EVALUATION REPORT

PERFORMANCE OF A SAMPLE OF NINE SEWAGE TREATMENT PLANTS IN EUROPEAN UNION MEMBER COUNTRIES

Based on a study carried out on behalf of the European Investment Bank by

TU DELFT INTERDUCT

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NOTICE

The EIB has an obligation of confidentiality in relation to the owners, promoters and operators of the projects referred to in this report, and in respect of the 1992 Mediterranean Environmental Technical Assistance Program (METAP) study cited in the text. Neither the EIB nor the consultants employed on these studies will disclose to a third party any information that might result in breach of that obligation, and the EIB and the consultants will not assume any obligation to disclose any further information nor to seek consent from relevant sources to do so.

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DEFINITIONS AND ABBREVIATIONS

Sustainable development: "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (the World Commission on Environment and Development, the Brundtland Commission). In the present report, **sustainability** is used in the more restricted sense of the plants' capacity to meet requirements during at least the lifetime of the investments.

Total Solution Concept: A project corresponding to this concept incorporates all the investments required to produce a sustainable benefit stream. In the context of the present study, this implies the capacity to add treatment facilities needed to meet criteria imposed by foreseeable EU environmental legislation including correct waste and surface water collection (upstream) and sludge treatment (downstream).

Mediterranean Environmental Technical Assistance Program (METAP): is the major component of the second phase of the Environmental Program for the Mediterranean (EPM), an initiative launched by the European Investment Bank and the World Bank to reverse current trends of environmental degradation in the Mediterranean. METAP specifically supports the development of environmental projects, the strengthening of environmental management capacity and the establishment of environmentally sound policies.

Population equivalents (p.e.): for Sewage Treatment Plants (STPs) which treat industrial as well as domestic sewage, this unit expresses the pollution load in terms of the equivalent domestic daily load produced by one person.

Biochemical oxygen demand (BOD): the quantity of oxygen consumed at 20°C and in darkness during a given period to produce by biological means oxidation of the biodegradable organic matter present in water. By convention, BOD5 is used, which is the quantity of oxygen consumed after five days' incubation. BOD5 normally represents only the biodegradable carbonaceous organic pollution.

Chemical oxygen demand (COD): indicates the total hot oxidation by potassium dichromate and covers the majority of organic compounds as well as oxidizable mineral salts.

Suspended solids (SS): includes all matter suspended in water that is large enough to be retained on a filter with a given porosity.

Median: designates the quantity which is so related to the other quantities observed, that exactly as many of them exceed it as fall short of it. Thus, 6 is the median number of the set: 1, 1, 2, 6, 10, 20, 44, while the average is 12.

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December 1995
Report EV/95-01

SEWAGE TREATMENT PLANTS

Operation Evaluation Report

Introduction

This report, produced by the newly created Operations Evaluation Unit (EV) of the European Investment Bank (EIB), is based on the findings of a study conducted by outside consultants under the supervision of EIB staff.

The study covers the technical, financial and environmental performance (with particular emphasis on the latter) of a sample of nine European Union (EU) located Sewage Treatment Plants (STPs), handling both domestic and industrial waste water. It was undertaken in the context of the EIB's efforts to broaden and generalise its experience in ex-post evaluation, and its recent decision to set up an autonomous Operations Evaluation Unit. Given the EIB's longstanding commitment to environmental protection and improvement, coupled with the prevailing worldwide concern regarding water resources, such a review appears particularly relevant at this time.

From the outset, the aim of the study was to deal exclusively with the operational performance of the STPs rather than implementation conditions since, on the evidence of a previous EIB sewage treatment plant study, these are generally satisfied. The socio-economic impact of the investments was not examined.

The combined investment (outturn) cost of the plants analysed amounts to almost 500 M ECU, of which approximately 200 M ECU (40%) lent by the EIB, over an implementation period spanning 1985-1993. Servicing of the EIB loans (to date, about 35% of the total committed) is proceeding according to schedule. During the same nine-year period, total EIB investment in water and waste water projects in the EU came to 8.5 billion ECU.

The study commenced in September 1994 and was completed in April 1995. It required 65 man-days on the part of the consultants and 30 days of in-house assistance. The consultants received excellent co-operation from the staff of the STPs.

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Report EV/95-01

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SEWAGE TREATMENT PLANTS

Operation Evaluation Report

1. Executive Summary

This report presents the results of an evaluation of the technical, financial and environmental performance of a limited number of EIB financed Sewage Treatment Plants (STPs) within the European Union (EU). The sample of nine completed plants in five countries was selected in order to provide an analysis, over the period 1985-1993, of a broad range of technical specifications and institutional set-ups, rather than a set of representative statistics on EIB financed STP projects. The report is also intended as an exercise in ex-post evaluation methodology. The conclusions are those of the outside consultant, complemented by EIB comments whenever appropriate.

Technically, the STPs evaluated perform satisfactorily when results are compared with the design criteria in terms of technology used, pollution reduction, automation and energy consumption. Three of the plants have enough spare capacity (10%) to avoid problems in the foreseeable future, and five have sufficient (30-40%) to meet long term needs.
Financial data are less reliable because promoters tend to manage several plants and do not systematically allocate overheads and revenues to each separate unit. Clients are charged according to the volume of clean water supplied while STP operating costs depend on the volume of waste water treated. The promoter entities analysed (four public, four private, and one mixed) all appeared to be in a healthy financial situation, with costs slightly exceeding allocated revenues in two plants only.

All the stations were shown to be making a significant contribution to pollution abatement. Environmental performance measured against applicable EU and national standards was considered to be adequate bearing in mind that EU Waste Water Directive 91/271/EC will come into force only after 31st December 1998. However, reduction in key pollution factors is heavily dependent on the presence of secondary and tertiary treatment facilities, currently absent from two STPs constructed before the Directive was issued in 1991. In terms of sustainability[1] - based on a combination of the plants' potential to meet the environmental standards which will be progressively applied over the period 1999-2005, and their capacity to continue to dispose of sludge (polluting elements extracted from sewage) and limit odours - a number of structural problems remain to be solved.

As shown in Table 1, the consultants rated the nine STPs according to a 5-level scale: excellent (A); minor improvements possible (B); minor problems need attention (C); structural problems need attention in the long run (D); and, no data available (na).

[1] See “definitions and abbreviations” for details

TABLE 1 Performance Ratings

PERFORMANCE	A	B	C	D	na	TOTAL
1. Technical	2	7				9
2. Financial	4	2	2		1	9
3. Environmental	1	6	2			9
4. Sustainability	1	1	4	3		9

The consultants completed their report with five key recommendations on EIB procedures :

(a) there should be systematic, periodic monitoring of STPs' performance using pre-defined reporting formats;

(b) the EIB should play an active role in promoting exchange of information among STPs;

(c) for projects involving several plants, the introduction of more detailed accounting and time registration procedures would help promoters improve quality and efficiency;

(d) EIB's decision procedures should include verification that proposed investments in STPs incorporate a "total solution concept"[2] in order to meet sustainability requirements;

(e) regarding operation evaluation procedures, the use of pre-audit questionnaires should be generalised.

Recommendation **(d)** already forms part of EIB procedures and recommendation **(e)** will be adopted by the Operations Evaluation Unit (EV). Recommendation **(a)** is being examined in the light of competing objectives. With regard to **(b)**, the EIB considers that this would involve taking on a role, that of consultant, which is beyond its remit. As far as **(c)** is concerned, the EIB will advise promoters along these lines if appropriate.
EV draws the following conclusions from the consultants' findings with regard to the nine plants analysed:

- through its support to these STPs, the EIB contributes significantly to the improvement of the environment;
- the plants are in line with EU environment directives applicable at the time of Bank approval; projects which do not have the potential to meet more stringent standards, due to take effect by the end of the century, were financed before the relevant directive was known;
- minor adjustments will be sufficient to bring the majority of the STPs into line with the new EU standards;
- the EIB should verify after 1998 whether the STPs it has helped finance meet the relevant EU standards and whether sludge continues to be satisfactorily disposed of in the event of landfill closures;
- generally speaking, these STPs are financially sound investments and respect the "polluter pays principle".

[2] See “definitions and abbreviations” for details

2. Background

Waste water treatment projects represent some 10% of total EIB lending and 46% of the Bank's environmental improvement portfolio. Approximately 75% of the schemes financed consist of storm water and sewage collection and treatment plants, the remainder comprise waste water transmission or other related infrastructure.

Internal EIB assessment of the STPs it has helped finance indicates that, on the construction side, project implementation and quality are by and large up to expectations. However, since the 1984 Board of Governors' recommendations that the EIB should "exercise close vigilance over the projects that it does finance, to monitor their potential effects on the environment" the Bank has endeavoured to extend its role beyond the commissioning phase of projects and to evaluate, on a case by case basis, their technical, financial, economic and, in particular, environmental impact during the operation and maintenance period.

As part of the Mediterranean Environmental Technical Assistance Programme (METAP), the EIB financed in 1992 a study evaluating the performance of eight completed sewage treatment plants located in a major river basin. Its main findings were that pollution originated principally from dispersed agricultural and industrial activities beyond the catchment areas of STPs, and that operating standards of existing plants needed to be improved. The STPs' operational difficulties were found to be a direct consequence of their inability to control the quality and load of the industrial waste waters received, and it was concluded that infringements could be reduced only by heightening environmental awareness on the part of industry, and intensifying monitoring and enforcement practices. The study suggested that an optimal organisational structure model for STPs would involve a public consortium contracting out operational control to specialised private service companies, with invoicing and collection of fees remaining with the municipalities. Interestingly, STPs were found to be financially self-supporting and their tariffs unsubsidised, in line with the "polluter pays principle".

3. Methodology

In the current study, the EIB sought to review a small sample of Bank financed STPs with varying specifications, which had already been operating for about 18 months, in order to evaluate technical, financial and environmental performance including sustainability. The limited nature of the sample ruled out the possibility of using it to establish any valid overall statistics on EIB financed STPs, and there is no guarantee that the selection is representative of the EIB portfolio of projects in the sector. The aim was rather to use the sample as a means of testing methodology and verifying the conclusions of the previous study.
Nine plants spread over five countries and serving 5.8 million population equivalents (p.e.)1 (with, on average, 65% of the 400 million m^3 treated in 1993 being of domestic origin), were ear-marked for assessment. A detailed questionnaire (see annex) was first tested on one of the stations and then sent to the remaining promoters in advance of field visits by the EIB employed consultants.

TABLE 2 Range of Key Technical Specifications

SPECIFICATION	Median	Maximum	Minimum
Type of treatment*	MBCD	MBNPTD	M
Capacity in population equivalents served	480 000	1 650 000	74 400
Capacity in million m³/year	32	104	1.6
Domestic/Industrial water input %/%	65/35	99/1	30/70
BOD5 Capacity (tons/day)	27.6	94.3	6.2
Reduction of BOD5 load (k tons/year)	8.9	28.4	0
Ecological Sensitivity of Receiving Water	sensitive: 4; less sensitive: 2; normal: 3		
Sludge disposal**	L : 7 ; A : 3 ; I : 2 ; S : 1		

***** Mechanical (M), Chemical (C), Biological (B), Removal of nitrogen (N), Removal of phosphor (P), Third stage suspended solids (T), Sludge digester (D).
****** Landfill (L), Agriculture (A), Incineration (I), Sea Dump (S). Some STPs use more than one method (cf §4.3 for further details).

4. Performance Evaluation

4.1. Technical Performance

In general, the technical performance of the STPs evaluated is satisfactory when actual performance is measured against the design criteria of each individual project and the prevailing legislation at the time of Bank approval. The level of automation is good. Individual STPs have developed excellent know-how in waste load reduction (one STP), application of Best Available Technology Not Exceeding Excessive Costs (BATNEEC) (one STP), telemetry (one STP), and sludge digestion (five STPs).

Reduction of pollution in terms of Biochemical Oxygen Demand (BOD_5)[3], Chemical Oxygen Demand (COD)[3], Suspended Solids (SS)[3], Nitrogen (N) and Phosphor (P), is significant, but biological treatment, available in seven out of the nine plants, is essential for adequate reduction of BOD_5.

Five STPs produce up to 65% of their energy requirements (heat and/or electricity) through digester gas combustion or sludge incineration.

Four STPs, including three which receive mainly industrial water, were unable to provide data on the heavy metal content of the effluent water. Most of the heavy metals, however, are transferred to the sludge.

[3] See “definitions and abbreviations” for details

Sludge can be handled in different ways: dumped in landfills or at sea through special outfalls, sold to farmers or burnt in incinerators to produce energy (see table 2). All these techniques are being used with varying degrees of success by the STPs analysed. Several of them are confronted with excessive sludge volume and heavy metal concentration, but such difficulties are beyond the control of plant managers and do not diminish the overall technical efficacy of the projects.

4.2. Financial Results

A clear financial picture was difficult to obtain. Tariff structures are often based on a package of services such as distribution of drinking water, transport as well as treatment of waste water, etc. Local taxes providing for improvements to infrastructure in the area may also obscure the picture. It is not always possible to relate overhead costs to the STP being evaluated as the promoter generally manages more than one plant. With regard to rehabilitation projects, the financial data related to EIB financed investments are difficult to separate from a whole series of activities.

Despite these shortcomings, total operating costs in 1993 were estimated to vary from 0.1 ECU/m³ to 0.6 ECU/m³ with the main items as follows (data given here only for the seven plants with biological treatment) :

TABLE 3 Operating Costs

COST ITEM	**ECU/m³**			**ECU/kg BOD5**		
	Median	Max	Min	Median	Max	Min
Personnel	0.05	0.13	0.005	0.21	0.38	0.035
Chemicals	0.01	0.06	0.001	0.04	0.17	0.004
Energy	0.01	0.76	0.007	0.09	2.16	0.046
Other*	0.08	0.5	0.02	0.37	1.59	0.06
Employment p./million m³	1.44	3.7	0.24	4.65	16.5	1.52
Energy kWh/m³	0.42	0.8	0.14	1.45	2.28	0.88
Capital costs**	0.13	0.16	0.02	0.42	1.28	0.12

* Maintenance, sludge disposal and effluent discharge.
** Figures available for only five plants with no distinction made between rehabilitation/modernisation and green field investments.

While minima and maxima tend to reflect special circumstances, medians1 appear to represent a cluster of significant figures.

The available data indicate a generally healthy financial situation among the STPs analysed. In just two cases, tariffs are clearly - if only marginally - inadequate to cover costs, including fixed costs, depreciation and financial charges, and in one of these it is the promoter's declared intention to raise tariffs. In this respect, the study confirms the findings of the 1992 EIB evaluation of STPs.

Better accounting and reporting practices are needed, however, not only to obtain a clearer picture of the financial issues affecting STPs, but also to encourage plant managers to improve technical and economic performance, and to reinforce the "polluter pays principle".

4.3. Environmental Impact

4.3.1 Effluent Standards

Under Directive 91/271/EC (which will be phased in over the period 31.12.1998 to 31.12.2005), treated water discharged into normal receiving waters (three of the plants covered in this study) must comply with the effluent standards set out below for Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), and Suspended Solids (SS), expressed in absolute terms or according to elimination rates. Plants discharging into sensitive waters (four), are subject to the same standards with, in addition, limits in respect of nitrogen (N) and phosphor (P).

TABLE 4 Effluent Standards

CRITERION		DISCHARGE INTO: NORMAL WATERS	SENSITIVE WATERS
BOD_5	Absolute terms (mg/l) or Elimination Rate (%)	< 25 or 70-90	< 25 or 70-90
COD	Absolute terms (mg/l) or Elimination Rate (%)	< 125 or 75	< 125 or 75
SS*	Absolute terms (mg/l) or Elimination Rate (%)	< 35 or 90	< 35 or 90
N (mg/l)	p.e. > 100 000 p.e. < 100 000		< 10 < 15
P (mg/l)	p.e. > 100 000 p.e. < 100 000		< 1 < 2

* this criterion is optional

Two plants discharge into less sensitive waters and, therefore, the standards applied are not as stringent. However, this classification may be revised in the near future, leading to stricter effluent criteria and necessitating upgrading of these plants.

All plants discharging into sensitive waters must meet the above standards (expressed in either absolute terms or according to elimination rates) by 31 December 1998. Large plants (>15 000 p.e.) discharging into normal waters must do so by 31 December 2000. Those which discharge into less sensitive waters must comply with the Directive by 31 December 2005.

The study demonstrates that pollution abatement by the STPs evaluated is significant and that they have a highly positive impact on the environment. Combined, the nine plants produce 152 000 tonnes/annum of sludge, and in all but two of the plants, elimination rates are already in line with the above EU requirements. Whatever inadequacies are listed hereafter should be considered against this favourable backdrop.

4.3.2 Sustainability

Sustainability was measured by the consultants on the basis of:

- the extent to which the plants meet, or could be adapted to meet, EU standards;
- the STPs' capacity to continue to dispose of sludge.

The current performance of the STPs with regard to effluent standards (in respect of BOD5, COD, SS, N, and P) expressed in absolute terms (cf. §4.3.1), is as follows:

i. one plant is within future EU limits for all five criteria;
ii. three plants, all of which discharge into sensitive waters, comply with the new limits in respect of four criteria;
iii. three plants were unable to provide data for one or two criteria;
iv. two plants (including one which discharges into sensitive waters) exceed future EU limits for more than one criterion;
v. three plants exceed the new limits, by a factor of at least two, for one criterion or more;
vi. plants discharging into sensitive waters have, in general, a better record than those which discharge into normal or less sensitive waters.

The sample is too small to allow a valid comparison between public and private owned plants on the issue of environmental rigour. However, among the plants analysed, those in the private sector appear to be more cost conscious and less eager to apply EC standards in advance of the implementation deadlines.

In terms of adaptability to future EU norms, most plants will need only minor upgrading to come into line. Two plants, however, lack the biological treatment indispensable to comply with the new standards and would need major adjustments. The physical lay-out of one of these plants rules out this possibility.

Existing EU directives do not comprehensively address the issues of odour nuisance and sludge disposal. Odour nuisance originates from oil, fish and/or aromatic solvent components in the influent, emissions from sedimentation and sludge holding tanks, as well as gases produced during the landfill process. The sludge disposal issue is related both to the large volume produced and to the heavy metal concentration.

In one plant, sludge handling was judged "less than optimal and .... must comply with international (EU) legislation"[4]. In the remainder, the difficulty has either been solved or is under review. The volume of sludge can be reduced by digestion and incineration. Both techniques are successfully applied by some of the STPs evaluated, and five of them are thereby able to partially satisfy their own energy requirements. The issue is critical because several landfills where sludge is currently dumped will be subject to stricter environmental legislation in the future, and may be forced to close as a result.

[4] This is a reference to the ban on sea dumping due to come into effect in 1988 under Directive 91/271/EC

While there is no proven technique available to reduce heavy metal concentration in sludge and no standards are set in Directive 91/271/EC, two of the plants which receive more than half their waste water from industrial sources produce sludge fit for agricultural use as defined in the relevant Directive 86/278/EC, which came into force in 1989.

In summary, all nine STPs are in line with prevailing standards in respect of treated water quality, but as tighter measures are introduced, both water and sludge handling will have to be improved in some plants. Strictly speaking, six projects can be considered as sustainable in terms of their capacity to comply with future requirements.

The selected STPs which lack the equipment needed to meet new EU standards were financed several years before the drafting of the 1991 Directive. Later projects are all designed to allow for subsequent upgradings and at minor cost. The EIB can therefore justifiably state that it only finances projects which are capable of complying with EU norms and that it adheres to the Board of Governors' recommendation regarding environmental screening of projects. The EIB could also claim to have given some consideration to sustainability in its project selection criteria prior to the 1992 United Nations Conference on the Environment and Development (UNCED) held in Rio, when the concept took hold in the international consciousness.

This conclusion merits confirmation by a review of EIB financed STPs after 1998, when the EU standards for discharge into sensitive waters become applicable, and by which stage several landfills may have been obliged to close.

5. Recommendations

The consultants' five key recommendations and the EIB's response are set out below:

Consultants' Recommendations	EIB Response
Periodic monitoring of STPs' performance during the project construction and operation phases using pre-defined reporting formats.	The Board of Governors recommended in 1984 that the EIB "exercise close vigilance over the projects financed to monitor their potential effects on the environment". The appropriate level of monitoring is decided on a case by case basis in the light of competing objectives.
The EIB should play an active role in promoting exchange of information among STPs.	The EIB does not consider that it should adopt the role of consultant, given that there are organisations better equipped to meet this need. However, during appraisal and monitoring missions, its technical staff discuss relevant information at their disposal.
For projects involving several plants, the introduction of more detailed accounting and time registration procedures would help promoters improve quality and efficiency.	This is very much a matter to be decided by the promoters, who must be seen to retain "project ownership". If appropriate, the EIB will advise promoters along the lines suggested by the consultants.
EIB's decision procedures should include checking whether proposed investments in STPs are aimed at a "total solution concept" in order to meet the Bank's sustainability requirements.	More recent STP projects meet the "total solution concept" (cf. § 4.3 of this report) in line with the Board of Governors' recommendation.
Regarding operation evaluation procedures, the use of pre-audit questionnaires should be generalised.	Future operation evaluations will make use of pre-audit questionnaires.

6. Conclusions

The consultants' findings and recommendations serve to highlight a number of strengths and weaknesses in the EIB's financing of installations designed to protect and improve the environment, in this case through its lending to selected STPs. On the credit side, the projects analysed are shown to respect applicable EU standards and most of them can be easily upgraded to meet future regulations as they come into force at the end of 1998. The fact that the adaptability of investments improved over the relevant period (1985-1993), suggests that the EIB took on board the concept of sustainable development at an early stage. In general, the study vindicates the EIB's claim that it actively supports environmental improvement in the EU through its financial assistance to STPs. Furthermore, the study tends to confirm earlier indications that most STPs are financially self-supporting, "bankable" projects, and that they respect the "polluter pays principle".

Among the weaknesses, the consultants noted that few of the EIB clients analysed go beyond their strict legal obligations, tending to wait for the EU standards laid down in Directive 91/271/EC to become mandatory (end 1998 at the earliest) before complying with the recommended levels. The absence of any comprehensive EU legislation on sludge disposal and odour nuisance leads to these by-products being treated with varying degrees of environmental concern. This situation implies that the EIB should monitor its projects closely, during the construction phase and beyond. A review of the STPs' environmental performance once the stricter norms come into force would provide an indication of the degree to which EU legislation can be relied upon to secure the desired results.

In this context, the findings illustrate the extent to which it is difficult for a lending institution such as the EIB to strike the correct balance between, on the one hand, environmental rigour, the need - in the words of the Board of Governors - to "achieve more than the standards strictly demand", and, on the other, the "pragmatic approach" which they also recommend. On the basis of the current study, pragmatism appears to have the edge, but the exercise provided the opportunity for an exchange of views within the EIB on the question of competing objectives and the ways in which the Bank could best accommodate a more proactive role in enhancing the environmental impact of STPs.

The above conclusions are based on the consultants' findings with regard to the nine projects analysed. The representativeness of the sample in terms of EIB financed STPs as a whole, is subject to further verification.

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Annex

PRE-AUDIT QUESTIONNAIRE SEWAGE TREATMENT PLANT STUDY
(MAIN ITEMS)

I GENERAL

1. Promoter details: name, address, ..., organisation chart
2. Total surface area
3. Type of treatment unit operations
4. Capacity population equivalents (pe)
5. Period of construction and date of commissioning
6. Design, Engineering, and Construction firms
7. Receiving water body (classification)
8. Total investment costs
9. Financing parties
10. Connected cities
11. Connected industries (types, number)
12. Volume ratios: industrial/domestic effluent
13. Sludge treatment type/capacity
14. Contractors involved in operations

II DESIGN BASIS

1. Reason for building the STP
2. Objective(s) of the plant
3. Number of pe connected (domestic and industrial)
4. Flow (dry and storm weather)
5. BOD_5 (dry and storm weather)
6. COD/BOD_5/N/P Ratio
7. pH and T Range
8. Seasonal variations in flow and pe - reasons
9. Sewage network design data: year, length, hold-up capacity, residence time, pumping stations
10. Design data sewage treatment plant - number/capacity/size/type/power of:
    screens, screw presses, grit chamber sand/oil separation, sand dewatering, primary settlers, aeration and basins, secondary clarifiers, flocculation stations, final clarification/filtration/flotation, sludge digesters, sludge thickeners, sludge tanks, sludge dewatering units, pumps/fans/compressors

III LEGAL AND ADMINISTRATIVE ASPECTS

2. Permit - authority, date of issue, expiry date
2. Permit conditions (inlet, outlet, national law, EC Directive): flow, BOD_5, COD, suspended solids, Kj-N, AOX, P, Zn, Cu, Pb, Cr, Ni, Cd, Hg, others, pH, T
2. Violation, monitoring and reporting procedures
2. Quality of receiving water: oxygen/Kj-N/P content, classification

IV TECHNICAL PERFORMANCE FOR YEAR 199X

(in and out flows where applicable)

1.	Min./Max/Av. flow	19.	Total staff employed (STP & sludge plant)
2.	Min./Max./Av. BOD5	20.	Sludge production volume/dry solids content
3.	Av. COD	21.	Sludge plant consumption: chemical, energy
4.	pH	22.	Sludge cake composition
5.	Temperature	23.	Gas production digestion (vol./composition)
6.	Av. suspended solids	24.	Gas utilisation
7.	Av. Kj-N	25.	Dewatering effluent: quality/quant., treatment
8.	Av. phosphate discharge	26.	Sludge cake disposal method
9.	Av. heavy metals discharge	27.	Contractors involved in sludge cake disposal
10.	Av. coliform count	28.	Mass balance over the entire process
11.	Percentile of non-compliance	29.	Emissions: quantification, abatement measures
12.	Type and reasons for non-compliance	30.	Complaints: odour, noise
13.	Number/nature/pattern of complaints	31.	List of problems encountered
14.	Action: source reduction, end of pipe	32.	Reduction rate: COD, BOD
15.	Performance monitoring tools	33.	Total reduction rate: N, P, heavy metal
16.	Total oxygen consumption per year	34.	Annual report
17.	Total energy/utility consump. STP	35.	Environmental action plans
18.	Chemical consump. (specified) STP	36.	Any other business

V SPECIFIC PROCESS PARAMETERS

1. Sewage System: length (km), depth (m), hold-up (m^3), DWF (m^3/h), SWF (m^3/h), rain intensity (m/h), effective surface (m^2), potable water use (m^3/h)
2. Waste Water: BOD (5D/20°C) (mg/l), COD (mg/l), TOC (mg/l), Kj-N (mg/l), dry residue % (m/m), pH, O2 content (mg/l)
3. Physical Processes: screens capacity (m^3/h), screens energy use (kJ/m^3), settling flow (m^3/h), settling dimensions (m^3), settling dry solids load ($kg/m^2.h$), settling velocity (m/s), settling surface load ($m^3/m^2.h$)
4. Biological Processes:
   flow (m^3/h), BOD load (kg/d), BOD volume load ($kg/m^3.d$), BOD surface load ($kg/m^2.d$), BOD sludge load (kg/kg(ds).d), sludge yield (kg(ds)/kg BOD (removed), sludge index (m^3/kg), endogenous/substrate/nitrification respiration (kg O2/m^3.d), F/M (kg BOD/kg SS.D)

VI FINANCIAL PERFORMANCE FOR YEAR 199X

1. Investment costs: sewage system, sewage treatment plant, sludge treatment plant
2. Variable costs: electricity, fuel, other utilities, chemicals, flocculants, discharge levies, disposal costs cake, PR, others
3. Fixed costs: capital charge, maintenance, plant changes, personnel
4. Tariffs: households, offices, small businesses, industries
5. Revenues: as for tariffs plus subsidies (specify)
6. Financial result (annual report)
7. Financial performance indicators (m^3 treated and kg BOD removed): personnel/energy/chemical/other costs, number of personnel, kWh consumed

VII ENVIRONMENTAL IMPACT

1. Receiving water: oxygen/phosphate/chemical (AOX) content, specific compounds
2. Description environmental situation before and after the project
3. Authorities' monitoring programme of receiving waters
4. List of problems encountered
5. Effects on surrounding areas: number of noise/odour/bathing area complaints
6. Public acceptance in general
7. Environmental pressure groups
8. List of future actions

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THE EUROPEAN INVESTMENT BANK

The European Investment Bank (EIB) is owned by the fifteen European Union (EU) Member States and has its headquarters in Luxembourg. It supports EU policies on a self-financing basis, raising its resources on the world's capital markets for onlending to sound capital investment projects that promote the balanced development of the European Union.

Set up in 1958 by the Treaty of Rome, the EIB has its own administrative structure and decision-making and control bodies (Board of Governors - usually the Finance Ministers of the Member Countries - Board of Directors, Management Committee and Audit Committee).

As a major international borrower, which has always been awarded the highest "AAA" credit rating by the world's leading rating agencies, the EIB raises large volumes of funds on fine terms. It onlends the proceeds of its borrowings on a non-profit basis.

The volume of the EIB's operations has grown steadily and the Bank is today one of the largest financing institutions of its kind in the world. While the bulk of its loans are within the European Union, the Bank has also been called upon to participate in the implementation of the Union's development aid and cooperation policies through financing for the benefit of some 120 non-EU countries. It therefore supports:

- economic growth in the African, Caribbean and Pacific States and the Overseas Countries and Territories, as well as in the Republic of South Africa;
- a stronger Euro - Mediterranean partnership;
- preparations for the accession of the Central and Eastern European Countries and Cyprus;
- industrial cooperation, including the transfer of technical know-how, with Asia and Latin America.

The EIB began carrying out ex-post evaluations in 1988, mainly for its operations in non-EU Member Countries. In 1995, the Bank established an Evaluation Unit to cover operations both inside and outside the Union. Ex-post evaluations take a thematic approach and are intended for publication. To-date the bank has published:

1. Performance of a Sample of Nine Sewage Treatment Plants in European Union Member Countries (1996 - available in English, French and German)
2. Evaluation of 10 Operations in the Telecommunications Sector in EU Member States (1998 - available in English, French and German)
3. Contribution of Large Rail and Road Infrastructure to Regional Development (1998 - available in English, French and German)
4. Evaluation of Industrial Projects Financed by the European Investment Bank under the Objective of Regional Development (1998 - available in English, French and German)
5. An Evaluation Study of 17 Water Projects located around the Mediterranean (1999 - available in English, French, German, Italian and Spanish).
6. The impact of EIB Borrowing Operations on the Integration of New Capital Markets. (1999 – available in English, French and German).
7. EIB Contribution to Regional Development A synthesis report on the regional development impact of EIB funding on 17 projects in Portugal and Italy (2001 – available in English, French, German, Italian and Portuguese).

These reports are available from:

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