318 final, p. 8.

[18] See Financial Regulation applicable to the general budget of the Union and its rules of application (2017), Title IV, Chapter II, Article 58(b).

to-day management of the policy, including selection of investment projects, is carried out by managing authorities (a national ministry, regional authority or local council) appointed by the Member States.

**Large infrastructure projects: technical aspects**

The 2000-2006 Regulation[19] specified that major projects are those 'which comprise an economically indivisible series of works fulfilling a precise technical function and which have clearly identified aims and whose total cost taken into account in determining the contribution of the Funds exceeds EUR 50 million'.

In the 2007-2013 period, major projects were defined along the same lines[20]. In this period, the threshold for environmental major projects was initially set at €25 million, before being aligned to €50 million which was the threshold in all other fields. During the 2000-2006 and 2007-2013 periods, major projects had to undergo specific approval procedures. The Commission had to appraise and approve major projects that were co-financed within the operational programmes. When submitting a major project for approval to the Commission, the competent authority presented a **cost-benefit analysis** of the project including: (i) an assessment of financial costs and benefits; (ii) a risk assessment; (iii) information on the economic viability of the project; (iv) an assessment of the feasibility of obtaining full or partial private financing for the project; and (v) an indication of how far the Funds' contribution would influence whether the projects would be implemented.

In the case of investment in major projects, an analysis of the project's social costs and benefits was indispensable, including an indication of the foreseeable impact on the development or conversion of the region concerned, and of the application of EU rules on public contracting. With this information, the Commission then assessed the project and took its decision on the basis of the following factors:

- the type of investment planned and, where applicable, the revenue expected;
- the results of the cost-benefit analysis, where the project had to have an overall positive marginal equity (i.e. society would be better off with the project than without the project);
- the result of the evaluation of the impact on the environment;
- consistency with the priorities in the corresponding assistance;
- compliance with other EU policies;
- a breakdown of the main sources of the expected economic and social benefits, particularly in terms of employment, value of time saved and value of accidents saved, having regard to the financial resources deployed;
- the coordination of the financial instruments and the combination of assistance and loans.

In 2007-2013, requirements were similar. Member States were requested to submit:

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19 Art. 25 of the Council Regulation (EC) No 1260/1999 of 21 June 1999 laying down general provisions on the Structural Funds.

20 Art. 39 of the Council Regulation (EC) No 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Regulation (EC) No 1260/1999: 'an operation comprising a series of works, activities or services intended in itself to accomplish an indivisible task of a precise economic or technical nature, which has clearly identified goals'.

- an analysis of the forecast impact on the sector concerned;
- an analysis of the forecast impact on the socio-economic situation in the Member State and/or the region concerned and, where possible and appropriate, in other relevant regions.

In 2005, facing the challenge of preparing and approving large infrastructure projects from the Member States that joined the EU in 2004 (the 'EU-10'), the European Commission joined forces with the European Investment Bank (EIB) in a new initiative known as 'Joint Assistance to Support Projects in European Regions' (JASPERS). The aim was to provide Member States with independent advice to help them prepare quality proposals for large investment projects for funding through the EU's Cohesion Fund and ERDF.

The initiative was financed through the Commission's technical assistance budget. Since 2006[21] JASPERS has assisted more than 500 projects (mainly major projects). Support from JASPERS is initiated at the request of a Member State, on the basis of an annual action plan. The action plan identifies a number of project tasks that JASPERS will carry out for the Member State in the year in question.

**Environmental infrastructures**

Environmental infrastructures have traditionally been a cohesion policy priority, geared to preserving and improving the environment[22] in line with Treaty[23] obligations.

The 2000-2006 General Provisions Regulation provided that 'the Community shall contribute to […] the protection and improvement of the environment'. Similarly, the 2007-2013 Regulation stated that 'the objectives of the Funds shall be pursued in the framework of sustainable development and the Community promotion of the goal of protecting and improving the environment'[24].

Environmental projects are instrumental in ensuring economic, social and territorial cohesion, in line with the EU's overall development strategies[25]. The environment is a key dimension of the integrated approach promoted by cohesion policy (European Commission 2005a), which requires that the most pressing socioeconomic issues be tackled through integrated strategies for the renewal, regeneration and development of urban and rural areas. Moreover, infrastructure investments in the environment and risk prevention support cohesion policy efforts to trigger economic development by strengthening the competitiveness and attractiveness of EU regions.

Environmental investments are expected to contribute to the economy by:

- ensuring the long-term sustainability of economic growth;
- reducing external environmental costs to the economy (e.g. health, clean-up and damage recovery); and

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21 JASPERS was originally intended to operate for the 2007-2013 period only, but following two evaluations, in 2010 and 2012, the Commission and EIB decided to continue with the initiative.

22 See, for example, Article 1 of Council Regulation (EC) No 1260/1999.

23 Article 11 TFEU: 'Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development'.

24 Council Regulation (EC) No 1083/2006.

25 Both the Lisbon Strategy (for 2000-2010) and the Europe 2020 Strategy (for 2010-2020) feature environmental objectives among their top priorities.

- stimulating innovation and job creation[26].

Environmental policy objectives can be pursued:

- as a horizontal principle across the range of sectors covered by cohesion policy throughout the programming cycle (horizontal integration); or
- by funding specific investments aimed at protecting or improving the environment and meeting the objectives generally (vertical integration).

Cohesion policy investments in the environmental sector can be direct or indirect[27]:

- the direct investments are those in environmental infrastructures that contribute directly to compliance with EU legislation in areas such as drinking water supply, wastewater treatment, solid waste management and 'green infrastructure' (contributing to the achievement of EU targets in fields such as biodiversity and the protection of ecosystems); and
- indirect investments in 'green' energy, transport and production systems contribute more broadly to the transition to a low-carbon, resource-efficient, safe and sustainable economy.

This report concerns only direct investments.

## 3. IMPLEMENTATION / STATE OF PLAY

### Description of the current situation

Allocations for direct environmental investments remained fairly stable in each programming period, at around €40 billion[28], while those for indirect environmental investments rose sharply. This reflects a 'greening' of cohesion policy investments in key sectors, including energy and transport. The largest share of financing in both periods went to drinking and wastewater, followed by waste management.

Allocations to large-scale environmental infrastructure projects rank second after those for transport[29]. In 2000-2006[30], cohesion policy supported 116 major environmental projects, for a total EU contribution of € 7.6 billion. The main beneficiary countries were Spain (ERDF, Cohesion Fund), France (ERDF), Poland (Cohesion Fund), Portugal (Cohesion Fund), Greece (Cohesion Fund) and Italy (ERDF). Cohesion Fund mainly

26 European Commission (2005), Communication on Cohesion policy in support of growth and jobs: Community strategic guidelines, 2007-2013 (COM(2005) 0299).

27 Integration of environmental concerns in cohesion policy funds (ERDF, ESF, CF): results evolution and trends through three programming periods (2000-2006, 2007-2013, 2014-2020), COWI A/S, Milieu sprl (March 2019).

28 Ibid.

29 REGIO Data, 2018.

30 For this period, a 'major project' was a project 'comprising a series of works, activities or services intended in itself to accomplish an indivisible task of a precise economic or technical nature, which has clearly identified goals and whose total cost exceeds €50 million' (Article 25(b) of the Council Regulation (EC) No 1260/1999).

supported wastewater treatment projects (46%) and the ERDF mainly drinking water supply projects (84%)[31].

In 2007-2013[32], the ERDF and the Cohesion Fund supported 167 environmental major projects for a total of €9.4 billion[33]. Most of the support went to Romania, Poland, Hungary, Spain and Portugal. In terms of sub-sectors funded, most of the funds went to wastewater management projects, followed by drinking water management and distribution projects, and projects supporting the management of household and industrial waste. Support for air-quality, pollution-control and biodiversity projects was much less significant[34].

**Short description of the methodology**

This staff working document is largely based on a study by an independent consultant[35]. The analysis is complemented by internal Commission data on fund management, analytical reports[36] and past evaluations[37]. The evaluation follows the principles set out in the Commission's *Better Regulation Guidelines*[38] and addresses the five standard evaluation criteria: relevance, coherence, effectiveness, efficiency and EU added value.

The methodology follows that used for the evaluation of large transport infrastructure projects, adjusted to the specific features of environmental projects. It is therefore based on an extensive review of the relevant theoretical and empirical literature[39] and *ex post* cost-benefit analysis (CBA) of the individual projects, complemented by qualitative assessment techniques (site visits, interviews with stakeholders, press articles, reviews, etc.) in such a way as to produce a 'narrative' for each project.

As a first step, the impacts of large environmental infrastructure projects were mapped, measured and quantified. A comprehensive set of parameters and unit values for the most common direct effects was developed and applied consistently to all cases. Counterfactual scenarios were used as baseline for comparison to assess the performance of the projects. From an *ex post* perspective, the counterfactual were produced on the basis of 'what would have happened in the absence of the project?'.

The CBA methodology followed the Commission *Guide to* Cost-Benefit Analysis of Investment projects[40], adapted to the *ex post* perspective. It included financial, economic and risk analysis. Where quantification and monetisation were not possible, qualitative assessments of the effects were carried out.

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31 REGIO Data, 2018.

32 For this period, Commission Regulation (EU) No 832/2010 (amending Regulation (EC) No 1828/2006 setting out rules for the implementation of Council Regulations (EC) No 1083/2006 and (EC) No 1080/2006) took over the definition of 'major project' from 2000-2006.

33 DG REGIO data, 2018.

34 *Ibid*.

35 CSIL, Ramboll (2019), *Ex post* evaluation of major projects supported by the European Regional Development Fund (ERDF) and the Cohesion Fund between 2000 and 2013 – Final report (study was conducted between June 2018 and June 2019).

36 See Annex 1, point 5.

37 https://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2000-2006/ and SWD(2016) 318.

38 SWD(2017) 350.

39 See Annex 1, point 5.

40 European Union (2015), Guide to Cost-Benefit Analysis of Investment Projects. Economic appraisal tool for Cohesion Policy 2014-2020.

As the next step, the analysis looked into the factors that determined the observed chain of effects. Field visits were carried out for each case study and an extensive interview plan allowed for the collection of primary data and the views of a broad range of stakeholders. A total of 217 people were interviewed, mainly face to face. They represented various interest groups: civil servants (Commission, national ministries, managing authorities), experts (engineers and planners), project managers, policymakers (mayors, regional and municipal councillors), users' and citizens' associations, and journalists.

**Review and selection of the case studies**[41]

The 10 case studies were selected from a preliminary screened list of 30 major projects supported by the ERDF and the Cohesion Fund in the two programming periods (for details of the selection process, see Annex 3).

As the objective was to analyse the long-term effects of large environmental infrastructure projects, the projects needed to have been in operation for at least five years at the time of the evaluation.

The case studies were selected on the basis of three broad criteria (weighted for relative importance):

- strategic relevance for evaluation purposes (40%);
- availability and quality of data from existing sources (30%);
- stakeholders' availability and willingness to cooperate (30%).

The second and third criteria were key. In shared management, managing authorities are responsible for collecting and monitoring data at project level (except for the Cohesion Fund projects in 2000-2006, the Commission collected data only at programme level). Project-level data availability and quality may therefore be challenging; it was essential that the evaluators could rely on quality data and stakeholders' willingness to provide them. Cohesion policy data monitoring and collection have improved in recent years. In particular, the introduction of the Open Data Platform has radically boosted transparency.

The choice of projects was also intended to be representative in terms of geographical and sectoral coverage (taking account of the relative scale of expenditure on the various sub-sectors), financing periods, types of project and types of financing.

It includes five projects financed in 2000-2006 and five in 2007-2013, as follows:

- seven water sector projects, of which:
  - two on wastewater collection and/or treatment (**Poland** and **Malta**);
  - two on water (**Italy** and **Spain**);
  - three relating to water and sanitation (**Bulgaria**, **Croatia** and **Romania**);
- two waste management projects (**Estonia** and **Slovenia**);
- one protection and remediation project (**France**).

[41] For full details, see First Interim Report, vol. II (see Annex 5).

*Figure 2. Case studies*[42]


Source: CSIL, Ramboll (2019).

## Limitations and specificity of the methodology applied

Effects produced by large scale environmental infrastructures take more or less time to materialise and achieve full potential. Also, projects differ in terms of the spatial scale of their effects. The evaluation captures changes that the projects brought over time, comparing the situations before and after their implementation.

Some of the environmental effects were assessed only qualitatively, due to a lack of data and/or valuation difficulties (e.g. as regards biodiversity preservation). Similarly, wider effects (e.g. impacts on socioeconomic structures, health and social effects) were difficult to isolate and attribute to an individual project. These effects were also analysed in a qualitative way and assessed conservatively. Finally, as stressed in the staff working document on transport, it is difficult to separate the impact of an individual project from a whole set of factors influencing growth, jobs and other long-term outcomes. Individual (even large-scale) projects rarely produce impacts of a magnitude that could be reflected in macroeconomic indicators.

Since the projects are in operation, it was necessary to cover *ex ante* and *ex post* perspectives (i.e. past and future values). *Ex ante* values serve as a starting point for the analysis and the deviations from initial assumptions; *ex post* values are examined to find

[42] Projects are classified according to their dominant theme. 'Water projects' refer to drinking water infrastructures.

the reasons for any differences. The objective of comparing *ex ante* and *ex post* assumptions is therefore not to produce an updated CBA, but rather to complement the analysis of the projects' performance.

The sample was not meant to be statistically representative. The decision to focus on 10 major projects was the result of an internal analysis. It took into account the financial and timing constraints associated with assessing a wider sample and the need for quality data. It may have led to an under-estimate of effectiveness. However, the ten projects selected are considered as examples illustrating a wide range of experience, suitable for developing project narratives and capable of producing policy lessons.

The objective was to capture long-term contributions to economic development, quality of life and environmental sustainability. Therefore, only projects that had been in operation for at least five years at the time of the evaluation and therefore 'finalised' and mature enough to produce stable outcomes were chosen. This factor *per se* may have created a positive bias.

## 4. ANALYSIS

### 4.1 Effectiveness

A project's effectiveness is the extent to which it achieves its stated objectives and delivers the expected effects. The expected long-term effects of major environmental projects identified and analysed in the report relate to:

- ✓ economic growth;
- ✓ quality of life and wellbeing;
- ✓ environmental sustainability; and
- ✓ distributional aspects.

Because effects differ according to the environmental focus area, they were analysed in three groups (see Table 2):

a) water supply and wastewater;

b) solid waste management; and

c) environment remediation and protection / risk prevention.

***Table 2. Most typical effects observed in evaluated projects***

| Effects | a) water supply / wastewater | b) solid waste management | c) protection / risk prevention |
|---|---|---|---|
| **Economic growth** | Variations in:<br>– quantity of water supplied and wastewater treated;<br>– reliability of water sources and water supply;<br>– water quality;<br>– resource savings (water preserved for other uses);<br>– operating costs | Variations in:<br>– waste to landfill;<br>– recovery of materials;<br>– energy recovery;<br>– reliability of waste collection;<br>– deployment cost for utility services | Variations in:<br>– value of assets;<br>– interruption of economic activity;<br>– tourism;<br>– fishing and hunting yields;<br>– yields from timber and other raw materials |

| | | | |
|---|---|---|---|
| | | | Indirect:<br>– variation in agricultural yields (indirect ecosystem services);<br>– economies of agglomeration;<br>– institutional learning |
| **Quality of life and wellbeing** | Variations in:<br>– number of consumers served by water supply and treatment services;<br>– quality of water supply | Variations in:<br>– number of consumers served by waste management services;<br>– exposure to negative environmental effects of waste disposal;<br>– household income;<br>– human health and hygiene | Variations in:<br>– health;<br>– recreational opportunities |
| **Environmental sustainability** | Variations in:<br>– contamination of air, water and soil;<br>– protection and resilience of natural resource systems;<br>– GHG emissions | Variations in:<br>– GHG emissions;<br>– contamination of air, water and soil | Preservation of species or ecosystems<br>Variations in:<br>– carbon sequestration;<br>– hazard risks |
| **Distributional** | Change in socio-geographical distribution by boosting growth and productivity in areas where they might have been constrained in the past.<br>Certain types of user may be highly affected by changes in drinking water and wastewater pricing. | Projects improved living conditions of low-income groups. | Not identified |

The most typical effects of the projects relate to:

- economic growth – these are effects resulting in more productive economic activities. They are not the main drivers behind environmental investments (where the main aims are to protect the environment and restore ecosystems), but they do materialise, in terms of costs avoided (risk prevention investments[43]) and costs saved (waste and wastewater treatment facilities[44]). Also, high-quality water and wastewater infrastructures can stimulate other activities, such as tourism, in

[43] The costs of inaction in environmental protection can exceed the cost of action. For example, once biodiversity loss exceeds a certain threshold, ecosystem services can no longer be provided and become costly to recover.

[44] For waste management investments, savings could come either from increased recycling or from re-use of materials. Investments in modern waste and wastewater facilities reduce the risks of soil and water contamination, so they may reduce health costs.

previously unserved areas. 'Natural capital' is also an input into economic activity, so it has an impact on economic returns;

- quality of life and wellbeing – water quality is fundamental for people's wellbeing. Investments in water and waste management facilities reduce health risks in the long term, improve hygiene and make regions more attractive;
- environmental sustainability – the most relevant expected effects of environmental infrastructure investments are those that improve the condition of natural resources (water, air, soil and biodiversity) and help to preserve them in the long term. This includes making ecosystems more resistant to potentially harmful phenomena (e.g. floods, droughts) and human activities; and
- distributional impacts – new infrastructures may change socio-geographical distribution by boosting economic growth and productivity in (typically rural and more sparsely populated) areas where they might previously have been constrained. Projects leading to changes in water, wastewater or waste management tariffs may affect the economic situation of specific groups (e.g. low-income households) or high water consuming industries.

**Main findings**

- ✓ Project objectives were generally well defined.
- ✓ Projects were effective, but only few fully achieved their objectives.
- ✓ Benefits are maximised by accompanying or synergic investments. However, projects addressing multiple phases of the water cycle are more exposed to risk.
- ✓ Environmental projects generate long-term effects through a variety of mechanisms.
- ✓ Forecasting future demand is one of the most problematic determinants of projects performance.

### 4.1.1 Project objectives were generally well defined

Setting well-defined, measurable and realistic objectives makes it possible to monitor and quantify benefits, and to evaluate a project's performance. The case studies also highlight the importance of such objectives in enabling us to identify and secure all potential benefits. Mechanisms for monitoring long-term achievements are fundamental to assessing whether projects have actually been effective.

All but one of the selected projects had clearly structured objectives (primarily driven by local needs and compliance with EU legislation), which in turn brought improved living conditions and clear environmental benefits (access to clean water, limited pollution, etc.). The objectives were generally in line with what could be expected from such investments, given the relevant EU directives and strategies.

The exception was the **Slovenian** project (phase II of the Celje regional waste management centre), where the objectives were not well defined and lacked quantitative targets, thus preventing proper quantitative assessment. Also, some objectives overlapped and were more relevant for the waste management centre as a whole. Better objective-setting would have made decision-making more transparent and accountable.

The **Bulgarian** project achieved its goal of contributing to compliance with EU directives. However, it could have been more effective if the initial set of objectives had

not been reduced during implementation, thus preventing it from also contributing to flood prevention in Sofia. The narrower scope represented a missed opportunity, as not all potential benefits were secured. The project was therefore only partially effective.

In the **Maltese** case, updated values were unavailable for some of the monitored parameters and no evidence could be found on the degree to which some expected benefits were achieved.

### 4.1.2 Projects were effective, but only few fully achieved their objectives

According to the *ex post* CBAs, nine of the projects delivered net benefits, but only two fully achieved their intended objectives. Table 3 summarises the main findings:

***Table 3. Effectiveness score[45] per project (1 to 5)***

| Sector | Case study | Objectives (as in project application) | Score | Motivation |
|---|---|---|---|---|
| **Waste-water** | Bulgaria – Sofia integrated water project | Compliance with Drinking Water Directive (DWD) and Urban Wastewater Treatment Directive (UWWTD).<br>Stimulate local and regional economic activities and development. | 3 | The project largely achieved its goals (contributing to compliance with Directives, improving reliability of water distribution, reducing losses, reducing pollution in rivers). A sewage collection system was developed, the number of households whose wastewater is treated increased, tertiary treatment was provided and water supply security improved.<br>However, the project could have been more effective. If its scope had not been reduced during implementation, it could have improved flood prevention in the centre of Sofia and the supply of treated water to two smaller settlements. |
| **Waste-water** | Malta South – sewage treatment | Compliance with UWWTD, Bathing Water Directive (BWD) and Water Framework Directive (WFD).<br>Secondary objectives: enhance tourism potential thanks to cleaner seawater and thus trigger economic development. | 3 | The project achieved its primary objective (treating wastewater collected by sewerage networks in the south of Malta before discharge), restored bathing water quality and ensured Malta's compliance with the BWD.<br>However, it is not yet in full compliance with the UWWTD and farm waste illegally discharged into sewers negatively affected the plant's operational phase. Fishing activity has not increased and there is no evidence of better drinking |

[45] The scores range from 1 to 5, as follows:
1 = the project did not achieve the expected objectives due to endogenous factors;
2 = the project did not achieve the expected objectives due to exogenous factors;
3 = the project partially achieved the expected objectives;
4 = the project achieved the expected objectives with some delay with respect to schedule. It turned out to be the best option among all feasible alternatives;
5 = the project achieved the expected objectives on schedule.

| | | | | |
|---|---|---|---|---|
| | | | | water. There are concerns over the impact of population growth in the long run. |
| **Waste-water** | Poland – Sochaczew sewage management | Improve wastewater management in the area by increasing connection rate to sewerage network and enhancing quality and effectiveness of wastewater treatment. | 4 | The project achieved its objectives of providing a sewerage service for new households and ensuring the capacity of the municipal wastewater treatment plant (WWTP), but the generation of benefits was delayed due to slow connection of households to the network. |
| **Waste-water** | Romania – Craiova sewerage network | Treat wastewater in line with Romanian law transposing UWWTD. | 4 | The project achieved its objectives (reduction of river pollution, transboundary pollution and water losses in distribution network).<br>However, it had a minor negative impact related to odour emissions around the WWTP. Operation of the WWTP resulted in increased energy consumption and it is currently not used at full capacity. |
| **Water** | Croatia – water supply and sewerage system | Reduce water pollution, improve living conditions and ensure compliance with EU legislation. | 3 | The project improved the sewerage system and enabled wastewater treatment. It increased the number of inhabitants connected to the drainage system, raising living standards and protecting the Sava River.<br>However, it led to an increase in GHG emissions. At present, the WWTP operates at half capacity due to depopulation resulting from the economic crisis. Mitigating measures are being taken, as full capacity is expected thanks to implementation of a new project (Slavonski Brod II) to connect two neighbouring agglomerations with compliance obligations. Technical issues also limited the project's impacts. |
| **Water** | Italy – Favara di Burgio aqueduct | Restore effective water captation, collection and adduction at aqueduct, reduce leaks from around 20% to 5% of total input and ensure continuity in provision of water to head tanks for inhabited areas. | 4 | The project achieved its goal (water provision to municipal head tanks) with minor delays. It has further potential to sustain local development, but accompanying investments were limited. |
| **Water** | Spain – Anguilas desalination plant | Address over-exploitation of water resources in the region and ensure reliable water service to inhabitants and farmers. | 4 | The project achieved its goal (reliable water provision for households and farms) and end-users are benefiting from its implementation. New projects are planned to take advantage of it. The generation of benefits was delayed by issues during implementation. |
| **Water** | Estonia – | Prevent and respond rapidly | 5 | The project achieved the objectives |

| | | | | |
|---|---|---|---|---|
| | purchase of a multifunctional ship | to pollution incidents to avoid contamination and disturbance of habitats and maintain their favourable status, ensure functioning of critical areas and reduce risk to human health and life. | | based on HELCOM recommendations[46]. It achieved its main target of improving offshore sea-pollution control capacity and reduced the risk of damage from maritime pollution. |
| **Waste** | Slovenia – Celje waste management centre | Ensure mechanic biological treatment (MBT) (61 500 t/yr) and thermal treatment (TT) (25 000 t/yr) of municipal waste. | 2 | The objectives were poorly defined and lacked quantitative indicators, so it is difficult to assess effectiveness. On the whole, the objectives were achieved (though later than scheduled).<br>However, the expected benefits were achieved only partially, mainly because of demand under-estimation. Selection of a different technology could have improved effectiveness and further reduced GHG emissions, e.g. as in the case of the Ljubljana waste management centre, which used cogeneration of electricity. |
| **Others** | France – Sète-Marseillan lido protection | Restore normal functioning of coastline and ensure better protection against erosion.<br>Protect environment, in particular natural area of ecological, fauna and floristic interest and Natura 2000 perimeter.<br>Maintain mobility function of coast road.<br>Maintain local economic activities on lido. | 5 | The project's main objectives were achieved. |

Source: CSIL, Ramboll (2019).

The **Estonian** and **French** projects, in the area of risk prevention and remediation, fully achieved their objectives and therefore scored highest. In the water and wastewater sector, the **Polish, Romanian, Italian** and **Spanish** projects were effective. They achieved their stated objectives and delivered the expected effects, despite minor reservations in each case. Three projects (in **Poland**, **Italy** and **Spain**) produced benefits later than planned, due to implementation issues that postponed the start of their operation phase. This was particularly relevant in the **Spanish** and **Polish** cases. In the **Romanian** case, the WWTP is still not working at full capacity as a result of over-optimistic estimates at the project design stage. Even after being revised, estimates of capacity remained too high due to a drastic decrease in water demand, because of reduced water losses in the networks and a diminishing population connected to the water and wastewater services. There are minor negative effects due to odours and increased GHG emissions. The Favara di Burgio aqueduct project (**Italy**) achieved its primary goal

[46] The Baltic Marine Environment Protection Commission (or Helsinki Commission – HELCOM) is an intergovernmental organisation governing the Convention on the Protection of the Marine Environment of the Baltic Sea Area. It brings together eight EU Member States, the EU itself and the Russian Federation, and works to protect the marine environment in the Baltic Sea.

(providing water to the municipal head tanks), but did not deliver all its potential benefits because the requisite accompanying investments were not implemented.

The lower effectiveness scores for the four other projects (in **Bulgaria, Malta, Croatia** and **Slovenia**) are due to various factors, with no identifiable unifying pattern. In the case of the **Bulgarian** project, the expected effects were delivered later than expected as a result of implementation issues. Also, the scope of the project was further reduced during implementation, thus preventing it from delivering all potential benefits.

In **Malta**, full compliance with the UWWTD has yet not been achieved, due to illegal dumping of farm waste into the sewers, and there is no evidence that some of the benefits expected *ex ante* (e.g. better-quality drinking water) have been secured.

The **Croatian** project achieved its primary goal of improving the sewerage system and enabled wastewater treatment, but it also led to an increase in GHG emissions. Also, the WWTP is operating only at half capacity.

The low score for the **Slovenian** project stems from its poorly defined objectives and a lack of quantitative indicators. As a result, it is difficult to assess effectiveness. While the general/strategic objectives in the project application can be considered as having been achieved, there are significant differences between the benefits that were expected and those that were achieved, due to a failure to take account of changes in recycling rates (thanks to the implementation of EU legislation), which led to a decrease in the volume of mixed municipal waste.

In the cases of the **Maltese** and **Croatian** projects, the capacity to forecast demographic trends proved to be an important factor influencing effectiveness. In both cases, this affected project performance.

### 4.1.3 Benefits are maximised by accompanying/synergic investments and adequate response to individuals' needs

EU waste and water legislation reflects the importance of co-investment in maximising the benefits of waste and water management systems. For example, the WFD aimed to bring about a shift from fragmented policies and investment in the water sector towards integrated management of water resources.

The project sample shows that in the case of investments following an integrated approach (water and waste), benefits can be maximised through accompanying or synergic investments and/or measures. In fact, impacts can be limited by a lack of accompanying measures.

It also shows the complexity and difficulty of such an approach, as projects addressing multiple phases of the water cycle are inevitably more exposed to risk. A trade-off emerges in this regard: while projects with the most integrated approach[47] allow for highly consistent planning and comprehensive design, more risk factors can affect overall project performance, as forecasting is multi-faceted and considerably more demanding.

The **Spanish** desalination plant project is an example of this. Addressing only one phase of the water cycle, it met all set objectives (reducing water deficit, reducing pressure on

[47] The Bulgarian and Croatian projects cover water supply, wastewater collection and wastewater treatment.

aquifers), but could have had a greater impact if accompanying investments (e.g. in water storage facilities) had been made to enable the plant to operate at a more efficient scale.

Similarly, the **Polish** project did not involve any incentive mechanisms to facilitate physical connection between individuals and the new wastewater network. This took longer than expected and affected the project's effectiveness. Likewise, in the **Italian** project, a lack of investment in local water distribution networks prevented the reconstructed aqueduct from achieving all potential benefits. On the other hand, in the **Maltese** case, the design of the WWTP allowed for future upgrades, i.e. the construction of a polishing plant providing treated sewage effluent for irrigation, which was instrumental in putting an end to the illegal dumping of farm waste into sewers, thus succeeding where law enforcement had failed.

Individuals may react in various ways to policy incentives and their response may affect projects' effectiveness. The effectiveness of an environmental project depends not only on infrastructure investments and legal provisions, but also on how choices are shaped and what practical alternatives to negative paths are offered. In this respect, other non-infrastructure accompanying measures can play a positive role.

The **Slovenian** waste management project included a campaign to promote waste separation. This delivered good results. Although a causal link is difficult to prove, the subsequent slowing-down of the campaign and related educational activities coincided with a reduction in the quantity and quality of separate waste collection[48].

### 4.1.4 Environmental projects generate long-term effects through a variety of mechanisms

The analysis shows that large environmental infrastructure projects generate non-environmental benefits by improving quality of life and contributing to economic development. This is in line with the rationale of environmental and cohesion policy legislation, where interventions are based on both socioeconomic and environmental considerations. The Water Framework Directive[49] and the Waste Framework Directive[50] promote a market-based approach: an efficient use of water resources and the use of market-based instruments to provide incentives for the application of the waste hierarchy[51], respectively. Member States have to apply the 'cost recovery' and 'polluter pays' principles[52] in achieving the Directives' environmental objectives. These factors have clear economic implications for operators and consumers.

Large-scale environmental investment projects improve the territorial distribution of key infrastructures (e.g. wastewater treatment plant (WWTPs)) and citizens' and firms' access to services (e.g. water supply) and ecosystems (e.g. a restored lido). In this way, they make territories more attractive for both the population and economic operators, thus providing a necessary (but not sufficient) precondition for territorial development in line with cohesion policy objectives.

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48 RegioStars 2012 Awards: https://ec.europa.eu/regional_policy/sources/projects/regiostars/doc/regiostars/2011/regiostars2011.pdf

49 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

50 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste.

51 Article 4 of the Waste Framework Directive.

52 Article 9 WFD.

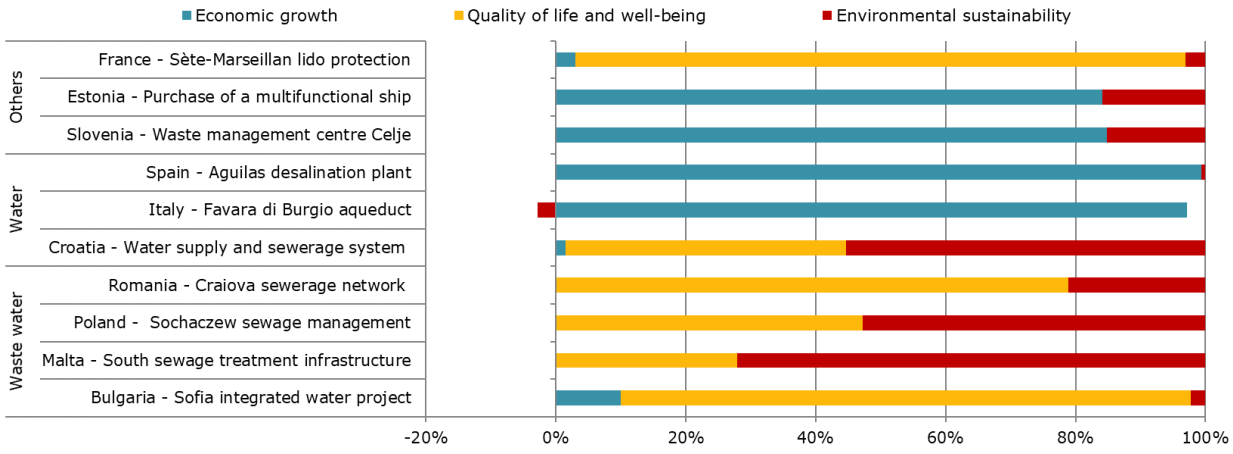
Environmental interventions are multidimensional and give rise to multiple changes. For instance, the **Maltese** project was aimed at treating wastewater before discharge into the sea, thus contributing to seawater quality. In turn, this contributed to the preservation of seawater ecosystems (environmental impact), odour reduction and the recreational value of beaches (impacts on human wellbeing).

The additional benefits generated by the projects differ according to the field of intervention. The main ones – both measurable (included in the CBA) and non-measurable (not included in the CBA) – were:

- the water supply projects generated mainly benefits of economic growth (**Italy** and **Spain**);
- the projects combining wastewater collection and treatment (in **Bulgaria**, **Poland**, **Romania** and **Croatia**) had a big impact in terms of quality of life and environmental sustainability;
- the **Maltese** project, which focused mainly on wastewater treatment with only a minor component of wastewater collection, generated benefits mainly in terms of environmental sustainability; and
- in the three other cases, environmental benefits were not the most significant effects[53]. The **Slovenian** and **Estonian** projects positively influenced economic development, while the **French** project mainly improved the quality of life.

These considerations remain largely true if measurable effects (economic growth, quality of life, environmental sustainability), covered in the *ex post* CBAs, are taken into consideration (see Figure 3).

***Figure 3. Long-term effects quantified by CBAs (%)***




Source: CSIL, Ramboll (2019).

All the selected major projects show benefits across the three categories, with the exception of the **Italian** project, which shows a negative impact in terms of environmental sustainability. This is due to the counterfactual scenario used for the analysis and the lack of quantified *ex post* data. The project consisted of replacing an old aqueduct that was characterised by high levels of leakage and required high amounts of energy to operate. However, the analysis did not capture the positive effect in terms of

[53] However, this should be partly attributed to the approach to categorising the effects.

energy savings, as the counterfactual scenario used was 'no operation' rather than 'business as usual' (which was considered unrealistic)[54]. For the purpose of the CBA, the new aqueduct is therefore considered as a greenfield investment that generated new GHG emissions not compensated by other positive environmental effects[55].

The varying degrees of environmental impact reflect two important features of environmental infrastructure projects in the cohesion policy framework:

- the development of water supply infrastructures involves integrating economic considerations (efficient use of natural resources) into water management in order to make efficiency gains and minimise costs. Investments in water supply, sanitation and waste management are aimed at improving the availability, reliability and quality of water and waste services. Accordingly, these projects addressed not only environmental protection, but also human wellbeing and economic development[56];

- even where a project achieves environmental objectives (e.g. the **French** case, where the objective was to counteract coastal erosion), it may give rise to much greater non-environmental benefits.

In some cases, there may be a trade-off between environmental benefits and environmental costs. For example, the modernisation of the WWTP in **Poland** had a positive impact in terms of avoiding the contamination of surface water and soil, but also a negative impact in terms of increased GHG emissions. Where investments entail substantial energy usage, either in construction or operation, the negative environmental implications thus need to be considered, since they may reduce the net environmental benefits of a project.

### 4.1.5 Forecasting future demand is the main and most problematic determinant of project performance

Several factors were found to affect project performance:

- the quality of *ex ante* analysis, in particular forecasting and management capacity;
- the quality of the selection process; and
- the governance structure.

'Forecasting and management capacity' is understood as the ability to predict future trends and react to unpredicted challenges by estimating and adapting resource requirements. It relates to technical effort in the *ex ante* (project preparation) phase and the professional capacity to manage the project in the operational phase to deliver the expected level of service.

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54 Works on the existing aqueduct were at no point considered a viable option.

55 The choice was due to the fact that the old infrastructure was not providing a reliable service and to the complete lack of data. The same approach had been adopted in the *ex ante* CBA and, when interviewed, several stakeholders confirmed it was the only possible one.

56 The main objective of the Italian aqueduct project was to ensure continuous water supply to municipalities in the area. However, the project was part of a larger effort to reorganise the management of the main aqueducts in four provinces in Sicily, in order to optimise the use of resources. Its main effects are thus the result of economic considerations.

The forecasting exercise (including data collection and modelling) is the foundation for sound project performance. The case studies show that *ex ante* forecasts are often over-optimistic and under-estimate completion time. This may affect the project's design, overall timeline and financial sustainability, and the actual delivery of long-term effects. The exercise is also the core of the CBA, the quality of which is thus affected by deficiencies in the forecasts.

The main areas where proper forecasting is essential and forecasting weaknesses were identified were demand, costs and completion time. The analysis echoes the findings of the *ex post* evaluation of major transport projects in 2000-2006 and 2007-2013, which highlighted forecasting capacity as a critical factor in the implementation of large infrastructure projects[57].

In several cases, a failure to predict demand accurately can be attributed to official statistical data that do not factor in changes in macro-trends and to local administrators' difficulty in anticipating and integrating territorial dynamics in available data.

***Box 1. Forecasting demand***

Demand for the planned environmental infrastructures was over-estimated in six of the reviewed cases, leading to overcapacity. However, whether this leads to operational inefficiencies depends on the chosen technology.

For example, the promoters of the **Slovenian** project did not adequately forecast the effects of changes in waste management legislation on trends in municipal waste. The technology chosen for the waste treatment plant was not fit for the actual amount of waste collected. Consequently, the unit cost of processing waste is higher than expected. Moreover, the aerobic biological treatment of such lower quantities of waste is not efficient, so electricity for the plant's operation needs to be sourced from the grid, causing higher GHG emissions than when higher quantities were processed.

In contrast, in the **Romanian** case, where demand for treated wastewater was also over-estimated, the choice of technology enables the operator to adapt to different quantities without an impact on efficiency.

Final demand was under-estimated in the case of the **Maltese** sewage treatment plant, which was designed for a resident population of 500 000. However, due to strong population growth (17% nationwide between 2007 and 2018), which is expected to continue in the next decade, the plant will have reached maximum capacity by 2023 and will have to be scaled up.

As regards completion-time forecasting, seven projects took longer to implement than initially forecast. Under-estimation of the complexity and duration of administrative procedures and over-estimation of contractors' capacity were the two main factors contributing to delays.

In the **Bulgarian** case, Sofia Municipality had unanticipated difficulties in expropriating properties so that the water pipelines could be built; these contributed to a 3-year delay in project implementation. In the **Italian** project, authorisations from local authorities took longer than expected and contributed to a 12-month delay.

Three of the projects were delivered on budget. The overruns in the other cases can be explained by the volatility of material and labour costs during and after the financial crisis.

[57] CSIL, Ramboll (2019), p. 123.

The examples above highlight that careful planning and forecasting of project demand, time and costs are essential in preventing project underperformance. At the same time, where a project deviates from a plan, its success depends on the response of those involved. An appropriate response to implementation or operational difficulties can turn a project around. Similarly, where a project is going better than expected, the situation can be further improved by exploiting unexpected opportunities. For example, when it became clear that the construction costs for the **Estonian** multifunctional ship would come in under budget, the project promoters included additional project management services (e.g. juridical and reporting services) in the budget. This ensured a high level of construction quality.

The quality of the selection process relates to the institutional and legislative framework in which public investment decisions (especially those co-financed by ESIFs) are taken. In particular, it concerns the processes in place and the tools used to choose between projects.

Overall, the selection process made a positive or slightly positive contribution to the performance of the projects. Selection went smoothly and there were no major complications, partly thanks to the fact that the projects were included in Operational Programmes and sector-specific plans, for which planning and selection are governed by well-established regulatory and administrative frameworks.

In the examined cases, the steps usually included a preliminary needs-based assessment, followed by a feasibility and options analysis. In general, once an option is selected, it undergoes stakeholder consultation, usually in the form of a public hearing where complaints and suggestions are taken into account. The project design is then completed and the project is implemented.

The analysis shows that selection processes can be lengthy. Major environmental projects take a lot of time; many years may pass from the first idea to actual implementation. For strategic, financial and technical reasons, projects may remain in the pipeline for a significant period, with a clear negative impact on effectiveness, as the generation of benefits is significantly delayed. Postponements, delays, administrative inertia and long tendering procedures are among the main reasons for the longest selection processes.

In **Italy**, **Malta** and **Poland**, the selection process involved stakeholder consultations. These helped to ensure that the concerns of local communities were addressed and no evidence was found that they contributed to delays in the selection process.

Evidence shows that, regardless of the length of the selection process, the project assessment should be updated and revised to take account of changed circumstances.

The evaluation showed that, in some cases, a CBA was carried out only in the framework of the funding request (attached to the application form), rather than as a basis for decision-making.

***Box 2. Good practice in planning – Malta***

The **Maltese** project is an example of good planning practice. The construction of a new WWTP in the south of Malta was part of a 1992 sewerage masterplan for Malta and Gozo, which set out the need for three new WWTPs. The first feasibility study (2000) identified the components of the future investment and featured an options analysis, which was updated in 2006, 2007 and 2010 with three project alternatives: phasing out, maintaining or upgrading the existing plant. The preferred option was selected in 2010 on the basis of cost, energy consumption, $CO_2$ footprint, the impact of construction works and

technology. Stakeholders were consulted as part of the selection process and a monitoring committee ensured that the concerns of the local community were duly addressed.

In the context of this document, 'project governance' concerns:

- the number and type of stakeholders involved during the project cycle;
- the degree to which they cooperate effectively; and
- the way roles and responsibilities are shared.

Project governance has major implications for the partners' financing arrangements, autonomy and responsibilities. The most important determinant of success was leadership by a single entity with the responsibility and capacity to lead all stakeholders. The involvement of a large number of stakeholders in project implementation is not necessarily a sign of a weak governance structure, if the leadership and coordination tasks are carried out effectively. However, some cases seemed to show a correlation between a higher number of stakeholders and a less positive impact from the governance structure.

In some cases, the Commission supported the formation of an efficient governance structure. In the EU-15 projects, it had discussions with project promoters at the application stage and then followed the projects more passively. With the EU-13 projects, it took a more active role in steering project implementation by interacting with stakeholders at various levels of governance.

***Box 3. Governance structure***

In the **Italian** case, a multi-faceted and complex set of institutional actors and stakeholders were involved in project implementation, due to a multi-level governance structure in which no institutional stakeholder played a strong supervisory role over the whole water cycle. In addition, institutional conflicts significantly hampered the implementation of indispensable complementary investments, preventing the benefits generated by the new aqueduct from being maximised.

A lack of clarity in the assignment of responsibilities within the governance structure might put at risk the future financial sustainability of the **French** project. Initially, the costs of maintaining the wave attenuators were to be split between the urban community of Sète and the towns of Sète and Marseillan. However, the related maintenance costs have proved to be higher than expected and the dredging costs for Marseillan have risen in the course of project implementation. As a result, the costs will probably need to be shared differently in future and it is not clear that the three stakeholders will be able to meet them.

## 4.2 Efficiency

'Project efficiency' gauges the relationship between resources used and changes generated, i.e. value for money[58]. It expresses how input resources (especially time and costs) were used in order to produce the desired effects.

### Main findings

- ✓ Most of the projects were efficient, delivering social benefits that exceeded the costs.
- ✓ Most of the projects were not as efficient as expected *ex ante*: cost overruns and time delays affected their performance.

of the project preparation and approval process.

*Table 4. Project efficiency – final assessment score (1 to 5)*[59]

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| Wastewater | **Bulgaria** – Sofia water cycle | 2 | Due to pitfalls in the planning stage, the project was severely delayed, over-estimated final demand and its scope was in the end reduced. Nevertheless, the socioeconomic benefits outweigh the costs. |
| | **Malta** South – WWTP | 3 | The project was completed on budget. Some differences were reported between costs and benefits forecast *ex ante* and those that can be observed *ex post*: an expected increase in fishing and aquaculture activities and an expected increase in the quality of drinking water did not materialise. Nevertheless, the project delivered a positive socioeconomic return on investment. |
| | **Poland** – Sochaczew sewage management | 3 | The project was completed with a large cost underrun due to the macroeconomic situation. Demographic trends meant that demand was not as high as anticipated. Nevertheless, the project delivered high net socioeconomic benefits. |
| | **Romania** – Craiova sewerage and wastewater treatment | 4 | Despite an over-estimation of demand, the project was completed on budget and provides socioeconomic benefits that exceed costs. |
| Water | **Croatia** – Slavonski Brod water supply, sewerage and wastewater treatment | 4 | Final costs were lower than in the original CBA, as services, equipment and materials prices changed due to the global economic crisis. Implementation was in line with the schedule. Overall, the project generated net benefits. |
| | **Italy** – Favara di Burgio aqueduct | 4 | The project was implemented on budget. The operating costs ended up lower than predicted, contributing to a net socioeconomic benefit. |
| | **Spain** – Anguilas desalination plant | 3 | The project cost was above the initial budget due to an increase in scope. However, the socioeconomic benefits outweigh the costs, as forecast. |
| Others | **Estonia** – multifunctional ship | 4 | Good project planning, design and implementation, due to a competent team and strong cooperation between stakeholders, ensured that the project was finished below anticipated cost. The socioeconomic benefits are roughly equal to the costs. |
| | **France** – Sète lido protection | 4 | The project is on track to be delivered within budget, with the socioeconomic benefits outweighing the costs. |
| | **Slovenia** – Celje waste | 1 | No proper assessment was possible, as no data were available on project design and technology (thus justifying |

[59] The scores range from 1 to 5, as follows:
1 = the determinant plays a positive, but almost negligible, role in the overall project performance;
2 = the determinant makes a slightly positive contribution to project performance;
3 = the determinant contributes in a moderately positive way to performance;
4 = the determinant makes a positive contribution to the overall performance of the project;
5 = the determinant is responsible for the positive performance of the project.

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| | management | | the low score). Costs increased in the construction phase. The demand forecast was over-estimated, causing the plant to operate below minimum efficient capacity. Both effects led to socioeconomic costs exceeding socioeconomic benefits. |

Source: CSIL, Ramboll (2019).

### 4.2.1 Most projects were efficient, delivering social benefits that exceeded the costs

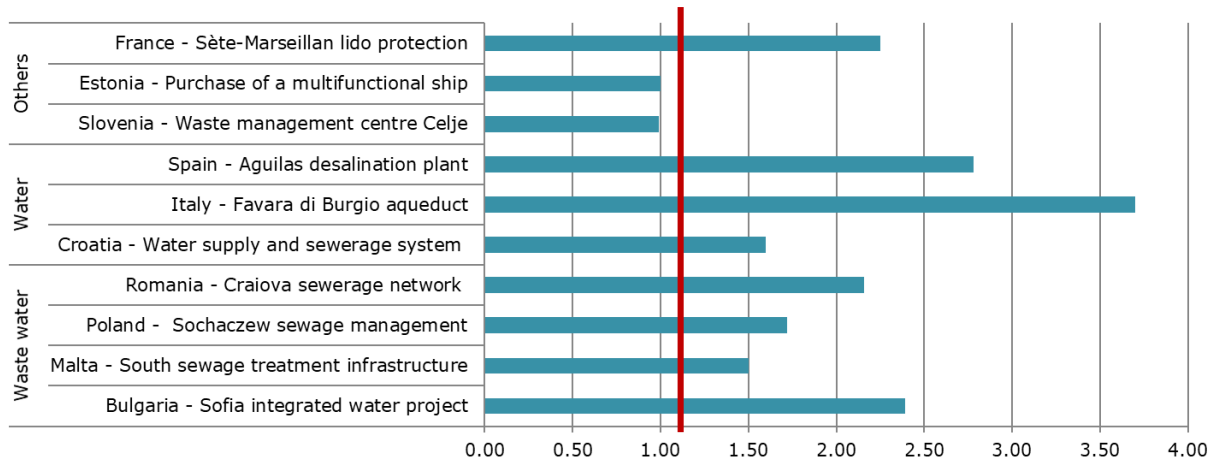
The CBAs show that all but one of the analysed projects delivered benefits that exceeded the costs[60]. The projects generated value for money, independently of whether they were completed on time and on budget. At the same time, most were not as efficient as expected *ex ante*: in some cases, costs exceeded the *ex ante* forecasts and benefits were affected by factors such as over-estimated demand. In some cases, delays were a cause of less-than-expected efficiency in project implementation.

There was insufficient data to look into the unit costs of comparable investment (or alternative technical solutions) to determine whether the same benefits could have been secured with fewer resources / at lower cost. However, evidence from projects suffering from overcapacity suggests that resources could have been allocated more efficiently.

The two lowest B/C ratios are caused by different factors. In the **Slovenian** case (B/C ratio < 1), final construction costs are higher and actual demand is lower than in the *ex ante* forecasts. Waste treatment suffers from overcapacity (causing excessive operating costs) and inflexible technology for energy sourcing.

In the **Estonian** case (B/C ratio = 1), the low ratio is the result of conservative estimates of net benefits: the ship's impact in terms of reducing the number of deliberate spills has not been quantified, due to the lack of data.

***Figure 4. B/C ratio in all selected projects***




Source: *Ex post* evaluation of major projects supported by the European Regional Development Fund

[60] B/C ratio > 1 in eight cases, B/C = 1 in one case, B/C < 1 in one case.

(ERDF) and the Cohesion Fund between 2000 and 2013.

### Financial sustainability

'Financial sustainability' is a measure of a project's capacity to cover its costs through the investment and operating phases. In line with the rationale of EU funding for major projects, none - except one - of the selected projects were financially profitable: their financial net present values were negative or zero and they required funding. For these, the EU grant was decisive in ensuring financial sustainability.

The exception was the **Italian** project, which turned out to be financially profitable after the event. *Ex ante*, it was not assessed as financially viable for the private sector. *Ex post*, however, the reductions in operating costs were greater than expected. Due to strong political will, the project would probably have been implemented even without EU support (see below).

Project funding came from various sources in addition to the EU. As shown in Table 5, all projects received national contributions or equivalents.

***Table 5. Funding structure in case studies***

| Case study | Funding | | | Loans | |
|---|---|---|---|---|---|
| | National contribution or equivalent | Infrastructure manager's own resources | ERDF / Cohesion Fund | EIB | Private loan / bonds |
| **Bulgaria** – Sofia water cycle | ☑ | | ☑ | ☑ | |
| **Malta** South – wastewater treatment | ☑ | | ☑ | ☑ | |
| **Poland** – Sochaczew sewage management | ☑ | ☑ | ☑ | | ☑ |
| **Romania** – Craiova sewerage and wastewater treatment | ☑ | | ☑ | ☑ | |
| **Croatia** – Slavonski Brod water supply, sewerage and wastewater treatment | ☑ | | ☑ | | |
| **Italy** – Favara di Burgio aqueduct | ☑ | ☑ | ☑ | | ☑ |
| **Spain** – Anguilas desalination plant | ☑ | | ☑ | ☑ | |
| **Estonia** – multifunctional ship | ☑ | | ☑ | | |
| **France** – Sète lido protection | ☑ | | ☑ | | |
| **Slovenia** – Celje waste management | ☑ | | ☑ | | |

Source: CSIL, Ramboll (2019).

All but one of the projects generated revenues that formed the basis of their financial sustainability in the operational phase. In seven cases, the revenues covered the

operational costs and ensured long-term financial sustainability. Three projects required public funding from local, regional or national sources to cover the operating and maintenance costs.

All water and waste projects collected revenues from end-users, in line with the 'polluter pays' principle[61]. The Water Framework Directive promotes the sustainable use of water as a scarce resource by requiring that the price of water reflect its true cost, in terms both of infrastructure provision and external costs to the environment (European Environment Agency 2013). Similarly, it applies the 'polluter pays' principle in the waste sector.

***Box 4. Financial sustainability and revenue-generating projects***

In three cases, tariffs ensured financial sustainability over the lifetime of the project. In the **Italian** case, the company managing local water distribution imposed a tariff on final household and industrial users. Part of this tariff covered the service of water transit, which is paid by the local distributor to the company that operates the aqueduct and supplies water to the municipal head tankers. The revenues from the tariffs exceeded the operating costs over the project lifetime and so ensured the financial sustainability of the aqueduct.

Likewise, in the **Bulgarian** project, the tariffs were set by a national commission at a level that is expected to be sufficient to generate a net revenue throughout the project's operational phase.

The **Polish** project was not expected to experience cash flow problems, as revenues from the wastewater tariff completely cover operating, maintenance and depreciation costs. Also, due to unexpected reductions in investment costs, the depreciation of the project is lower than expected, which has allowed for a reduction of the tariff.

Some projects became financially sustainable only after a transition period, due to end-users' low willingness to pay and the existence of alternatives. In the **Maltese** case, there were concerns that users might not be able to pay tariffs at the level required to guarantee financial sustainability immediately after project completion. Therefore, the tariff is scheduled to increase gradually until 2032, when costs will have been completely recovered. In the meantime, the operating company (WSC) will receive subsidies from the government, which (together with collected revenues) will ensure the project's sustainability.

In the **Spanish** case, the tariff for water from the desalination plant was set at cost-recovery levels from the beginning. Because this was nearly double the tariff for water from aquifers (which arguably did not cover external environmental costs), demand for the desalinated water was initially low. Therefore, the operator initially failed to cover operating costs and national public contributions were required to sustain operations. Later, however, farmers experienced difficulties in obtaining water from other sources and had to resort to the desalination plant; eventually, demand picked up and the desalination plant became financially sustainable.

Even if financial sustainability is secured in the short term, it may be threatened in the long run as a result of political factors or demographic trends. For instance, the **Croatian** project was financially sustainable at the time of the evaluation (2018), as the water price covered operational and administrative costs. However, due to strong depopulation in the area, water consumption may decrease in the future, in which case the revenues collected via the water tariff may not be sufficient to cover operating, maintenance and depreciation costs, and operations may become financially unsustainable. For this reason,

[61] Article 191(2) TFEU.

the national authorities have prepared a phase II of the Slavonski Brod project whereby it will take in two neighbouring agglomerations (Grcin and Brodski Stupkin). In addition, a consolidation of water utility companies throughout Croatia is currently under way.

Similarly, in the **Slovenian** case, the volume of municipal waste treated by the plant is already (by 2018) less than predicted *ex ante*. This is a result of updated waste legislation and the introduction of separate waste collection and recycling in Slovenia. Increased recycling rates created financial problems for the project in the first few years of its operation, but this was compensated by taking in waste from a wider area. At the time of writing, this has ensured cost recovery and the financial sustainability of the project.

Unlike water and waste projects, risk-reduction projects rely exclusively on government subsidies for their financial sustainability. The operations of **Estonia's** multifunctional ship were funded purely by the government. In **France**, the costs of maintaining the wave attenuator were covered by the local municipality and all other operating costs (e.g. relating to the maintenance of the beach and car parks) were covered by the two towns nearest the beach. Although the project generated revenues in the form of concessions paid by businesses operating on the beach, these were not earmarked to cover the operating costs of the project infrastructure.

### 4.2.2 Most projects were not as efficient as expected: cost overruns and time delays affected their performance

As discussed extensively in the literature, cost and time overruns in project construction are common in major projects[62], including those relating to environmental infrastructure[63]. Investment costs are often under-estimated. Delays postpone benefits and may result in cost overruns as well. Seven out of ten selected projects experienced time overruns, while only three experienced cost overruns[64]. Table 6 summarises these factors for each of the case studies.

***Table 6. Divergences from planned schedule and budget***

| Case study | Was the project completed on schedule? | | Was the project completed within budget? | |
|---|---|---|---|---|
| **Bulgaria** – Sofia water cycle | 🔴 | Delayed by 3 years due to prolonged expropriation procedures that were not predicted. | 🔴 | Substantial cost overrun (+32%) mainly from price increases due to a construction boom and extension of public procurement procedures. |
| **Malta South** – wastewater treatment | 🟢 | Completed on time. | 🟢 | Slight cost underrun (-2%) due to non-occurrence of planned contingencies and favourable project management contract. |
| **Poland** – Sochaczew sewage management | 🟡 | Delays of over a year due to a slow procurement process. | 🟢 | Significant cost underrun (-51%) due to price reductions from economic crisis and competitive tendering process. |

62 e.g. Flyvbjerg (2014).

63 e.g. RGL Forensics (2011) and COWI, Milieu and CSIL (2016).

64 The ex-post CBAs were carried out on the basis of the "actual" costs as observed "ex-post". They therefore included all project "savings", whether resulting from procurement processes (cost reductions granted by contractors) or effective management.

| Case study | Was the project completed on schedule? | | Was the project completed within budget? | |
|---|---|---|---|---|
| **Romania** – Craiova sewerage and wastewater treatment | 🟡 | Slightly delayed implementation due to underperformance of a contractor and re-launch of tendering process. | 🟢 | Slight cost underrun (-2%) due to savings achieved in tendering process and works contract. |
| **Croatia** – Slavonski Brod water supply, sewerage and wastewater treatment | 🟢 | Finished with 1-month delay due to bad weather conditions. | 🟢 | Significant cost underrun (-22%) due to price reductions following financial crisis. |
| **Italy** – Favara di Burgio aqueduct | 🟡 | Delay of 1 year due to bad weather, administrative procedures and third-party supplier delays. | 🟢 | Significant cost underrun (-17%) due to discount offered by winning consortium of contractors. |
| **Spain** – Anguilas desalination plant | 🔴 | Delayed by 3 years due to lack of complementary investments and change in project design. | 🔴 | Cost overrun (+63%) due to changes in project design. |
| **Estonia** – multifunctional ship | 🟢 | Completed 4 months earlier than expected due to experienced contractors and good stakeholder cooperation. | 🟢 | Slight cost underrun (-0.6%) due to changes in project design (elements excluded). |
| **France** – Sète lido protection | 🔴 | Delayed by 3 years due to introduction of a testing phase for innovative technology. | 🟢 | Cost underrun (-7%) due to good project management (e.g. introduction of cost-saving test phase). |
| **Slovenia** – Celje waste management | 🔴 | Delay of 1.5 years from changes in selected contractors due to bankruptcy and limited experience. | 🔴 | Cost overrun (6%) due to multiple changes in contractors, which resulted in design changes. Low score also influenced by lack of appropriate data. |

Source: CSIL, Ramboll (2019). Final project completion time and costs compared to data contained in major project applications

### Delays

Three of the projects were completed on schedule. In two cases, project preparation was crucial for smooth implementation[65]. For example, during the planning of the **Estonian** multifunctional ship, a team of sectoral experts mapped the possible risks associated with the implementation phase. This risk-mapping, combined with the high expertise of the construction and design companies, resulted in a smooth and timely construction of the ship. In the **Croatian** case, thanks partly to the technical assistance provided to the project promoters, the project was well prepared in terms of technical documentation, a feasibility study and CBA. In addition, it received strong political support at local and national levels and was completed on time.

[65] This study has been able to ascertain only the benefits of the project preparation phase. Its scope does not cover the costs and administrative burdens of project preparation, which have therefore not been estimated here.

The other seven projects experienced delays. In three cases, the delays were significant and can be partly attributed to contractors' underperformance. This was the case with the **Romanian** project, where the original contractor had to be replaced through a new tendering procedure. For the **Slovenian** project, a full assessment of cost and time overruns was hampered by a lack of supporting data for the technology and design decisions (hence the very low score). In addition, the first two selected contractors filed for bankruptcy and the third had little experience with the type of technology selected for a solid waste treatment plant of such a scale. This led to delays in the building and installation of equipment, changes in the design of the plant and thus to increased costs. In addition, a fire damaged the MBT plant, so reconstruction and further investment were needed.

In two cases, the delay was caused partly by unpredicted exogenous factors: adverse weather conditions (**Italian** and **Polish** projects) and unpredictable events. In the case of the **Polish** project, the builders came up against underground infrastructure that had probably been built over 50 years previously, was not included in existing registers and maps, and required additional works and changes to project design.

However, exogenous factors do not necessarily cause delays if they are properly predicted in the planning phase. The **Italian** project was interrupted due to archaeological findings requiring additional excavations. However, the project was not delayed, as this possibility had been factored in during the planning phase.

In contrast, a lack of experience led to significant delays to the **Bulgarian** water supply network. The project promoters under-estimated the complexity of (and time involved in) concluding expropriation procedures to carry out the construction work. The impact was amplified by the lack of a geographical information system, which meant that the properties to be expropriated were initially identified manually – a highly time-consuming activity.

Slow procurement procedures caused delays in both the **Romanian** and the **Polish** projects.

The **French** project was deliberately delayed. It involved using two innovative technologies to reduce coastal erosion:

- an on-land drainage system that accelerates the infiltration of water into sand on the beach to stabilise it; and
- a soft (as opposed to hard) wave attenuator placed 300 m out to sea.

Although both technologies had been successfully tested elsewhere, the French authorities required a three-year trial period in which both were tested on a limited scale. The wave attenuator was then selected as the best solution. The decision to test the technologies ensured the project's financial sustainability, as full deployment of both would have resulted in a net loss. This is an example of prudent project management, where delay was the result of an active strategic choice.

**Cost overruns**

For seven of the projects, the final costs were within estimated budgets. Two projects experienced significant cost overruns, while one ran a slight overrun. In general, where benefits exceed costs by a sufficient margin, projects may remain efficient (and still have a good B/C ratio) even in the event of cost overruns and delays. For example, the

**Bulgarian** and **Spanish** projects suffered from significant cost overruns and delays, but were still efficient, in the sense of socioeconomic benefits outweighing costs.

Discounts provided by contractors during the procurement processes played an important role in budget control in several of the analysed projects. For instance, the **Polish** project was split into smaller contracts, so that small companies could take part in the tender procedure. This increased competition among contractors and put downward pressure on the prices of submitted tenders. In the **Italian** case, interest charged due to delayed payments and additional payment requests by the construction company increased expenditure by about €2 million. However, due to the discount offered by the winning consortium at the end of the tendering procedure, the total project costs were still 16.8% below those initially envisaged. The tendering strategy had encouraged the participation of local engineering firms with good knowledge of the construction area. Similarly, a well-executed tendering procedure led to total cost savings of about €1.5 million in the **Romanian** case.

Severe macroeconomic shocks can heavily influence the construction costs of major projects. As the cases below show, these may have a major impact on the financial sustainability of project implementation, but are difficult to foresee.

In the **Polish** case, the onset of the financial crisis increased competition among contractors, putting downward pressure on prices in the sector. Also, the crisis caused a devaluation of the Polish currency, reducing project expenditure in euro terms. The crisis therefore contributed to significant cost underruns of about half the predicted total cost. It had a similar effect on the **Croatian** project, albeit resulting in a smaller cost underrun. The macroeconomic situation had the opposite effect in **Bulgaria**. A boom in the construction sector at the time of implementation (between 2006 and 2009) led to an increase in construction prices and a cost overrun amounting to about a third of the envisaged total costs.

Changes to project design influenced the implementation costs in two projects. In **Spain**, this was due to a decision to construct pipeline connections to the irrigation community dams, to facilitate the full operation of the desalination plant, which gave rise to a request from Spain to modify substantially the initial eligible costs of the project[66]. In contrast, the scope of the **Bulgarian** project was reduced due to under-estimated difficulties in carrying out expropriation procedures. This led to a reduction in the overall expected costs and, as a result, in the grant from the EU[67]. The **Slovenian** project suffered a slight cost overrun due to adjustments in the design of the planned TT plant for waste. In contrast, the promoters of the **Estonian** project decided to exclude an on-board laboratory for the chemical testing of oil spill samples from the project design, because the Police and Border Guard Board (the operating organisation) did not have a laboratory technician. This change of specifications allowed bidders to reduce their prices in the procurement procedure and the project was completed with a slight cost underrun.

In the **Maltese** case, the choice of technology and design for the sewerage treatment plant best suited to the context, and good management, resulted in cost underruns. No technical issues or modifications to the original project plans were reported during implementation. Therefore, none of the €1.5 million budgeted for contingencies was disbursed.

66 Commission Decision of 2 December 2008 amending Decision C(2006) 6550.

67 At this stage, there was still a cost overrun.

As underlined in the effectiveness section[68], forecasting capacity proved to be a critical factor and in some cases affected the final efficiency of the project. In the ten analysed case studies, ex-ante forecasts were often too optimistic in terms of demand, time, and costs estimation thus affecting the design, implementation timeline, financial sustainability as well as the actual delivery of long-term effects of major projects. Forecasts were not always adjusted over time in line with the evolving context of the projects, such as demographic trends, institutional or legislative framework and behavioural patterns. Demand was for example overestimated in the case of the **Sochaczew sewage management plant and in the Slovenian case**, causing the plants to operate below their minimum efficient capacity and suggesting a sub-optimal allocation of resources.

**Administrative costs**

Managing and implementing ESIF programmes demands financial and personal investments from all involved. 'Administrative costs'[69] (costs linked to the administrative tasks of any fund-programming body) relate to administrative workload and the costs for the purchase of services (e.g. expertise) and goods. The *ex post* evaluation did not study the overall administrative cost of preparing and managing these specific projects.

A recent study[70] established a new baseline for the administrative costs and burden of the current ESIF programming period. It concluded that the administrative costs linked to managing the ESIFs are reasonable overall and decrease as a proportion of the budget with the size of the project.

## 4.3 Relevance

'Project relevance' is a twofold concept relating to a project's:

- alignment with existing needs; and
- consistency with priorities established in the field at various levels (local/regional, national and EU).

**Main findings**

- ✓ The projects contributed to integrate sustainability concerns in programme design and implementation.
- ✓ All projects address real and significant environmental needs.
- ✓ The projects remain relevant over time.
- ✓ Projects address not only environmental, but also economic needs.
- ✓ Compliance is a significant driver for project implementation.
- ✓ Projects are aligned with the EU and national priorities.

[68] See p. 25-26.

[70] Spatial Foresight & t33 (August 2018). New assessment of ESIF administrative costs and burden. Final report. Administrative costs were not analysed in detail in the case studies. This analysis is based on *New assessment of ESIF administrative costs and burden – final report*, Spatial Foresight & t33 (2018).

### 4.3.1 The projects contributed to integrate sustainability concerns in programme design and implementation

Attention to sustainable development as a horizontal theme has increased over the years, which is reflected in the legislative changes of the three programming periods.

In 2000-2006, project relevance from an environmental point of view was not always a prime concern of cohesion policy. The *ex post* evaluation of 2000-2006 cohesion policy programmes[71] in the environmental sector found that:

> 'none of the analysed OPs contained a comprehensive analysis of how environmental issues may interact with the economic and social development of the regions. Decisions on the allocation of funds were driven by sectoral approaches rather than addressing the regional needs from a more integrated perspective. The interventions in the environmental sector were designed to address the main environmental issues within the framework of sectoral policies and were not integrated into a regional perspective. This was particularly true for the major sectoral programmes covering environment that were oriented towards environmental objectives.'

The evaluation also concluded that little attention was paid to sustainable development (linking three pillars: economic, social and environmental) as a horizontal theme in programme design and implementation. Efforts in this area were mostly seen as a question of fulfilling regulatory requirements rather than developing the concept[72].

In 2007-2013, integrating sustainability concerns into programme implementation proved challenging, particularly when it came to developing, appraising and selecting projects for financing. In particular, the newer Member States struggled to transfer the complexity of sustainable development into actual project development and on the ground[73].

The Common Provisions Regulation (CPR) for 2014-2020[74] puts greater emphasis on sustainable development by requiring Member States and the Commission to ensure that environmental requirements are promoted in the preparation and implementation of partnership agreements and programmes.

***Table 7. Project relevance – final assessment score (1 to 5)***

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| **Waste water** | **Bulgaria** – Sofia integrated water project | 5 | The project addressed a clear bottleneck in infrastructure endowment and service provision, and severe environmental concerns, caused by a lack of sewage system in part of the city, illegal sewer connections and sewage discharge into watercourses. The project was aligned with |

[71] ADE, Agrotec, BIO Intelligence Service, Orbicon (2009). *Ex post* evaluation of major projects supported by the European Regional Development Fund (ERDF) between 2000 and 2006 (work package 5B: environment and climate change – final report; vol. I, p. 61).

[72] ADE, Agrotec, BIO Intelligence Service, Orbicon (2009). Work package 11: management and implementation systems.

[73] COWI A/S, Milieu sprl (2019). Integration of environmental concerns in cohesion policy funds (ERDF, ESF, CF) – Final report.

[74] Article 8 of the Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006 Common Provision Regulation.

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| | | | priorities established at local, national and EU levels. |
| | **Malta** South – sewage treatment infrastructure | 5 | The project addressed the issue of untreated wastewater discharge into the sea, which hampered the use of coastal waters and damaged ecosystems. It was in line with EU directives in the water sector (especially UWWTD) and directly addressed EU and national priorities (e.g. in the Malta and Gozo sewerage masterplan). |
| | **Poland** – Sochaczew sewage management | | The project addressed a real need (lack of wastewater infrastructure in part of the city), which meant that rivers and soil (and indirectly groundwater) were affected by sewage discharge. It was consistent with strategic priorities set at European, national and local levels. |
| | **Romania** – Craiova sewerage network | 5 | The project aimed to address the lack of an operating WWTP, an incomplete sewer system and water leaks in the water distribution network. It was aligned with the strategic objectives of the Danube pollution reduction programme and with EU directives. |
| **Water** | **Croatia** – water supply and sewerage system | 5 | The project addressed a low connection rate to the water supply system, water leaks in the water distribution network, an insufficient wastewater network and the lack of a WWTP. It was in line with national, regional and local priorities, as well as EU directives. |
| | **Italy** – Favara di Burgio aqueduct | 5 | The project was highly relevant in addressing serious water management problems caused by an old and dysfunctional aqueduct that did not ensure a reliable water supply to municipal head tanks. It was in line with EU directives and directly addressed priorities established at national level (reorganisation of the water sector) and regional level (countering local water shortages). |
| | **Spain** – Aguilas desalination plant | 5 | The project tackled serious problems in water management: the existing plant was not operating at full efficiency and there was a severe water deficit and aquifer over-exploitation. Water provision for irrigation was hampered, leading to land abandonment and economic slowdown. The project was in line with EU directives in the water sector and directly addressed national and regional priorities. |
| **Others** | **Estonia** – purchase of a multifunctional ship | 5 | The project addressed the lack of pollution-removal capacity in Estonia's Baltic waters. It was consistent with EU directives, national strategies and Baltic cooperation under the Convention on the Protection of the Marine Environment of the Baltic Sea Area. |
| | **Slovenia** – Celje waste management centre | 4 | Despite poorly defined goals, the project addressed real needs (lack of landfill space, failure to comply with the Landfill Directive and national law, lack of separate waste collection). It was in line with Slovenia's 2004-2006 single programming document, which included the priority measures of national waste policy and was funded by the CF. Not all objectives were relevant for the phase II project, as they were more important for the waste management centre as a whole. |
| | **France** – Sète-Marseillan lido protection | 5 | The project addressed natural risks (erosion, unregulated parking and camping, pollution linked to waste, noise pollution, accidents and congestion) and took account of ecological and economic factors. It was in line with EU and national recommendations on strategies to deal with erosion issues. |

Source: CSIL, Ramboll (2019).

### 4.3.2 All projects addressed real and significant environmental needs

All 10 projects responded to a clearly identified need for intervention and addressed real and significant environment-related needs, while delivering a range of benefits.

As regards the two water supply projects (**Italy's** Favara di Burgio aqueduct and **Spain's** desalination plant in Aguilas), new infrastructure was necessary to address water deficits resulting from resource-management problems. When the **Italian** project was conceived, the existing aqueduct was in poor condition and suffered from high water losses, so a reliable water supply to municipal head tanks could not be ensured. The Sicilian water crisis (1999-2004) exacerbated the need for immediate action. Before the **Spanish** project was implemented, water supply was not consistently ensured due to permanent water scarcity. This led to land abandonment and over-exploitation of aquifers. An existing desalination plant was underperforming due to operational problems.

In other cases, it was necessary to intervene to address severe environmental concerns and avoid potential future damage or destruction of the natural environment. A compromised environmental situation characterised the five projects (in **Bulgaria**, **Malta**, **Poland**, **Romania** and **Croatia**) featuring wastewater treatment infrastructure, all of which dealt primarily with the discharge of raw sewage into water bodies. The aim of the **Estonian** and **French** projects was to deal with environmental hazards that threatened to cause irreversible damage to natural resources.

Seven projects addressing a water cycle, together with the **Slovenian** waste management project, were designed to ensure the sustainable provision of key services of general interest (e.g. water supply, wastewater collection and treatment, and waste treatment), which were necessary for civil and economic activities. In these cases, the *ex ante* situation differed depending on the sub-sector. In the water supply sector (projects in **Italy** and **Spain**, project components in **Bulgaria**, **Romania** and **Croatia**), services generally existed but were not satisfactory. As regards wastewater collection (projects in **Bulgaria**, **Poland**, **Romania** and **Croatia** and, to some extent, the **Maltese** project), no or only incomplete services were provided in the project areas. Wastewater treatment services were lacking in **Malta** and **Croatia**, and they needed to be upgraded in **Bulgaria**, **Poland** and **Romania**.

The ten selected major projects remained on the whole relevant over time. All the projects addressed basic human needs, and the use and preservation of natural resources, that remain relevant over time. Evolving needs and consumption patterns were to a large extent taken into consideration during planning and implementation, partly through stakeholder consultation. This also guaranteed relevance over time.

The **Estonian** project and the **Slovenian** waste management project both appear to be characterised by a trade-off between the requisite intervention and long-term relevance. While they were highly relevant at the moment of the financing decision (in the absence of other solutions), they may become less so over time with the adoption of measures to comply with further requirements.

### 4.3.3 Projects address not only environmental, but also economic needs

While environmental concerns were the main drivers of all 10 projects, they made equally important contributions to economic development. However, unlike transport investments, which directly trigger economic growth, environmental projects contribute

to economic development mainly by managing natural resources efficiently and providing basic environmental services in previously unserved areas.

In most of the assessed cases, considerations relating to the efficient and sustainable management of natural and socioeconomic resources were never separate from purely environmental concerns. For instance, water is a key input for various economic activities and aquatic ecosystems deliver goods and services used by certain sectors (e.g. water-related tourism, professional fishing). Also, specific projects aimed to deliver services to households. Accordingly, economic considerations can relate to the optimisation (in terms of efficiency, sustainability and quality) of the management of natural resources and the preservation of ecosystems.

In several cases, economic goals featured among the projects' primary objectives. For example, the area around Aguilas, where the **Spanish** desalination plant was built, suffered from land abandonment and general economic slowdown as a result of irregular water supply. The project was designed to address this problem in the long term. The **Maltese** WWTP was partly designed to promote tourism and economic development on the south-east coast, where they had been hampered by seawater contamination. Similarly, the protection of local economic activities was part of the rationale for the lido protection project in **France**.

On a different note, the primary goal of the **Italian** project was to enhance water supply to municipal tanks. However, the project also generated economic effects, as the increased availability of water proved a significant incentive for entrepreneurs to establish their firms in the area.

The selected projects did not involve zero-sum trade-offs between environmental and economic considerations (e.g. the protection of natural resources, on the one hand, and the protection of jobs, on the other). As such, they were generally not controversial and enjoyed the support of economic operators and (most) citizens.

### 4.3.4 Compliance is a significant driver of project implementation

The analysis reveals that compliance was a significant driver behind the implementation of major environmental projects analysed in this *ex post* evaluation, particularly as regards drinking water, wastewater treatment and waste management. However, it was never an objective per se. Rather, compliance with environmental standards was instrumental in the prioritisation of needs and investments, and the recognition of some as more pressing than others. ERDF/Cohesion Fund co-funding for major projects is a means of ensuring the implementation of EU environmental legislation, particularly in EU-13 Member States.

The role of compliance as a driver for project prioritisation is a peculiarity of the environmental sector; it was not so evident in the transport sector, for instance (see EC, 2018). Environmental legislation is characterised by standards and requirements that are stricter than those in other infrastructure sectors.

All five wastewater treatment projects (in **Romania**, **Malta**, **Poland**, **Croatia** and **Bulgaria**) were driven by the need to comply with EU accession criteria and the

environmental *acquis*[75]. However, it is important to stress that compliance considerations simply reflected the countries' urgent need for such investments.

Incomplete compliance with the requirements of the Landfill Directive (due to a lack of landfill space and separate waste collection to ensure the suitable treatment of municipal waste) was one of the main drivers for the **Slovenian** waste management project.

As implied above, compliance with EU requirements was less a driver in the EU-15. For example, it was not among the lead drivers for the **Italian** and **Spanish** projects (the two investments dealing only with water supply), which aimed to address failures in the provision of water for civil and agricultural uses respectively. However, the projects still had to be in line with the WFD and the DWD.

The **Estonian** project was slightly different, in that a major driver was compliance with HELCOM recommendations, in line with the Convention on the Protection of the Marine Environment of the Baltic Sea Area. Further legal parameters stemmed from national strategies and EU directives (Marine Strategy Framework Directive, Birds Directive and Habitats Directive).

### 4.3.5 Projects are aligned with EU and national priorities

As required by the applicable legal provisions, all the projects had to be included in an OP and screened against the OP's objectives before acceptance. Most were part of wider strategic sectoral plans. Major projects must be strategically aligned with national and EU objectives to be eligible for EU funding. This requirement has been further strengthened for the 2014-2020 period, with the introduction of specific *ex ante* conditions.

Analysis confirms that most of the water and wastewater projects were developed as part of an integrated network[76], so they were covered by wider local, regional or national plans. For example, the **Italian** aqueduct was part of a wider strategic approach aimed at countering the water emergency through the joint management of all major Sicilian aqueducts. Similarly, the WWTP in **Malta** was part of a broader strategy to enhance wastewater connection and treatment in the country.

All 10 projects were found to be consistent with EU and national and priorities. Alignment with regional priorities played a role in the two projects (in **Italy** and **Spain**) dealing only with water supply, while local priorities were particularly relevant for the projects (in **Bulgaria**, **Poland** and **Croatia**) dealing with wastewater treatment[77].

Specific policy frameworks apply to the two projects with cross-border (including extra-EU) effects, which had to comply with an additional layer of provisions:

- the Craiova sewerage network project in **Romania** was designed and implemented in alignment with the Danube pollution reduction programme and the strategic action plan for the Danube river basin, developed under the auspices of the International Commission for the Protection of the Danube River, an international organisation established in 1998 and consisting of 14 cooperating states and the EU. The project was also listed as a priority in Romania's national

[75] UWWTD, WFD, Drinking Water Directive (DWD) and the Bathing Waters Directive (BWD).

[76] Projects in **Bulgaria**, **Malta**, **Romania**, **Croatia**, **Italy** and **Spain**.

[77] In the case of **Malta**, due to the country's limited size, no differentiation was identified between local, regional and national priorities.

environmental action programme and national plan for the environment under the Structural Pre-Accession Instrument (ISPA); and

– the multifunctional ship in **Estonia** contributed to alignment with HELCOM recommendations (see above).

## 4.5 Coherence

'Project coherence' refers to consistency between project components/features and the wider stated project objectives – be it at European or local level. It refers only to strategic alignment, regardless of how and whether strategies and plans are actually implemented.

### Main findings

- ✓ Projects were coherent with the EU environmental framework.
- ✓ Project components were generally consistent with the project objectives.
- ✓ They were also well placed in the wider policy context, contributing to EU and local priorities.

***Table 8. Project coherence – final assessment score (1 to 5)***

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| Waste water | **Bulgaria** – Sofia integrated water project | 5 | All project components were in line with the stated objectives and the project was in line with larger investments by the Sofia Municipality. |
| | **Malta** South – sewage treatment infrastructure | 5 | All project components were in line with the stated objectives. The project was in line with two other treatment plants. It enabled further investments (in re-using treated sewage)[78]. |
| | **Poland** – Sochaczew sewage management | 5 | All project components were in line with the stated objectives. With respect to external coherence, the project can be deemed to be independent from other projects. |
| | **Romania** – Craiova sewerage network | 5 | Initially, the project included a WWTP and focused on the sewage network; later, it included the rehabilitation of the water distribution network. Project components were in line with the stated objectives. External coherence: further water and wastewater infrastructure projects are planned at county level. |
| Water | **Croatia** – water supply and sewerage system | 5 | Project components were overall in line with the intended objectives. The project was part of the local municipal company's long-term investment plan and other projects are being prepared. |
| | **Italy** – Favara di Burgio | 5 | All project components were in line with the stated objectives. The project was part of a wider investment plan, with the renewal of two |

[78] Although implementation was fully consistent with the relevant EU directives, at the time of writing (2019) illegal discharges to sewers in its operational phase have prevented the project from achieving full compliance with the UWWTD.

| | | | |
|---|---|---|---|
| | aqueduct | | other aqueducts. |
| | **Spain** – Aguilas desalination plant | 5 | All project components were in line with the stated objectives. The project was part of Spain's broader AGUA investment programme. |
| **Others** | **Estonia** – purchase of a multifunctional ship | 4 | Project components were in line with the stated objectives and the project represented part of a broader effort to meet HELCOM recommendations (further measures are expected in the future). |
| | **Slovenia** – Celje waste management centre | 3 | Project components were in line with the stated objectives, except for one (reduction of waste load in the environment and reduction of methane emissions). The project was phase II of the implementation of the waste management centre. Synergies with other investments have been ensured. |
| | **France** - Sète-Marseillan lido protection | 3 | Project components were consistent with the stated objectives. Substantial incoherence can be identified in the building of a new neighbourhood very close to the most fragile part of the lido. |

Source: CSIL, Ramboll (2019).

### 4.5.1 Projects were coherent with the EU environmental framework

All the 10 projects selected were either compliant with EU environmental legislation, or had compliance among their main objectives, particularly in the fields of wastewater treatment and waste management. This was particularly the case in the new Member State where the projects pushed the national and regional administrations to align their environmental legislation with the EU environmental acquis, and finally to achieve coherence with respect to the regulatory requirements.

Coherence with environmental legal standards was instrumental to prioritise needs and investments. For example, one of the main objectives of the Bulgarian project was compliance with EU accession criteria and with the environmental acquis. The Polish project directly implemented the National Programme for Municipal Wastewater Treatment, which in turn aimed to fulfil the obligations assumed by Poland in the Treaty of Accession as regards the Urban Wastewater Treatment Directive.

### 4.5.2 Project components were generally consistent with the project objectives

In most cases, the features of the project, in particular the selected variant, were those most appropriate in the light of identified need(s). A partial exception is the **Slovenian** waste management project, where internal coherence was satisfactory overall, but project components were poorly defined *ex ante*.

### 4.5.3 Project components were well placed in the wider policy context

An important feature of large environmental infrastructure projects, particularly in the water and wastewater sectors, is their integrated approach. Currently, this represents a considerable strength of infrastructure projects, ensuring consistency with complementary investments and allowing for economies of scale. The **Bulgarian**, **Croatian** and **Romanian** projects were hybrid in nature, covering different phases of the water cycle (i.e. water supply, wastewater collection and wastewater treatment). The **Italian** project was part of a broader effort by the regional and national authorities to

revamp aqueducts in Sicily. The Favara di Burgio aqueduct was intended to form the backbone of the new regional infrastructure for water provision as part of a package of investments. According to the initial design and the initial investment plan, the primary intervention was to be accompanied by the overall refurbishment of the local distribution networks connecting the municipal central reservoirs to end-users. A series of problems in the implementation phase (relating to the management of the local distribution services) meant that this did not happen. However, this development, which is the result of implementation problems, does not put into question the initial coherence of the design.

Most water supply and wastewater projects were part of larger sectoral investment plans, drawn up at national level (**Malta** and **Spain)**, regional level (**Italy)** and local level (**Bulgaria** and **Croatia)**. These involved a series of projects addressing a problematic issue (e.g. discharge of raw sewage into water bodies, water crisis) shared across a wider area than that affected by the main project alone.

### 4.6 EU added value

'EU added value' refers to beneficial impacts that can be attributed to EU intervention, over and above what could reasonably have been expected and achieved from Member State action alone.

The study confirmed that in most cases, the EU's contribution was beneficial to project implementation and ensured the achievement of the observed results, which might otherwise have been postponed, not achieved or achieved in a different manner (e.g. without meeting certain standards).

**Main findings**

The EU's contribution added value in three ways:

- ✓ helping to finance the project (financial support);
- ✓ setting priorities and standards (strategic support);
- ✓ triggering transboundary effects and fostering knowledge sharing;
- ✓ determining the technical aspects of the project (technical support) and institutional capacity building.

***Table 9. EU added value – final assessment score (1 to 5)***

| Sector | Case study | Score | Motivation |
|---|---|---|---|
| **Waste water** | **Bulgaria** – Sofia water cycle | 5 | The project would not have taken place without EU financing, due to the limited financial capacity of local institutions and heavily regulated water prices translating into insufficient revenues. This was the first major project in Bulgaria of such scale and complexity, and (along with technical support from the EU delegation) it built local administrative and technical capacity. The political visibility and drive for compliance led to a revision of national tariff policy. |

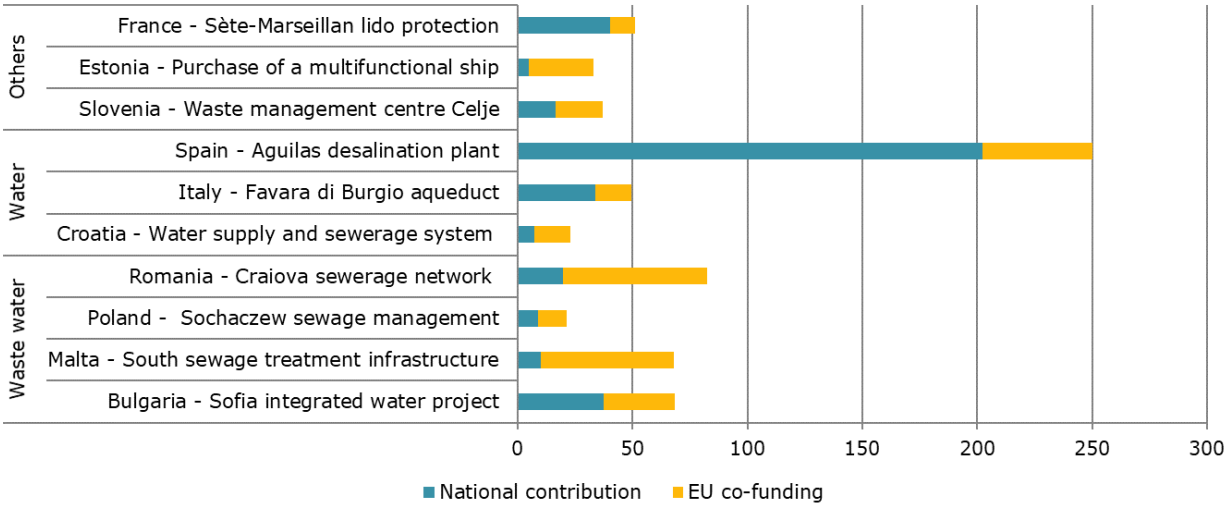
| Sector | Case study | Score | Motivation |
|---|---|---|---|
| | **Malta** South – wastewater treatment | 4 | The project would not have been implemented without the EU contribution, which covered 85% of the total cost. Technical support from Jaspers greatly improved the project application and *ex ante* CBA methodology, which was instrumental in facilitating the financing decision. The project also helped Malta to comply with EU wastewater directives and improve environmental standards. |
| | **Poland** – Sochaczew sewage management | 4 | The project would probably not have been implemented without the EU contribution, due to the limited financial resources of the operator and the city. Technical assistance from JASPERS helped optimise project design and co-financed technical assistance built the beneficiary's capacity to carry out similar projects in the future. The EU intervention also mobilised local stakeholders to achieve project objectives. |
| | **Romania** – Craiova sewerage and wastewater treatment | 5 | The project had started decades before, but had stopped indefinitely due to lack of funds. It would not have been implemented without EU financing. It supported compliance with an EU directive on river water pollution. The establishment of a project implementation unit (PIU) strengthened the capacity of the operator and managing authority. |
| **Water** | **Croatia** – Slavonski Brod water supply, sewerage and wastewater treatment | 5 | Although the investment was included in the operator's long-term plan, the EU financing accelerated implementation by several decades. It enabled Croatia to comply with the UWWTD. Technical assistance in project preparation, design and implementation built local capacity. |
| | **Italy** – Favara di Burgio aqueduct | 2 | Due to its high relevance for national and regional objectives and its urgency, the project would probably have been implemented even without EU support. The financing decision was made after the contract for construction works had been signed. Therefore, the EU had limited influence on project planning. |
| | **Spain** – Anguilas desalination plant | 4 | As EU financing was a national precondition for project approval, the implementation of the project was probably accelerated by the EU contribution. |
| **Others** | **Estonia** – multifunctional ship | 4 | Although the application for EU co-financing was submitted after the procurement process had started, the EU contribution was planned from the beginning of the development phase. Due to limited national funds, the project would not have taken place without EU support. It has a positive transboundary effect, as it reduces risk across the Baltic Sea and contributes to cooperation among surrounding countries. |
| | **France** – Sète lido protection | 4 | The EU financing decision attracted additional support from local, regional and national financiers. The project is an innovative technical solution to coastal erosion, which has already inspired scientific communities across Europe and spin-off projects with European partners. Coastal erosion will be an issue across the EU in the future due to climate change, so lessons learned from this project are important. Dialogue with the Commission built local capacity to carry out *ex ante* CBA of such projects. |
| | **Slovenia** – Celje waste management | 3 | The project would not have been implemented without the EU contribution, due to the beneficiary's lack of financial capacity. It contributed to compliance with EU legislation. The final design and technology were suboptimal, thus reducing the added value score. The project could have benefited from more technical support. |

Source: CSIL, Ramboll (2019).

### 4.6.1 EU financial support

In many cases, the availability of a significant and critical share of funding accelerated – or even enabled – project implementation. This is probably the most obvious dimension of EU added value. Figure 5 shows the extent of EU co-financing for the projects.

***Figure 5. EU co-funding, 2018 (€ million)***




Source: CSIL, Ramboll (2019).

As Figure 5 shows, the EU grant ranges from nearly a fifth (19% for the **Spanish** desalination plant) to well over three quarters (85% for the **Maltese** WWTP) of the total investment cost.

Six of the projects could not have been financed by the Member State alone and EU objectives would not have been reached in time or at all. In **Bulgaria**, **Malta**, **Poland**, **Romania**, **Estonia** and **Slovenia**, EU funding was decisive for implementation, as the authorities responsible for the projects had limited or no financial capacity to invest in large-scale infrastructure.

Other projects would have been financed from national sources, but the EU grant greatly accelerated implementation. This is the case with **Croatia**, where the construction of the water supply and sewerage infrastructure, while included in the operator's long-term plan, would have probably taken decades. Thanks to the EU funding, the project was implemented within 5 years of being approved. In the case of the **Spanish** project, the managing authority and the operator agreed that project approval depended on securing funding from three different sources, including the EU. Therefore, without the EU contribution, the national financing decision would have probably been delayed or not taken at all.

The EU grant decision for the **French** project generated support from additional local, regional and national financiers. This shows that EU financing can provide leverage and bring in additional public investors.

For the **Italian** project, EU financing was not a determining factor**.** The modernisation of the water supply infrastructure was a top priority and featured high on the regional and national agenda. The project would therefore most probably have been implemented even

without the EU contribution. In this case, EU funding might have released national resources for other uses.

In line with the principle of additionality[79], EU contributions must not replace public or equivalent structural expenditure by a Member State in the regions concerned, but rather be additional to national funding. The release of national funds for other uses can be considered as adding value only if it complies with this principle. If the national funds were reinvested in environmental infrastructure in the same region, the EU financing would be additional and considered to be adding value. Otherwise, if the financing went against the additionality principle, the EU added value would be questionable. It was not possible to determine from the case studies how the released national resources were invested.

### 4.6.2 EU strategic support

In co-financing large environmental infrastructure projects, the EU can play a strategic role by shaping the framework in which the projects are implemented. This leads to the selection of projects that are consistent with EU priorities and objectives.

The weight of EU funds as a proportion of total investment provides important leverage for project implementation, although it is not the only aspect related to EU added value. As ERDF and Cohesion Fund financing is provided on strict conditions, it can guide public investments towards compliance with EU environmental standards. For example, the **Croatian** project contributed to Croatia's compliance with the environment and water management *acquis*. Similarly, prior to the construction of the sewage treatment plant in **Malta**, wastewater was dumped directly into the sea. EU financing enabled the country to make important progress towards compliance with EU directives on wastewater treatment and the objectives of preserving the environment and ensuring high-quality bathing waters. Thus, by strategically co-financing projects in line with its environment policy, the EU can influence national spending in the direction of its own priorities and steer national agendas towards environmental improvements that go beyond minimum requirements.

Compliance with the *acquis* in the water and waste sectors has been further promoted in the 2014-2020 period, with the CPR making it a condition for eligibility for EU funding.

### 4.6.3 EU Triggering transboundary effects and fostering knowledge sharing

Environmental issues are often transboundary in nature and require action at international level[80]. As a supranational organisation, the EU can facilitate such action, *inter alia* via ERDF and Cohesion Fund investments. Its involvement helps to secure socioeconomic gains that may not have been attainable through Member State action alone.

For example, the multifunctional ship in **Estonia** reduces the risk of environmental damage from chemical spills and marine pollution for a large part of the Baltic Sea, thus benefiting all surrounding countries, including non-EU countries (Russia). The project has contributed to improve well-being all over the Baltic Sea basin and to enhance co-operation among countries in the area. Similarly, in the case of the **Romanian** project,

[79] Additionality is one of the key principles of cohesion policy action; see: https://ec.europa.eu/regional_policy/en/policy/what/glossary/a/additionality/

[80] This is because the cost of such pollution is not fully borne by the polluting country. If countries act out of self-interest, they typically fail to internalise the external costs of pollution. Thus, transboundary pollution often requires action at supranational level; see, for example, Persson (2008), p. 2.

the fact that untreated water is no longer dumped into the Jiu River has helped to reduce pollution in the Danube, which runs through many countries and into the Black Sea.

Transboundary effects can also be economic in nature: a slow or ineffective elimination of seawater pollution in case of a pollution event could in fact negatively affect maritime transport, interrupt economic activities and change the flow of international transit in the Baltic Sea (thus damaging not only neighbouring countries, but also foreign economic operators).

By financing innovative solutions, which inherently involves a degree of risk, the ERDF and Cohesion Fund can stimulate technological development and knowledge-sharing. For example, to protect the shoreline from coastal erosion in Sète (**France**), a new technology was deployed in the form of a soft rubber tube instead of placing traditional hard wave attenuators (i.e. cement blocks) in the sea. Unlike the old technology, this does not cause erosion of other beaches in the region. The project has attracted great interest from scientific communities across Europe and spurred several spin-off projects involving European partners as many countries in Europe are faced with the risk of coastal erosion, which is expected to increase in the future due to climate change.

EU funding may give a project greater visibility, which in turn stimulates engagement and cooperation among national and local stakeholders. For example, the EU contribution in **Poland** boosted local stakeholders' cooperation in connecting 11 000 households to the water distribution network. Similarly, the EU involvement in the **Bulgarian** project led to greater interaction between national institutions and triggered a review of the water tariff policy.

More generally, the strategic role played by the EU can be inferred from the projects' high scores for relevance and coherence.

### 4.6.4 EU technical support and institutional capacity-building

Input from various EU institutions can improve the technical specifications of a project. Table 10 summarises which were involved in the case studies.

***Table 10. EU organisations providing technical support, by project***

| Case study | European Commission | EIB | Jaspers |
|---|---|---|---|
| **Bulgaria** – Sofia water cycle | ☑ | | |
| **Malta** South – wastewater treatment | ☑ | | ☑ |
| **Poland** – Sochaczew sewage management | ☑ | | ☑ |
| **Romania** – Craiova sewerage and wastewater treatment | ☑ | | |
| **Croatia** – Slavonski Brod water supply sewerage and wastewater treatment | ☑ | ☑ | ☑ |
| **Italy** – Favara di Burgio aqueduct | | | |
| **Spain** – Anguilas desalination plant | | | |
| **Estonia** – multifunctional ship | | | |
| **France** – Sète lido protection | ☑ | | |

| Case study | European Commission | EIB | Jaspers |
|---|---|---|---|
| **Slovenia** – Celje waste management centre | | | |

Source: CSIL, Ramboll (2019).

For some projects, the Commission's involvement in the preparation and implementation phases served to build local institutional capacity. For example, for the **French** project, dialogue with the Commission facilitated the *ex ante* CBA, which had never previously been done for such a project in that region. In **Croatia**, an EU delegation was involved with the project management throughout the implementation phase. This strengthened the administrative capacity of the managing authority and the operator.

The EIB offers in-depth scrutiny of a project's financial and technical merits. It asked the Danube Investment Support Facility to assist the operator of the **Croatian** project in preparing the project documents. Its funding significantly improved the project preparation process. In addition, EIB financing is usually considered to encourage other lenders. Four of the analysed case studies received an EIB loan.

The **Croatian**, **Maltese** and **Polish** projects received some form of support or input from Jaspers and this was perceived as being an important factor in their preparation.

Several projects received ISPA funding. Often, this involved technical assistance to facilitate investments and build capacity in accession countries. Of the analysed cases, those in **Bulgaria**, **Croatia**, **Poland** and **Romania** received technical assistance as ISPA projects. For example, for the integrated water cycle project in **Bulgaria**, ISPA provided the Ministry of Environment and Water with a framework for technical assistance for the preparation of the funding application. Project implementation units (PIUs) served to concentrate and retain knowledge in all of the ISPA projects.

The timing of EU engagement in a project may determine the EU added value from technical support. Due to the late application for co-funding for the **Italian** project, the ERDF contribution came at a time when construction had already begun, so there was limited scope for the EU to influence the project planning. The Commission financing decision for the **Maltese** project was taken in November 2010, while the construction works had begun in December 2008. The application for EU co-financing for the **Estonian** project was submitted after the procurement process had been initiated. For projects that receive EU support late in the development process, the main EU added value may be largely financial.

In all 10 cases assessed, institutional learning took place mainly at a local level. For example, in the **Bulgarian** project, institutional capacity-building benefited mainly Sofia Municipality and the operator. Similarly, the operator in the **Croatian** project gained expertise from the technical support financed by the EIB. This is in contrast with major transport projects, for which capacity-building took place mainly at the level of the national authorities (European Commission, 2018)[81].

[81] For example, EU support for the construction of the M43 motorway between Szeged and Mako in Hungary served to improve the administrative capacity of the National Development Agency.

## 5. CONCLUSIONS

There is evidence that large-scale environmental infrastructure projects co-funded by the ERDF and the Cohesion Fund contributed to the achievement of core cohesion policy goals by supporting economic growth and competiveness, and protecting and improving the environment[82].

While such projects are primarily a response to environmental needs, the evaluation has shown that they generate wider benefits and affect economic development and quality of life. They do so primarily by allowing for the efficient and sustainable management of natural resources and providing basic environmental services to previously unserved areas. In this way, they make those areas more economically and socially attractive, drawing in people and firms, and creating necessary (though not sufficient) conditions for territorial development.

In most of the assessed cases, the availability of a significant and critical proportion of EU funding accelerated (and even enabled) project implementation and thus the achievement of EU objectives. The financial support was therefore the most obvious and most widely recognised dimension of EU added value.

At the same time, environmental infrastructure projects contributed to compliance with the environmental *acquis* and broader sustainable development strategies. The need to comply with EU environmental standards provided a practical, clear legal framework that was instrumental in the selection of the most urgent investments, especially in the EU-13 Member States. Compliance with the *acquis* was therefore a key driver for investment prioritisation and the strategic EU-level legal framework was the most important aspect of EU added value. The fact that individual projects are implemented within a single, sector-specific, stringent legal framework made it possible to achieve EU-wide environmental effects according to agreed standards. This could not have been done without the EU legislation and funds. In addition, the investment priorities based on this common framework give innovative and complex investments demonstrable value and enable knowledge transfer, as clearly shown by some of the projects.

The projects contributed to the development of administrative capacity, especially in the EU-13 Member States.

Project efficiency was affected by cost and time overruns, which are common in large infrastructure projects, including environmental ones. Most of the projects were affected by time overruns, but budget planning proved to generally be accurate. Delays were primarily due to contractors' underperformance, low capacity, slow procurement procedures or unpredicted exogenous factors such as adverse weather conditions.

Forecasting capacity (especially as regards future demand) and design flexibility emerged as problematic determinants of performance.

In the future, the environment will remain a priority for EU cohesion policy, which will continue to support large infrastructure projects in the sector thanks to a specific policy objective targeting a greener, low-carbon Europe[83]. The 'thematic concentration'

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[82] Article 3 of Regulation (EC) No 1083/2006.

[83] Article 4(1)(b) of Commission proposal for a Regulation laying down common provisions (COM(2018) 375);

provisions proposed by the Commission, whereby Member States would have to devote a greater proportion of their resources to policy objectives such as 'a smarter Europe' and 'a greener Europe', would further boost the environmental benefits of cohesion policy.

The Commission's proposals for the next programming period drop the procedural distinction between projects above and below a specific threshold. All projects, regardless of their size, would undergo an enhanced selection procedure incorporating some features of the old 'major projects' approach. Selected operations will have to present the best mix of amount of support, activities undertaken and achievement of objectives. Beneficiaries will have to have the necessary financial resources and mechanisms to cover operation and maintenance costs, thus addressing potential financial sustainability issues. The clear prioritisation of projects is designed to maximise the contribution of EU funding to the achievement of the programme's objectives.

Achievement of these objectives would be further supported by the proposed introduction of new enabling conditions replacing and reinforcing the 2014-2020 *ex ante* conditionalities for environmental investments. The two-tier approach requiring a cost/benefit analysis (CBA) only for projects above a certain threshold would be discontinued. To prioritise projects offering the best value for money, programme authorities will need a suitable assessment tool or mechanism. After decades of project development experience in the framework established by the Commission, Member State administrations and beneficiaries have developed their own economic and financial assessment capacity and skills, adapted to the context in which they operate, including national and regional requirements. Member States will therefore be free to choose what form this takes, but it is likely that many will continue to use CBAs, given their experience from previous periods and the straightforwardness of the tool.

The Commission's proposal would require that the most important projects from a strategic perspective be explicitly included in the programme and be subject to heightened monitoring in discussions with the monitoring committee, and with the Commission in the annual review process. They would also be subject to stricter visibility and communication requirements.

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Article 2(1)(b) of Commission proposal for a Regulation on the ERDF and the Cohesion Fund (COM(2018) 372).

## ANNEX 1: PROCEDURAL INFORMATION

### 1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

DG Regional and Urban Policy was the lead DG.

Decide Planning: PLAN/2018/4708- Planning (Planned) – 17.12.2018

### 2. ORGANISATION AND TIMING

| | |
|---|---|
| Tender procedure launched | December 2016 (contract renewal) |
| Contract signed | May 2018 |
| 1st steering group meeting | September 2018 |
| Last steering group meeting | 17 September 2019 |
| Final report accepted | August 2019 |
| Number of steering group meetings | 5 |
| Participating DGs (in addition to DG REGIO) | CONNECT: Communications Networks, Content and Technology<br>ENV: Environment<br>MOVE: Mobility and Transport<br>RTD: Research and Innovation<br>SG: Secretariat-General |

### 3. EXCEPTIONS TO *BETTER REGULATION GUIDELINES*

The initiative was exempted from a general open public consultation, as agreed with the Secretariat-General in line with the approach followed for the Evaluation on Major projects in the transport sector. It was considered in fact that general public might not be familiar with the notion of 'major projects' thus making it difficult to collect relevant feedback on cohesion policy investments in the sector. The limited number of replies (40) to the on-line targeted public consultation conducted as part of the *ex post* evaluation of major projects supported by the ERDF and Cohesion Fund in 2000-2013 confirmed the identified difficulties. Therefore in the case of this evaluation, as mentioned in the roadmap[84], the consultation strategy involved interviews for all selected projects and a seminar with relevant stakeholders, including major project beneficiaries, programme-managing authorities, national and regional authorities, academics and experts in environmental infrastructures.

### 4. EVIDENCE, SOURCES AND QUALITY

[84] See Evaluation Roadmap: file:///C:/Users/amichcl/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/PART-2018-591321V1.pdf.

This staff working document is based largely on a study by an independent consultant, to which the Commission contributed through active participation in the interservice steering group, which ensured the quality of the study.

The analysis is complemented by internal Commission fund management data, analytical reports and past evaluations. It follows the methodology provided for in the *Better Regulation Guidelines* and the Commission's *Guide to cost-benefit analysis*. The main sources of information were:

- European Commission (2018), *Ex post* evaluation of major projects supported by the European Regional Development Fund (ERDF) and Cohesion Fund between 2000 and 2013 – final report;
- European Commission (2005), *Ex post* evaluation of a sample of projects co-financed by the Cohesion Fund (1993-2002) – synthesis report;
- European Commission (2010), *Ex post* evaluation of cohesion policy interventions 2000-2006 financed by the Cohesion Fund (including former ISPA) – work package C: cost-benefit analysis of selected environment projects (DG REGIO);
- European Commission (2012), *Ex post* evaluation of investment projects co-financed by the European Regional Development Fund (ERDF) and Cohesion Fund (CF) in the period 1994-1999 (DG REGIO);
- European Union (2015), Guide to cost-benefit analysis of investment projects – economic appraisal tool for cohesion policy 2014-2020;
- European Commission (2016), *Ex post* evaluation of cohesion policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) – work package 6: environment – final report;
- ADE, Agrotec, Bio Intelligence Service, Orbicon (2009), *Ex post* evaluation of cohesion policy programmes 2000-2006 co-financed by the European Fund for Regional Development (objectives 1 and 2) – work package 5b: environment and climate change – final report (Volume I);
- ADE (2009), *Ex post* evaluation of cohesion policy programmes 2000-2006 co-financed by the European Fund for Regional Development (objectives 1 and 2) – work package 5b: environment and climate change – second intermediate report;
- Applica (2012), *Ex post* evaluation of the Cohesion Fund (including former ISPA) in the 2000-2006 period – work package E:
- Applica (2012), *Ex post* evaluation of cohesion policy programmes 2000-2006 co-financed by the ERDF (objectives 1 and 2) – work package 5a: transport – final report;
- COWI A/S, Milieu sprl, (2019), Integration of environmental concerns in cohesion policy funds (ERDF, ESF, Cohesion Fund): results, evolution and trends through three programming periods (2000-2006, 2007-2013, 2014-2020);
- COWI A/S, Milieu, CSIL (2016), *Ex post* evaluation of cohesion policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) – work package 6: environment;
- https://cohesiondata.ec.europa.eu/ (Open Data platform).

## ANNEX 2: STAKEHOLDER CONSULTATION

As envisaged in the evaluation roadmap, the consultation strategy involved two main activities: qualitative interviews for case studies and a seminar with stakeholders.

The interviews took place between September and December 2018. The seminar took place in March 2019.

| *Consultation activities* / *Stakeholders* | **Interviews (for case studies)** | **Seminar** |
|---|---|---|
| **Managing authorities responsible for programmes including major projects** | Relevance, Coherence, Effectiveness, Efficiency, EU added value, Sustainability | Relevance, Coherence, Effectiveness, Efficiency, EU added value, Sustainability |
| **Beneficiaries of major projects covered by the 10 case studies and environmental major projects in general** | Effectiveness, Efficiency, Sustainability | Effectiveness, Efficiency; Sustainability |
| **Regional/national authorities responsible for areas where environmental major projects were implemented** | Relevance, Coherence, Effectiveness, EU added value | Relevance, Coherence, Effectiveness, EU added value |
| **Experts and academics** | Relevance, Effectiveness, EU added value | Relevance, Effectiveness, EU added value |

### Interviews for case studies

Field missions for each case study were essential in the assessment of project performance. An extensive interview plan was drawn up to collect primary data and the views and perceptions of a broad range of stakeholders. On average, 20 interviews with relevant stakeholders were conducted for each case study. The 217 interviewees included civil servants (national ministries and EC officials, managing authorities), representatives of the service provider, experts (engineers and planners), policymakers (mayors, regional and municipal councillors), users and journalists. They were especially helpful in:

- ✓ describing the projects, with a critical focus on scoping, geographical and technical aspects and key stakeholders;
- ✓ analysing the socioeconomic context in which projects were implemented, highlighting key regional development needs and how the projects could meet them;
- ✓ reconstructing the decision-making process as regards the choice of project;
- ✓ exploring whether other feasible alternatives were available and explaining the reasons for the final choice; and
- ✓ collecting evidence on non-quantifiable effects and factors affecting project outcomes (both in the past and in the present/future).

The independent consultants who run the study provided the case studies' authors with a toolkit for conducting interviews with the relevant stakeholders. A matrix was set up to investigate the major projects according to the evaluation criteria (relevance, coherence, effectiveness, efficiency, EU added value). As a result, it was possible to deepen the evidence by:

- introducing effects that are by nature unquantifiable and excluded from the CBA, but are relevant to the evaluation; and
- analysing project governance and organisational arrangements for correlations between project results and motivations, responsibilities and roles (decision-making process and stakeholder involvement).

A list of interviewees is attached to each case study report.

**Seminar**

The seminar took place on 5 March 2019 in Brussels and gathered 42 experts. The main topics discussed were:

- the benefits of environmental infrastructure projects;
- the EU added value of major projects in the environment sector; and
- forecasting capacity and project success.

The main conclusions can be summarised as follows:

- **benefits** – environmental infrastructure projects can bring a wide range of benefits, many of which are multidimensional, e.g. improved seawater quality can generate benefits in terms not only of environmental sustainability, but also of economic growth and quality of life. The exact scope of a project within the wider network and the counterfactual scenario determine what types of benefit can be detected;
- **maximisation of benefits** – the benefits can:
    - be maximised through accurate prioritisation of related projects;
    - ensure timely implementation of accompanying investments; and
    - take account of potential external factors;
- **the valuation of ecosystem services** (i.e. goods and services provided by the natural environment that benefit people) is a good way of capturing the value provided by the environment in a CBA. The inclusion of ecosystem services in CBAs has become standard procedure – the approach is to calculate the value that people attach to them, taking into consideration both use and non-use values;
- **EU added value** can be delivered as:
    - financial and technical value (e.g. raising enough funds to realise the projects and freeing up national funds for alternative projects; enhancing the credibility of EU-funded projects, thus encouraging other lenders to follow suit);
    - knowledge transfer and innovation value (e.g. financing innovative solutions, facilitating knowledge transfer);

- environmental value (e.g. promoting compliance with EU environmental standards and directives, setting political agendas, solving common cross-border environmental problems); and
- capacity-building and stakeholder engagement value (e.g. local capacity-building, increasing visibility and engagement).

It can be maximised by identifying and funding projects that show potential benefits in all four categories. Also, transboundary effects represent a key argument for EU intervention on environmental protection;

- **forecasting capacity** remains a critical issue. Two main sources of potential forecasting errors were identified: project outcomes and parameter values. Uncertainty is an inherent part of forecasting and thus of policymaking. The impact of behavioural aspects should be taken into account in this context. While experience from previous projects, statistical trends and interdisciplinary cooperation can help to mitigate errors, a sensitivity and risk analysis (to verify the accuracy of the economic evaluation) is key to a sound assessment;
- **costs and benefits of disaster risk reduction** – prevention and risk-reduction projects entail difficulties, as they incur costs in the present, but their benefits are not tangible and will theoretically materialise only in the future. The benefits are difficult to estimate or promote, as they relate to an absence of damage. In order to determine the true benefit of such projects, it is necessary to compare the socioeconomic costs of implementation with those of non-action in the event of a disaster. Therefore, there is a need to develop a fully-fledged systematic approach for risk modelling, adopting a 'what if' perspective;
- **economic valuation of environmental goods and services** – economics can provide valuations only in terms of anthropocentric values. Therefore, the values determined in a CBA represent only a lower bound of the true value of nature, which would incorporate other intrinsic values beyond its significance for humans. However, as a tool CBAs allow for systematic analysis and provide transparency for decision-makers. In particular, they make it possible to check for and adjust assumptions, over-estimates and under-estimates; and
- **relationship between environmental impact assessment (EIA) and CBA** – it is crucial to follow closely the results of the EIA in order to identify the relevant physical effects detected by scientists and incorporate them in the CBA. These effects can be used as a basis for valuing and monetising the anticipated changes.

## ANNEX 3: METHODS AND ANALYTICAL MODELS

The methodology used for this evaluation followed that used for the *ex post* evaluation of major projects in transport, but was adjusted to the specificities of large environmental infrastructures. The aim was to analyse the long-term contribution of 10 major projects in the EU in the environment sector in the 2000-2006 and 2007-2013 programming periods and co-financed by the ERDF or the Cohesion Fund. The main goal was to assess their role in economic development and improving citizens' quality of life and wellbeing, and their environmental sustainability.

The evaluation concerns only major projects supported by direct cohesion policy investments in the environment sector. Case studies were the main tools used: the focus of the exercise was to evaluate 10 illustrative examples of environment projects capable of delivering insights into the possible long-term effects of infrastructures and the causal chain leading to those effects.

### Process of selection

First, the Commission produced a list of 30 major environmental projects financed in the programming periods in question and particularly relevant to the scope of the evaluation. The following criteria were taken into account:

- the projects should be implemented in Member States investing the most cohesion policy resources (in absolute and/or relative[85] terms) in certain fields of intervention (FOIs) (2000-2006) or priority themes (PTs) (2007-2013);
- they should reflect the financial allocation among the four environmental FOIs/PTs:
    - category 45 – management and distribution of water (drinking water);
    - category 46 – water treatment (wastewater);
    - category 44 – management of household and industrial waste; and
    - category 54 – other measures to preserve the environment and prevent risks;
- they should have been operational for at least five years by the time the evaluation was launched and not have been covered by case studies in other DG REGIO evaluations;
- data availability;
- capacity to provide relevant policy lessons;
- project variety in terms of expected long-term effects;
- stakeholders' willingness to cooperate.

The evaluation team prepared project summary sheets on the basis of the following research and analysis:

[85] i.e. in relation to their cohesion policy allocation.

- *thorough analysis of project documents* available to the Commission and collected by the national and local authorities in charge of the projects;
- *interviews* with managing authorities or intermediate bodies, beneficiary institutions and, where relevant, other informed parties, and national correspondents' knowledge of the projects' history; and
- *desk research* of publicly available information and data (including project websites, press articles, reports and studies).

The evaluation experts then conducted an in-depth analysis to select the final 10 major projects. They developed an evaluability scoring system in order to select the case studies in an objective and consistent way. In particular, the projects' evaluability was assessed according to the following criteria, weighted to reflect their relative importance:

- strategic relevance for evaluation purposes (40%);
- availability and quality of data from existing sources (30%);
- stakeholders' availability and willingness to cooperate, and availability and relevance of information for assessing the chain of effects in the development, implementation and operational stages of the project in its wider context ('theory of change' analysis) (30%).

For each criterion, a set of questions was compiled and four conditions identified, to be scored on a four-point scale. By summing up the scores and weighting for the relative importance of the criteria, a total score was calculated for each criterion. The projects were then ranked according to evaluability and qualitative comments added setting out the reasons for the rankings.

The following variables were also considered, in order to ensure a balanced sample of projects:

- sector – water (including wastewater and water supply projects), solid waste and other environmental projects;
- financing period – 2000-2006 or 2007-2013. There is a trade-off between more mature and more recent projects. While the former are more likely to have long-term effects that have fully materialised, they may be associated with issues that have already been addressed/discussed and so less informative for the next programming period. On the other hand, the latter are in principle more informative, but operational for a shorter time span, so it is more difficult to capture their long-term contribution to wellbeing;
- location – geographical distribution across Member States;
- type of project; and
- type of financing.

The evaluation team prepared a toolkit to guide the case studies' authors and national correspondents in their work. The guidelines sought to provide helpful suggestions on the sources to be used for the quantitative and qualitative analysis, and the structure and style of the documents themselves.

The qualitative-quantitative approach required national correspondents to use several sources of information. Official sources were the main basis for research and analysis,

but independent reports, press articles and stakeholders' perceptions and opinions were also used.

Field missions and direct interviews played an essential part in the assessment (see Annex 2). The interviewees provided overall insights into the impacts and history of the projects. The field missions enabled the authors to observe the projects in person.

Once qualitative and quantitative information had been gathered, the evaluation experts integrated it into a coherent narrative. In order to guarantee consistency, the evaluation team developed a case study template.

**Analysis -method**

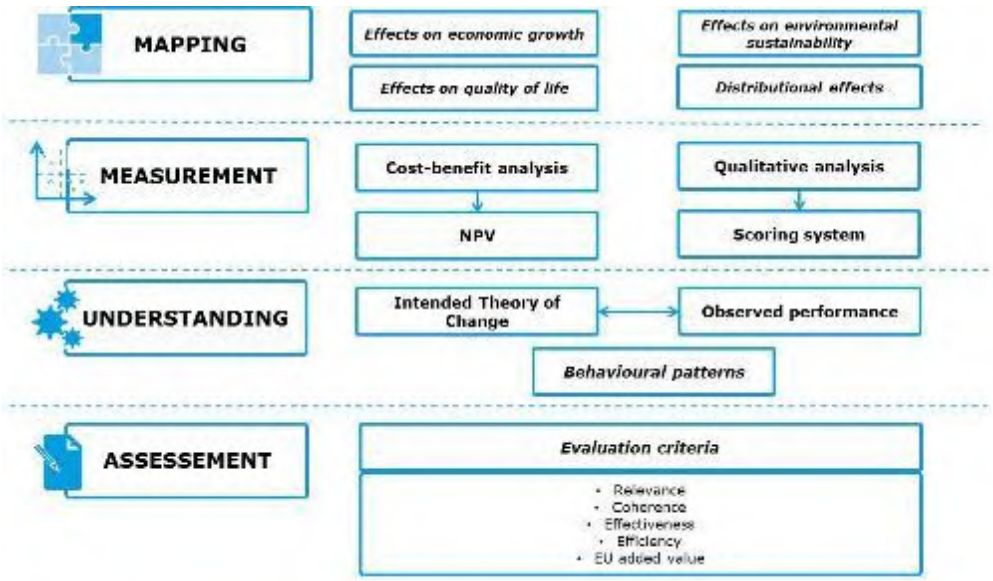
The methodology used for the evaluation consisted of an *ex post* CBA combined with qualitative techniques (site visits, stakeholder interviews, press articles, reviews, etc.).

The core team developed the methodological framework on the basis of an extensive review of the relevant theoretical and empirical literature. It was then uniformly applied to all 10 selected case studies. It allows for comparisons to be made and common policy lessons to be drawn.

The methodology consisted of four building blocks:

- mapping the effects of large environmental infrastructure projects;
- measuring the effects;
- understanding the effects;
- synthesis and conclusions.

**Assessment framework**




Source: CSIL and Ramboll.

**Mapping the effects**

The first step was to conduct a comprehensive literature review to map and develop a common understanding of the potential effects of major environmental projects in each of the three sub-sectors (water supply and sanitation, waste management, and environment protection, remediation and risk prevention). The effects were grouped in four broad categories:

- effects on economic growth;
- effects relating to quality of life and wellbeing;
- effects relating to environmental sustainability;
- effects relating to distributional issues.

**Measuring the effects**

The second step involved measuring the relevant negative and positive effects. CBA was selected as the most suitable method for assessing long-term effects. As demonstrated in the literature and in international practice, it makes it possible to identify, quantify and value in monetary terms most of the direct economic effects generated by major projects. Also, it is particularly appropriate given the micro level of analysis, which produces findings and recommendations that can be used in project design, selection and implementation. Finally, CBA is the quantitative method used most commonly to assess the long-term effects of infrastructure projects both *ex ante* and *ex post*. As required under the 'major project' procedure, an *ex ante* CBA was available for all the selected projects, so using CBA for *ex post* evaluation allowed for comparison of *ex ante* forecasts with observed effects in order to assess project effectiveness.

Qualitative analysis was used to complement the CBA with a broader view of long-term effects. Some intangible long-term contributions (e.g. institutional learning, social cohesion) are difficult to express in monetary terms. Although they are additional to direct effects accounted for in the CBA, they are relevant, particularly for a comprehensive understanding of the mechanisms of change, so qualitative assessment was used to take account of them. This mix is particularly appropriate, because it gives a broad view of long-term effects, while sticking to a prudent approach based on hard facts.

The long-term effects of major projects in the environment sector are:

- effects that are naturally expressed in monetary terms (e.g. price/cost savings) – these can easily be included in a CBA;
- effects that are quantitative, but not expressed in monetary terms, and that can be converted into monetary units in a reasonably reliable way (e.g. variation in energy recovery in waste-to-energy projects) – these can also be included in the CBA;
- effects that are quantitative, but not expressed in monetary terms, for which there are no reasonably reliable conversion factors – they were not included in the CBA, but discuss in qualitative terms together with the overall outcome of the CBA;

- effects that are difficult to measure in quantitative (cardinal) terms, but lend themselves to ordinal measurement (projects can be ranked 'very good', 'good', 'neutral', 'bad', 'very bad', for example, on the basis of their impact) – they were analysed in qualitative terms;
- effects that might occur, but are subject to a high degree of uncertainty – these are addressed in the risk/scenario analysis in the CBA; and
- effects that might occur, but cannot even be expressed in an ordinal (ranking) manner – these are residual effects that can be described in qualitative terms in the case study report.

Where possible, effects were quantified and monetary values were assigned to them for inclusion in a CBA model. Otherwise, a qualitative assessment was carried out. It was then possible to use a scoring system to build consistent metrics of the effects.

The approach proposed in the Commission's *CBA guide* was adjusted slightly to take account of the interim perspective of the assessment. While the *CBA guide* adopts an *ex ante* perspective, the evaluation covered projects in operation for at least five years before the launch of the study itself and so involved an interim assessment in relation to the projects' lifetime. For this reason, the approach also drew lessons from Florio (2014)[86], which contains useful insights for carrying out *ex post* CBAs, and from the team's experience of applying *ex post* CBA to a sample of major projects co-financed by the ERDF and the Cohesion Fund in 1994-1999.

The first implication of the interim perspective was that, while the most significant set of effects that the evaluation experts expected to observe *ex post* were those also reflected in the *ex ante* CBA, the *ex post* CBA could be slightly more ambitious in terms of effects to be accounted for, as the risk of optimism bias was mitigated by the availability of observed data. While prudence is fundamental to avoid optimism bias in an *ex ante* CBA, an *ex post* CBA benefits from much greater certainty and knowledge as to what actually happened.

Also, the fact that it is carried out during a project's lifetime lends the CBA a hybrid character that shares features of an *ex ante* and a pure *ex post* (i.e. retrospective) exercise. The CBA is conducted 'today', i.e. it looks both backwards (using past evidence of project performance) and forward (forecasting future developments). Therefore, it is necessary to mix historical data with present data and forecasts.

The main aim of the analysis was to assess the long-term contribution of the selected projects to economic development and quality of life, rather than comparing the *ex ante* and *ex post* CBAs. For this reason, the *ex ante* appraisal was used as a reference to understand better the rationale of project selection and the underlying assumptions, in order more accurately to reconstruct the decision-making process; it will not necessarily be a comparator for the observed *ex post* CBA.

The interim perspective posed some challenges to the treatment of key parameters in the CBA and some important related issues:

- time horizon – this depends on the sector; the recommended periods are:

[86] Florio, M. (2014). *Applied welfare economics: cost-benefit analysis of projects and policies* (Routledge; London, UK).

- for water and waste management, 30 years;
- for projects that relate to ecosystem services, 100 years;
- for disaster risk reduction projects, 35-50 years;

- choice between current and real prices – the CBA is based on constant (real) prices;
- project identification – this is based on two criteria:
  - self-standing unit of analysis;
  - pertinence.

  This approach meant that:

  - investments completed before project year 'zero' that are not functionally related to existing infrastructure are treated as sunk costs and not included in the CBA;
  - preparatory works, site arrangements, environmental protection and land-use related costs are included, as they are necessary for the implementation of the project;
  - operating (and extraordinary maintenance) costs are included;
- reference scenario – from an *ex post* perspective, the counterfactual scenario is what would have happened in the absence of the project. While the *ex post* perspective would allow to take account of unpredictable events that occurred after the start of the project, this knowledge is ignored in the definition of the counterfactual scenario;
- forecasting the future – the 'today' viewpoint involves forecasting inflows and outflows from today until the end of the time horizon. In this regard, the *ex post* and *ex ante* approaches do not differ significantly;
- discount rates – the social discount rate (SDR) is used to discount economic costs and benefits in the future, as it reflects how society evaluates today's wellbeing *versus* future wellbeing. As the CBA was carried out in the middle of the project's lifecycle, it was necessary to discount future cash flows and capitalise past ones. For this reason, a backward and a forward SDR were needed. *Ad hoc* country-specific SDR values are provided. In contrast, the financial analysis applies a single backward and onward financial discount rate (4%) to financial flows;
- shadow prices – in a hybrid *ex post* CBA, two sets of conversion factors should ideally be estimated for the two levels of analysis (backwards and onwards), as the opportunity cost may change over time. For this reason, *ad hoc* backward and onward conversion factors of labour at regional level were computed. For other major inputs (e.g. land and utilities), *ad hoc* conversion factors were estimated case by case, depending on available data and according to national guidelines where applicable;
- standard conversion factors (SCFs) – these are used to adjust the cost of all inputs into the financial analysis for which a specific conversion factor is not available. Normally, SCFs are used only for correcting the financial prices of minor (non-tradable) inputs. For the purpose of this study and based on methodological considerations, they were set at 1;

- monetisation of economic benefits – unit values of typical economic benefits and costs generated by environmental projects are estimated using the standard methodologies currently used for CBAs of major projects for the 2014-2020 programming period and updating values to today's value.

It should be stressed that the main aim of this study was not to verify the *ex ante* CBA and/or merely discover *ex post* deviations from it.

Qualitative analysis complemented the quantitative exercise. The techniques used were documentary analysis, desk research and interviews with stakeholders.

Effects investigated in qualitative terms were then aggregated to measurable effects and a comprehensive assessment was provided through a scoring system from -5 ('the highest negative effect was generated') to +5 ('given the existing constraints, the highest positive effect was generated'). The purpose of this scoring system was to highlight intuitively the most important effects generated in each case study, regardless of whether they were measurable.

**Understanding the effects**

Once the project effects had been identified and measured, and the causal chain linking different categories of short-term and long-term effects investigated, the third stage entailed looking at the external and internal factors that determined the observed causal chain of effects and influenced the observed project performance.

The evaluation team identified six determinants of project outcomes and their development:

- relation to the context, which includes aspects of the institutional, social and economic environment surrounding the project;
- selection process, which relates to the institutional and legislative framework that regulates how public investment decisions are taken;
- project design, which refers to the technical capacity to design a project properly;
- forecasting capacity, which relates to the possibility of predicting future trends and forecasting demand level and technical challenges, and the ability to do so;
- project governance, which concerns the number and type of stakeholders involved during the project cycle and how responsibilities are attributed and shared;
- managerial capacity, which refers to the professional ability to:
    - react to changes in the project context and to unforeseen events;
    - deliver the expected level of services in the operational phase.

These determinants were highly interrelated and capable of reinforcing or diluting each other. Also, determinants can change over time, so it is important to make clear the link between identified determinants and the specific effect triggered. In doing so, the evaluation team identified typical 'paths' or project behaviours linking the determinants in a dynamic fashion. These patterns represented common narratives describing recurring performance patterns, and typical problems that can influence the sequence of events.

**Summary and conclusion**

The fourth stage of the methodology was to summarise the findings from the projects using a set of evaluation questions. This enabled a final assessment based on the following evaluation criteria:

- relevance (were the objectives in line with development needs and priorities at programme, national and/or EU level?);
- coherence (with other national and/or EU interventions in the same sector or region);
- effectiveness (were the objectives achieved, and on time? Did other effects materialise? Were other options considered?);
- efficiency (costs and benefits relative to each other and to *ex ante* values);
- EU added value (was EU support necessary? EU-wide effects? Further EU action required?)

A stakeholder seminar to discuss preliminary evidence from the case studies was an integral part of the methodology. It was held on March 2019 in Brussels and was attended by 42 people, including policymakers, academic experts and local stakeholders. The main topics discussed were:

- the benefits of environmental infrastructure projects;
- EU added value of major projects in the environment sector;
- forecasting capacity and project success.

## ANNEX 4: CASE STUDIES

### PROJECTS IN THE WATER SUPPLY AND SANITATION SECTOR, INCLUDING WASTEWATER TREATMENT

**Sofia integrated water project (Bulgaria)**

This project was co-financed by the Cohesion Fund in the ISPA 2000-2006 programming period.

It covered the whole water cycle in the Sofia municipality, from the treatment and distribution of potable water to the collection, conveyance and return of treated wastewater to the environment. In particular, it consisted of the design, planning and construction of a sewerage network to convey sewage to a reconstructed and enlarged WWTP in Sofia up to the EU standard and the rehabilitation of two drinking water treatment plants to ensure the public supply of purified water.

The overall objective was to achieve compliance with the EU environmental *acquis* (particularly the DWD and UWWTD) and to stimulate local and regional economic activity and regional development.

Sofia, the capital of Bulgaria, is located in the western part of the country below the northern Vitosha Mountain and has a rapidly expanding population that currently stands at around 1.2 million. At the time of project implementation, highly insufficient water and wastewater infrastructure investments had resulted in poor maintenance and a failure to replace or expand the wastewater network, as required in the light of the city's development. The sewerage system in the newly built neighbourhoods was undeveloped. As a consequence, both the water bodies and the surrounding environment were in poor condition.

The Municipality was unable to meet citizens' and businesses' infrastructure needs. In some areas, sewerage systems were only partially constructed, while a third of the city had none. This hindered opportunities for business development, improving inhabitants' quality of life and, more generally, the sustainable economic and environmental development of the area.

The construction phase ran from 2009 to 2011, while the operational phase started in 2012. The project involved a total investment of €68.4 million[87], of which €31 million was co-financed by ISPA. The remaining investment was covered by a national public contribution of €31.3 million and a €6.1 million EIB loan.

[87] In nominal prices, excluding VAT.

The beneficiary (and owner) of the infrastructure is Sofia Municipality and it is operated by Sofiyska Voda JSC under a 25-year concession contract. Tariffs are controlled by the Energy and Water Regulatory Commission.

The scope of the project was changed during project preparation by excluding three main components, due to delays in land expropriation procedures, additional investment costs and over-estimation of the components' performance. This led to a 20% decrease in EU assistance.

The project achieved its objectives of contributing to achieving compliance with the WFD and UWWTD, making the water distribution system more reliable and reducing losses and river pollution.

The evidence is that the project had a positive impact on economic growth, welfare and the environment. This impact was all the greater because the *ex ante* situation was so bad and the project addressed very urgent needs. Therefore, the project is assessed as highly relevant. It remained fully in line with the development needs and priorities established at various levels. The benefits to society could have been maximised through more precise forecasting and project selection. However, the good management qualities shown by the main players helped overcome the challenges of the planning period and achieve the set objectives. Effectiveness could have been maximised if the scope of the project had not been reduced. That, together with the implementation delays and the reduction in the amount of the EU grant, meant that the project was less efficient than initially planned. However, the gradual improvement of the tariff-setting system, ensuring sustainability and compliance with the 'polluter pays' and 'cost recovery' principles, deserves to be recognised. Beyond financial aid, significant EU added value lay in the capacity-building and institutional learning acquired in the course of project preparation and implementation.

**Malta South sewage treatment plant (Malta)**

The Malta South sewage treatment plant was co-financed by the EU in the 2007-2013 programming period. The project is located on the south-east coast of Malta.

In the past decade, the south of Malta, like rest of the country, has seen strong population growth, combined with significant economic development. Several infrastructure projects implemented before and after EU accession in 2004 have formed the backbone of the island's economic growth.

Before project implementation, most of the wastewater produced on the Maltese islands was discharged untreated into the Mediterranean. This caused high levels of contamination, which damaged coastal ecosystems and hampered bathing and other recreational activities.

The core of the project was the construction of a new sewage treatment plant near the old discharge site. The primary goal was to treat wastewater before discharging it into the sea, thereby improving offshore/inshore water quality, restoring bathing water quality and thus achieving compliance with EU directives.

The project involved a total initial investment of €68 million in nominal prices (excluding VAT), which was co-financed from national funds (15%) and a Cohesion Fund contribution (85%), allocated through Malta's Operational Programme I – Investing in competitiveness for a better quality of life (2007-2013). Initial project ideas from 1992 were included in the sewerage masterplan for the Maltese Islands, drawn up for the Ministry of Development and Infrastructure. After feasibility studies, an accurate option analysis and project design, construction works were carried out between 2008 and 2010. The operational phase started in 2011.

The construction of the sewage treatment plant was the last and the largest part of a wider investment plan, which included two smaller plants, one in Gozo and one in the north of Malta. Together, the three infrastructures represented a new long-term vision for sustainable wastewater treatment in Malta.

The project achieved its main objective of treating all collected wastewater before discharging it into the sea. However, while the effluent is compliant with the BWD (all bathing waters have been 'excellent' since 2014), it is not yet fully compliant with the UWWTD.

Thanks to its high relevance, socioeconomic desirability and consistency with national and EU needs and objectives, this represents a good example of a major project. Project implementation proceeded smoothly overall and efficient use was made of public resources.

There are some concerns in relation to plant capacity. Continuing population growth may affect the relevance of the project in the long term. Other factors, such as the discharge of farm waste into sewers and the lack of alternatives to the landfilling of sludge, had a big impact on project performance.

**Sochaczew sewage management (Poland)**

The construction of a wastewater network serving nearly a third of the population of Sochaczew was a major project co-financed by the EU in the 2007-2013 programming period.

Sochaczew is a medium-size city and the capital of Sochaczew county, in the Masovian voivodeship in central Poland. Its population (currently just below 37 000) is on a downward trend, which is expected to continue. Although it is in Poland's most developed region, most of its macroeconomic indicators are in line with the national average, due to its being located at the regional border.

Previously, the wastewater network covered only part of the city and over a third of the population was without a wastewater collection system. In 2008, the situation was much worse than the Polish average (85% connection rate to the wastewater network).

The project involved constructing about 91.3 km of wastewater network, including pumping stations, modernisation of the municipal WWTP, closure of the small outdated WWTPs and rehabilitation of the 3.4 km wastewater network in the city centre. Its primary goal was to ensure wastewater collection and proper treatment for an additional 11 138 inhabitants.

The project involved a total final investment of €21.5 million in nominal prices (excluding VAT), which was co-financed from the beneficiary's own funds (17%), the Cohesion Fund (58%) and corporate bonds (25%). The Cohesion Fund contribution was allocated through the 2007-2013 infrastructure and environment OP.

The first ideas for the project date back to 2004, but the project was actually designed in 2007-2010 and the construction works lasted from 2010 to 2013. The operational phase started in late 2013, while connections to the wastewater network continued to the end of 2016.

Despite some delay, the project achieved the objective stated in the CF support application form, i.e. connection of over 11 000 inhabitants to the wastewater network and ensuring the municipal WWTP's treatment capacity and parameters.

The project is considered successful overall, in that it achieved its primary objectives. It addressed real needs and was implemented smoothly. However, the lack of connections to individual users that were not a part of the project and which were not financed from other sources prevented the project from reaping the full benefits of the investment after implementation.

In this respect, the project illustrates that addressing the whole value chain through investments is essential to achieving project objectives effectively and without delay.

**Craiova sewerage network (Romania)**

The sewerage network and wastewater treatment facilities in Craiova were rehabilitated in order to protect the River Danube, in a major CF co-financed project in the ISPA 2000-2006 programming period.

Craiova is the main city in Dolj county, a major economic and industrial centre in the south-west of Romania. According to the urban development plan, the population was around 306 000 on 1 January 1996 and expected to reach 320 000 in 2010.

The Craiova area is by far the largest city in the catchment area of the Jiu River, a tributary of the Danube. Wastewater is discharged downstream from all major cities and towns in the area. Craiova accounts for over 50% of the pollutant load from wastewater discharged into the Jiu River.

Craiova did not have an operating WWTP until 2011. A WWTP was designed in 1979 and construction works started in 1989, but the plant was never finalised due to lack of finance. Some of the civil works were completed, but no mechanical or electrical equipment was installed. The site had no equipment until 2000, when implementation of the ISPA project started.

In addition, the sewer system in Craiova was incomplete. Domestic and industrial wastewater was discharged directly into a partly open channel (the Craioviţa channel) passing through the city or a small lake (the Craioviţa Lake) in a recreational area in the city. It then flowed untreated into the Jiu River. The discharge of sewage into the lake and the open channel was a hygiene risk for the local population – hence the need for a WWTP.

The overall objective of the original project was to reduce the volume of wastewater flowing from Craiova into the Jiu River and onwards into the Danube. The upgrading of the WWTP included sludge treatment, rehabilitation and extension of the main wastewater collector. This was meant to provide the city with a sewerage system meeting modern hygiene requirements. Cutting discharge into the Jiu and Danube to levels below the thresholds imposed by national legislation would significantly reduce transboundary pollution. More specifically, the main aim was to attain effluent parameters that complied with the relevant EU (i.e. UWWTD) and Romanian legislation.

The main objective of the works was to redirect discharge from the Craioviţa Lake and the Craioviţa channel into the sewerage system, thus ensuring proper treatment of the wastewater.

In 2004, the rehabilitation of the drinking water distribution network was added as a further component of the ISPA project. The plan was to reduce substantial water losses from the old and damaged water pipelines, which were the main source of infiltration into the sewerage network.

The final project had three main works components:

1. rehabilitation and upgrading of the Craiova city WWTP – completion of the existing plant for biological oxygen demand removal (second stage) and extension of the plant for tertiary treatment (compliance of effluent demand for discharges into sensitive areas). This involved construction of a new laboratory facility;
2. rehabilitation and extension of the sewerage network:
    - 55 km extension of sewerage networks;
    - elimination of wastewater discharges into Craioviţa lake and Craioviţa channel, and transfer of these discharges into the sewerage system; and
    - reduction of storm water discharges into the sewerage system and discharge into the Jiu River; and
3. rehabilitation of drinking water distribution network:
    - rehabilitation of 42 km of water pipes;
    - construction of 6.70 km of new water pipes;
    - rehabilitation of a pumping station;
    - repair works on damaged water pipes;
    - installation of 8 000 water meters;
    - rehabilitation of water tanks; and
    - restructuring of primary and secondary network in order to monitor flows and pressures in the 18 districts of the network.

    The completion date for this component was extended when it was changed to include additional works relating to the rehabilitation of the drinking water distribution network and the completion of a water metering system for all consumers. The component had a positive impact by reducing water losses and infiltration into the sewerage system.

Construction took place between July 2003 and July 2011. The operational phase started in July 2011 and is planned to last up to 30 years.

According to the latest financing decision, the total estimated investment costs, in line with amendment 6 to the financing memorandum, were €84.3 million, of which 62.64% was co-financed through the Cohesion Fund. The remaining investment cost was covered from an EIB loan (20.88%) and a national public contribution (16.48%).

The project achieved its objectives, i.e. pollution prevention and control.

Overall, the project represented a starting point in the improvement of living standards in one of the biggest cities in Romania. Also, it helped to cut pollution of the water bodies by reducing discharges of untreated wastewater into the Jiu River and on into the Danube.

On the basis of the ISPA project, CAO (the implementing body) was able to enlarge the area of operation, thus rehabilitating, modernising and extending water supply and wastewater systems at county level. It used the lessons learnt from one phase to the next, in line with national and EU requirements in the field of water/wastewater management.

The project also marked a milestone in the strengthening of CAO's capacity to manage large infrastructure projects in the field of water supply and treatment, especially EU-financed projects with strict requirements in terms of planning, preparation, procurement, implementation (e.g. International Federation of Consulting Engineers condition of contract) and monitoring.

Under the project, CAO set up a tariff strategy in line with the 'cost recovery' principle to ensure the financial sustainability of its activities and investments.

The project has generated relevant long-term infrastructure effects. However, the WWTP is currently used below its designed capacity, due to a downward trend in the number of (residential and non-residential) consumers. As quantified in the CBA, the balance of long-term positive effects and under-use of capacity returns a slightly positive net benefit for the local community.

**Water supply and sewerage system (Croatia)**

The Slavonski Brod water supply and sewerage system with WWTP project was financed by the Instrument for Pre-Accession Assistance (IPA) under the 2007-2013 environmental protection OP.

In preparation for EU accession, Croatia had to harmonise its legal framework with the *acquis*. This required significant investment in environmental infrastructures.

The city of Slavonski Brod (population 56 769 in 2015) is situated in Brod–Posavina county in the east of Croatia. Its water supply system was inefficient, with water losses of up to 43% and low connection rates. There was no wastewater network and untreated wastewater was discharged into the Sava River.

In 2005, a local municipal company, Vodovod d.o.o., developed a project to resolve these problems. In 2006, it hired the BCEOM / Jacobs Engineering joint venture consultants, who prepared a first draft of the project. The main goals were to:

- ensure the functioning of the entire local water supply system;
- improve water supply reliability for existing consumers and connect around 4 300 new residents in Slavonski Brod by improving the water supply system and increasing the storage volume;
- improve the sewerage system to ensure more cost-effective wastewater treatment and connect 9 950 more residents to the drainage system; and
- improve living conditions and decrease pollution in the Slavonski Brod conurbation, and improve compliance with the environmental *acquis*[88] in particular the UWWTD.

The project was the first large infrastructure project in the water sector funded in Croatia under the IPA 2007-2013 environment OP[89]. The request for IPA funding was submitted in 2008. After Commission officials visited Slavonski Brod and requested some changes, a revised application was submitted in December 2008 and approved in April 2009. The project beneficiary (the national public company Croatian Waters) implemented the project in close cooperation with Vodovod d.o.o., to which ownership and management of the completed project was transferred in 2015.

The planned total nominal value of the project was €29.65 million, to be financed 58.65% by the IPA fund, 41.35% by the national resources. In 2015, the project was

[88] The requirements of the Water Framework Directive (2000/60/EC), Drinking Water Directive (80/778/EEC, 81/858/EEC, 91/692/EEC), Urban Wastewater Treatment Directive (91/271/EEC) and Bathing Waters Directive (76/160/EEC, 91/692/EEC, 1882/2003/EC and 807/2003/EC).

[89] https://mzoip.hr/doc/operativni_program_okolis_2007-2013.pdf

completed, with a total nominal value of €23.11 million, of which €15.88 million (68.7%) was co-financed through the IPA fund. The government covered the remaining investment cost.

Thanks to good preparation (technical documentation, feasibility study, CBA), strong political support at national and local levels, timely implementation and continuous monitoring and support by the Commission Delegation in Zagreb, the project was completed on time and became fully operational in 2015. It led to new project applications in the water supply and sewerage system in the country.

After more than 3 years of implementation, the project can be said to be on track to achieve the long-term goals set out in the application. The *ex post* evaluation shows that it achieved its goals: the water supply and sewerage systems were improved, new residents were connected to the networks and river pollution was reduced with the construction of the WWTP. The project has raised living standards in Slavonski Brod and contributed to the protection of the Sava River and the overall ecosystem.

The successful implementation of the project has ensured the sustainability of the results and the effects have spread to other construction projects relating to the Slavonski Brod water infrastructure.

Experience from this project proved useful in the preparation of subsequent projects. One of the key factors for success was the inclusion of all relevant stakeholders, particularly local government units, in the preparation phase.

It is also key that public bodies improve communication on project activities, in order to raise people's awareness of the benefits and address potential causes of dissatisfaction (noise, disruption caused by construction works, etc.).

**Favara di Burgio aqueduct (Italy)**

The reconstruction of the Favara di Burgio aqueduct was a major project co-financed by the ERDF in the 2000-2006 programming period.

The project was located in the province of Agrigento (Sicily). In particular, it concerned the municipalities between Agrigento and Sciacca (total of 151 610 inhabitants in 2017[90]). Economic development in the area had long been hampered by structural difficulties, including weak infrastructure. Most macroeconomic indicators are below Italian and Sicilian averages and the province's *per capita* GDP is among the lowest in the country.

Before the project, water supply to inhabited areas was periodically threatened. A 'water emergency' was declared between 1999 and 2004, due to the very poor condition of the water supply and distribution infrastructures (primarily for lack of maintenance). The crumbling and dysfunctional Favara di Burgio aqueduct suffered from a very high leakage rate (around 22%) and was not providing the municipal head tanks it served with a constant supply. The project provided for a replacement aqueduct, which was also to be connected to another aqueduct, Dissalata Gela–Aragona. The main aim was to ensure continuity of water supply to the head reservoirs of the water networks for inhabited areas and bring total water losses below 8%.

The project involved a total initial investment of €49.5 million in nominal prices (excluding VAT), which was co-financed by national funds (59%), private funds (Siciliacque SpA[91]: 14%) and the ERDF (27%) through Sicily's 2000-2006 regional OP[92]. The first project ideas dated back to 1999, the project design was carried out in 2002 and the construction works lasted from 2005 to 2008. The aqueduct became operational in 2009.

The reconstruction of the aqueduct was part of a wider investment plan, which included the restoration of two other old, dysfunctional aqueducts (Montescuro Ovest and Gela-Aragona) and joint management of all major Sicilian aqueducts (through a newly appointed concession-holder: Siciliacque SpA). The project was the first step in the implementation of a policy designed to optimise the overall supply of water.

The project achieved its main objective of ensuring constant water provision to the municipal head tanks. However, end-users do not fully benefit, as (mainly due to governance, institutional, administrative and financial constraints) the requisite

90 Italian National Institute of Statistics (ISTAT).

91 The service provider.

92 Commission Decision of 3 September 2007 (C(2007) 4179). The certified ERDF contribution amounts to €13.3 million, i.e. 40% of the certified total expenditure (€32.9 million).

accompanying investments at the level of municipal networks, though planned, have not yet been carried out, resulting in significant water leaks and substandard services.

Given the relevance of the project for both national and regional objectives, and the urgent need for its implementation, it is reasonable to assume that it would have been implemented even without the EU grant. The financing decision was taken after the contract for the construction works had been signed, so the EU had limited influence on project planning. Nevertheless, the EU financing freed up national funds for other uses, encouraged cooperation between stakeholders and ensured that high priority is given to compliance with EU and national rules.

The project is considered successful overall, in that it achieved the primary objectives identified in the application. However, as regards its impact on local people, the final assessment is less straightforward, as the lack of investment in local networks deprives them of the full benefit of the new aqueduct.

The story of the new aqueduct illustrates that an ambitious project design, based on good knowledge of the local area and appropriate technical capacity, can lead to highly effective infrastructures. However, projects that are part of an integrated cycle can be fully effective only with the necessary complementary investments. In this respect, administrative capacity and institutional coordination are both essential.

**Aguilas desalination plant (Spain)**

The renewal/enlargement of Águilas desalination plant was co-financed by the EU in the 2000-2006 programming period.

The project was in the region of Murcia, which is part of the basin of the Segura River[93]. It concerned three municipalities (total of 142 077 inhabitants in 2017) in Alto Guadalentín county, where local industry and employment are directly and indirectly influenced by a very rich, intensive agriculture sector that supplies European markets.

Before project implementation, the provision of water was weak. Water shortages periodically hampered activities such as farming, resulting in land abandonment, over-exploitation of aquifers and economic slowdown. A state of drought was declared in 2015.

The existing desalination plant (constructed in 2000 by the local farmers' committee) was not performing to its full potential, due to technical issues in the catchment of water. The project therefore provided for the building of a new plant in order to:

- increase available water resources, thus guaranteeing water supply in Alto Guadalentín and its coastal zone, providing irrigation to Águilas, Lorca and Puerto Lumbreras;
- reduce over-exploitation of the Alto Guadalentín aquifer;
- reduce the deficit of water needs for crops in the area; and
- have a fully operational plant.

The project involved a total initial investment of €250.08 million in nominal prices (excluding VAT), of which €202.20 million was co-financed from national funds and €47.88 million from the ERDF, through Murcia's 2000-2006 OP.

The construction of the new desalination plant was part of Spain's (partly EU-funded) AGUA programme, which represented a fundamental policy shift in national water management from large inter-basin water transfers to integrated water management, combining improvements to purification, re-use and desalination infrastructures. Around 20 desalination facilities, water re-use projects and investments for irrigation infrastructure improvement were planned to address the water needs of six provinces along Spain's Mediterranean coast.

The project achieved its main objective of ensuring constant and reliable water provision to farming communities. In this respect, it can be considered successful overall. As

[93] The rest of the river basin is in Castilla-La Mancha (25%), the Andalusian provinces of Jaén, Almería and Granada (9%), and Alicante in the Valencia region (7%).

regards its impact on the population, the final assessment is unambiguously positive, given the measurable increase in irrigated area, diversification of traditional crops and boost for agricultural technology. In addition, it emerged from interviews with local stakeholders that complementary water-saving investments are planned for water storage and irrigation modernisation as a consequence of the project, thus ensuring its sustainability for future generations.

**PROJECTS IN THE WASTE MANAGEMENT SECTOR**

**Purchase of a multifunctional ship (Estonia)**

The purchase of a multifunctional ship in Estonia was co-financed by the EU in the 2007-2013 programming period.

A number of northern countries and Baltic states (Denmark, Germany, Poland, Lithuania, Latvia, Estonia, Russia, Finland and Sweden) are strongly connected by the Baltic Sea. Marine and coastal activities bring social and economic benefits in the areas of goods shipping and passenger transport (€6.5 billion annual added value), fisheries (€95 million), energy generation, extraction of resources, energy re-generation (€15 billion), and leisure and tourism (€4.8 billion)[94].

The area around the Baltic Sea is home to 85 million people. Human activities put pressure on the marine environment and changes in the marine environment influence human wellbeing. Maritime transport is a case in point. Over 160 million tonnes of chemicals are transported annually across the Gulf of Finland. In 2004-2013, 1 328 accidents were reported, 86 of which resulted in pollution. Most accidents in 2013 occurred close to shore (26% in port and 19% in port approach) and 34% occurred in the open sea. Two major accidents in Estonian waters in 2006 exposed the limits of Estonia's ability actively to remove pollution, especially in the winter.

The Baltic Sea is one of Europe's most vulnerable areas. It is shallow and semi-enclosed, with slow water exchange, so any pollution incident has a long-lasting effect on the entire Sea. At about 4 015 km, the Estonian coastline is the longest of all the Baltic states'. Around 600 000 people (40% of the Estonian population) live in coastal municipalities and the capital, Tallinn, and may be at risk in the event of a major environmental incident.

Only rarely do accidents in the Baltic result in an oil leakage. Nevertheless, from time to time large spills occur, requiring an international response to avoid significant damage to the environment. In order to prepare for major pollution accidents, the coastal countries maintain a high level of preparedness and response capacity. Cooperation between them is implemented through a regional agreement on pollution preparedness and response, operated by HELCOM. Further support is provided by the EU through the European Maritime Safety Agency. Preparedness involves purchasing and maintaining the necessary equipment, including specialised spill-response vessels and surveillance aircraft. There are also commonly agreed regional procedures, which are practised in joint annual BALEX DELTA exercises, for example. Estonia has been a member of the

94 *Economic and social analysis in the Baltic Sea region* (HELCOM).

Convention on the Protection of the Marine Environment of the Baltic Sea Area since 1992. One of HELCOM's recommendations is to have a development plan for national capability to respond to oil spillages and other harmful substances, in order to eliminate pollution in an area of 4.5 $km^2$ within 12 hours. At the time of the project application, the Police and Border Guard Board had only one pollution-control ship, which had been donated by Sweden in 2002 and accounted for only 13% of the HELCOM recommendation[95].

Due to the sensitivity of the Baltic Sea ecosystem, dispersants (chemical products which dissolve oil slicks to minuscule droplets) are not considered an appropriate primary response measure to oil spills. Rather, the focus is on mechanical recovery (sweeping arms, skimmers and brushes) and booms, in order to be able jointly to collect oil at sea and stop large spills from reaching shorelines[96].

The main objective of purchasing a multifunctional ship was to increase the ability to detect, localise and eliminate marine pollution, thus ensuring preparedness for accidents (in line with HELCOM recommendations). The project was also aimed at ensuring the fast eradication of marine and coastal pollution through prevention and monitoring, thus minimising environmental damage and improving living conditions for animals and people. Only with a physical presence at sea can the Estonian authorities detect potential danger, monitor maritime activities near small islands, protect the environment and save sailors in distress.

The ship is owned by the Estonian Police and Border Guard Board, which is 100% owned by the state. The ship mainly operates in the strategic areas of the Baltic Sea, crossing the east-west (cargo) and north-south (passenger) maritime routes in the Finnish lagoon. It is primarily (90%) used for prevention and surveillance work, followed by pollution control (about 10% is for crew exchanges, maintenance, repairs, etc.). It was the preferred choice among various alternatives and is estimated to have a 30-year life span, thus ensuring long-term impact on the environment.

The total investment was €32.9 million (including VAT), of which 85% was co-financed through the ERDF. The remaining cost was covered through a national contribution (15%). The construction phase lasted from April 2010 to August 2012. The operational phase started in August 2012, and is planned to last for at least 28 years (30 years in total).

The project achieved all planned and expected objectives, including its main target: to enlarge the sea area under environmental control. It is an important step in the implementation of the environmental protection strategy in the Baltic and the benefits are felt across the region.

The project is highly relevant. Its design and implementation phase were comprehensive and suffered no serious drawbacks.

With this project, Estonia implemented 26% of HELCOM's minimum recommendations, but there is still a long way to go and the state should acquire more anti-pollution vessels.

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95 Following HELCOM recommendations, ships oil recovery capability is calculated by means of method, that takes into account ships velocity and technical parameters of high seas oil booms.

96 Response to Spills. HELCOM Baltic Sea Case study.

**Celje waste management centre (Slovenia)**

The Celje regional waste management centre (phase II) project involved the construction of facilities for the mechanic biological treatment (MBT) and thermal treatment (TT) of municipal waste. It covered the second phase of the waste management scheme for the former landfill site for the city of Celje in the district of Bukovžlak.

Before phases I and II of the scheme, no more waste from the municipality of Celje and other municipalities in the region could go to landfill due to lack of space and non-compliance with the Landfill Directive and national legislation. At the same time, there was no separate waste collection as a basis for the suitable treatment of municipal waste. It was in response to this situation that Celje Municipality, together with the Ministry of Environment and Spatial Planning, prepared the scheme.

Phase I involved:

- expanding the existing landfill; and
- constructing a composting plant, a sorting plant with a dismantling facility, an administrative building, a car wash and supporting infrastructures.

Phase II involved constructing:

- an MBT plant to process mixed municipal waste; and
- a TT plant, where a fraction of treated waste would provide additional energy for the city's central heating system.

Celje Municipality is one of 11 'city municipalities' (municipalities consisting largely of urban centres) in Slovenia. With 49 377 inhabitants[97], it is the third largest city and is the capital of the Savinjska statistical region. With its surrounding area, it is one of the main industrial centres in the country. While much of the industry collapsed in the transition from Communism, some heavy industries are still present (steel mill, titanium production) and there is a large number of strong and very diverse SMEs.

The total eligible cost of the phase II project[98] was €29 million (excluding VAT); the Cohesion Fund contribution was €20.3 million, the central government contributed €4.4 million and municipalities (project partners) provided €4.4 million. The final cost (including non-eligible costs and costs before the co-financing decision) was €36.9 million, which meant that the national financing was higher than planned: €10.5 million.

97 Statistical Office of the Republic of Slovenia, 2018.

98 Commission Decision of 14 September 2009 on the amendment of Decision C(2005) 5772 concerning the grant of assistance from the Cohesion Fund to a project concerning Regional Waste Management Centre Celje – Stage II in the Republic of Slovenia CCI 2005/SI/16/C/PE/001.

The construction phase started in June 2006 and finished in August 2008. The MBT part of the project started operations in May 2010 and the TT part in October 2010. The MBT plant is operated by Simbio d.o.o. (formerly Javne naprave), a public utility owned by the Municipalities of Celje, Vojnik, Štore and Dobrna, with Celje Municipality as the main owner (84.1% share). The TT plant is operated by Energetika Celje d.o.o., a public utility owned by Celje Municipality.

Celje Municipality (the beneficiary) was responsible for the implementation of the project, while the Government Office for Local Government and Regional Policy (now the Government Office for Development and European Cohesion Policy) was responsible for the funding application.

The project is considered to have been only partially successful. Weaknesses were identified primarily in the early stages. The project achieved its objectives (although these were not well defined) and has brought benefits in terms of improved environmental conditions and quality of life for the residents of Celje and surrounding municipalities. However, it has not been successful in terms of efficiency, as the socioeconomic costs exceed the socioeconomic benefits. Efficiency could have been greater with better selection of technology, forecasting and planning of implementation.

**Sète-Marseillan lido protection (France)**

The protection and sustainable organisation of the lido between Sète and Marseillan was a major project co-financed by the EU in the 2007-2013 programming period.

The project is located in the Hérault department in the coastal region of Languedoc-Roussillon (Occitania). The coastline is a major asset for the region, in both ecological and touristic terms. The lido is a 12 km-long sand strip linking the towns of Sète and Marseillan, and providing a natural barrier between the Mediterranean and the 7 500 ha Thau lagoon, which is a regional hotspot for shellfish aquaculture. The entire area of the lido and the lagoon is rich in biodiversity, economic activity (aquaculture, tourist beaches, vine growing, a bottling company) and commerce (mainly restaurants, bars and shops selling nautical equipment). A coast road linking Sète, Marseillan and the Montpellier-Narbonne railway (which continues to Spain) has run across the lido since 1928.

For many decades, the lido has been subject to natural erosion, which has reduced the width of the beach by about 40% since 1954. This has been aggravated by the fact that the coast road runs directly parallel to the beach, thus disrupting the natural function of the dunes in slowing erosion. The road has also brought unregulated parking and camping, litter, noise pollution, high accident levels and chronic congestion in the summer.

The project (CCI no. 2007FR162PR005) consisted of a mix of land and maritime works to protect the lido against natural hazards and organise it in a sustainable way for human use:

- the land works involved mainly relocating the coast road behind a restored and revegetated row of dunes;
- the maritime component consisted mainly of installing an innovative 'wave attenuator' system at sea[99], which was designed to reduce erosion on the coastline;
- further accompanying works involved reloading sand onto the beach to restore it to its natural width (70 m) and creating new beach and road infrastructure (car parks, a cycle path, toilets and showers); and

[99] A 'wave attenuator' is a sort of tube set up 5-6 m below water and about 400 m offshore parallel to the coastline. It is designed to absorb some of the impact of the strongest waves and storms in order to reduce coastal erosion.

- an '*ecoplage*' system was also to be tested as part of the maritime phase; it was supposed to accelerate the infiltration of water into, and to stabilise, the sand on the beach.

The total cost of the project at the time of the application was €55 million in nominal terms, but only €23 million (corresponding to some of the land and maritime works) was initially included in the 2007-2013 major project application. The ERDF financing for the project, including grants from three programming periods[100], amounts to €10.9 million, of which €6.3 million was for the 2007-2013 major project.

The project can be considered a technological success and a landmark in the context of a wider policy shift towards the use of new, softer techniques to fight erosion. The variety and number of (quantifiable and non-quantifiable) benefits is also an indication that it was successful in addressing the wide range of issues affecting the lido.

The project achieved its main objectives of restoring the normal functioning of the coastline and improving protection against erosion, without disrupting traffic on the coast road or local economic activities. It also succeeded in restoring biodiversity, mainly on the restored dunes, reducing pollution and preserving the lido's ecosystems. It is part of a larger plan by the French authorities to protect the lido and its exceptional biodiversity.

The project has major economic benefits, mainly in terms of the sustained flow of beach visitors resulting from decreased beach erosion. It also has a large number of side-benefits, ranging from fewer road accidents to lower levels of noise and air pollution.

There is some uncertainty as to the long-term economic benefits of the project. The final assessment will depend heavily on the level of natural risks avoided. However, it is difficult to produce reliable projections of erosion trends and to document all the risks with an accurate probability of occurrence and likely impact.

[100] I.e. 2000-2006, 2007-2013 and 2014-2020.