NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE

FINAL REPORT

Period covered by this report (start date–end date): 24/11/1999– 31/08/2002

1. Project contractual information

◈ **Acronym of the project:**	WASTREAT
◈ **Title:**	Natural Systems for Wastewater Treatment and Reuse
◈ **Area of co-operation:**	Environmental Improvement for Sustainable Development
◈ **Working language:**	English
◈ **Principal Partner No 1, name and address:**	Panagiotis Rigas (Prefect during the project) Dimitrios Bailas (New Prefect of Cyclades) Prefecture of Cyclades, Ermoupoli 84100 Syros, Greece
◈ **Co-ordinator of the project:**	The Goulandris Natural History Museum – Greek Biotope/ Wetland Centre (EKBY) 14th km Thessaloniki-Mihaniona, 57001 Thermi, Greece
◈ **ERDF No:**	98.08.29.007.BG
◈ **PHARE No:**	99-0217
◈ **ERDF: start date of contract:**	24/11/1999
◈ **ERDF: final date of the period of work:**	31/08/2002
◈ **ERDF: final date for payments:**	
◈ **Start date of the PHARE contract:**	24/11/1999
◈ **Final date of the PHARE contract:**	27/10/2001
◈ **Last ERDF budget approved:**	600 000 euro
◈ **Amount of ERDF contribution:**	429 750 euro
◈ **Percentage of ERDF contribution:**	71.63 %
◈ **ERDF: Organization responsible for the financial management**	The Goulandris Natural History Museum – Greek Biotope/Wetland Centre (EKBY) *Georgios Seferiadis* 14th km Thessaloniki-Mihaniona, 57001 Thermi, Greece Tel.: +30 2310 473320, 475604 Fax: +30 2310 471 795 e-mail: sef@ekby.gr

- **Last PHARE budget approved:** 80 790 euro
- **Amount of PHARE contribution:** 60 790 euro
- **Percentage of PHARE contribution:** 75 %
- **PHARE: Organization responsible for the financial management** Municipality of Varna
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2. Dynamics of the partnership

Organisation of the initial partnership

According to the Project proposal submitted to the European Commission, and the Grand Letter signed on 24/11/1999, the project participants were as follows:

Principal Partner No 1

Prefecture of Cyclades, Greece (Project Leader)

Associate Partners

Greek Biotope/Wetland Centre (EKBY)(ERDF Management Body)

Regional Development Agency of Cyclades

Municipality of Exomburgo

Municipality of Amorgos

Municipality of Ios

Principal Partner No 2

Samtgemeinde Rosche, Germany

Associate Partners

Bauckhof, Sozialtherapeutiche Gemeinschft

Planungsburo Burka

Principal Partner No 3

Municipality of Varna, Bulgaria

Associate Partners

Water Supply/Sewage Treatment LTD

Technical University-Varna

Community of Zvezditsa

Evolution during the project

During the project, difficulties were encountered regarding a) EU funds transfer from the Project Leader to the Management Body, and b) collaboration among the ERDF German partners. Representatives of the European Commission, the Project Leader, and the ERDF Management Body during a meeting in Brussels had discussed the main impediments and the extension of the ERDF project. As a result the European Commission had agreed to the request for a 12-month extension through a letter dated 13/8/2001 and signed by Mr. Guy Grauser.

PHARE partners had applied for extension of the PHARE part of the project, in order to complete a joint – with ERDF partners – action regarding the construction of a wetland for municipal wastewater treatment in Bulgaria. As we were informed by the administrative co-ordinator of the PHARE partners, the European Commission was not in the position to approve this request. This was a final decision, regarding all PHARE projects (that had to end until the end of the year 2001), and did not relate to the evaluation of the progress of the project in question. Therefore, since the 27th of October 2001, the project had run without Principal Partner No 3, and its Associate Partners. However the ERDF partners continued providing advice and support for the elaboration of a feasibility study for the construction of a wetland in Zvezditsa, Bulgaria.

Steering methods used

1. The Greek Biotope/Wetland Centre (EKBY) was appointed, to act as management body in relation to the financial management of the ERDF appropriations granted by the European Commission concerning the implementation of the WASTREAT Project in Greece and Germany. For that reason, the ERDF Policy Management Delegation Agreement was signed between the Project Leader and the Management Body, and approved by the European Commission on 13/08/2001.

2. Seven meetings of the project bodies (two of the Management Committee, one of the Steering Committee, two of the Local Committee, one meeting among European Commission, Project Leader and Management Body and one meeting among project partners), were held during the reporting period. During the first Steering Committee meeting, the persons that would form each Committee were identified, as follows:

Steering Committee

- Mr. Konstantinos Voltis (Regional Development Agency of Cyclades, Greece)
- Mr. Nikiforos Delasoudas (Mayor of Municipality of Exomburgo, Cyclades, Greece
- Mr. Michalis Kovaios (Mayor of Municipality of Amorgos, Cyclades, Greece)
- Mr. Georgios Martinos (Mayor of the Municipality of Kythnos, representative of Prefecture of Cyclades, Greece)
- Mr. Georgios Zalidis (Technical Consultant from the Greek Biotope/Wetland Centre EKBY)
- Mr. Uwe Burka (Planungsburo Burka, Germany)
- Mr. Venelin Zhechev (Architecture and City Planning, Bulgaria)

Management Committee

- Mr. Konstantinos Voltis (Regional Development Agency of Cyclades, Greece)
- Mr. Georgios Zalidis (Technical Consultant from the Greek Biotope/Wetland Centre, Greece)
- Mr. Uwe Burka (Planungsburo Burka, Germany)
- Mr. Kiril Vidolov (Municipality of Varna, Bulgaria)

Technical & Local Advisory Committee

- Mr. Georgios Paganelis (Prefecture of Cyclades, Greece)
- Mr. Petros Karvonis (Technical Service of Municipalities and Communities, Prefecture of Cyclades, Greece)
- Mr. Georgios Zalidis (Technical Consultant from the Greek Biotope/Wetland Centre, Greece)
- Mr. Uwe Burka (Planungsburo Burka, Germany)
- Mr. Plamen Petrov (Water Supply and Sewage Ltd, Bulgaria)

- Mr. Hristo Patev (Technical University-Varna, Bulgaria)
- Ms. Vera Kovatcheva (Municipality of Varna, Bulgaria)
- Mr. Nikola Nikolov (Community of Zvezditsa, Bulgaria)

Monitoring methods employed

- Establishment of the above mentioned Committees, for the continuous monitoring of the project.
- Drafting and submitting to the European Commission, six-monthly progress reports and minutes of the meetings of the project steering and management bodies.
- Establishment of a communication network among the project partners and with the European Commission, via electronic mail, post, telephone and fax.
- Signing of the ERDF Policy Management Delegation Agreement, for the management of the ERDF funds, by the Greek Biotope/Wetland Centre. The Municipality of Varna was responsible for the management of the PHARE funds.

3. Achievements

Actions carried out

Action 1: Participation in the Ecos-Ouverture seminar for Project Co-ordinators in Brussels.

On 27-28 January 2000, a seminar was held in Brussels among all the Project Co-ordinators of Ecos-Ouverture programmes. The participant members were:

1. Vasilios Takavakoglou, Greek Biotope/Wetland Centre
   Responsible for the technical management
2. Georgios Seferiadis, Greek Biotope/Wetland Centre
   Responsible for the financial management of the ERDF funds

In this seminar, the technical, financial and organizational issues were presented to all Co-ordinators of Ecos-Ouverture programmes.

Furthermore, a bilateral meeting between the Greek and Bulgarian participants in the seminar took place.

Action 2: Preparation of Management Delegation Agreement

The ERDF Policy Management Delegation Agreement was drafted by the legal consultants of the Greek Biotope/Wetland Centre, was approved by the legal consultants of the Prefecture of Cyclades, and was signed by the authorised representatives of the two partners. The Agreement was validated by the pertinent Body of the Prefecture of Cyclades and was finally approved by the European Commission (13/06/2001).

Action 3: Visits in constructed wetlands in Greece and Germany

All project participants had the opportunity to visit twice during the project period constructed wetlands used for wastewater treatment, in both Greece and Germany.

The first visit took place in Thessaloniki, Greece, where a prototype constructed wetland system for wastewater treatment has been in operation since 1997. The staff of the Greek Biotope/Wetland Centre made a presentation on the construction and operation of this system (see also Annex 1, minutes of 1st Steering and 1st Management Committee meeting). The second visit was held in Germany, where the participants visited two constructed wetlands and one conventional wastewater treatment facility (see also Annex 1, minutes of the meeting among project partners).

Action 4: Site selection for construction of wetlands in Greece

Experts from EKBY had visited Tinos, Kythnos, Ios and Amorgos islands in Greece in order to select the most appropriate sites for the construction of wetlands. According to the project plan, two constructed wetlands were to be established. The Municipality of Exomburgo, in Tinos island was the site selected. After the preliminary visits, the project team collected the appropriate data concerning the hydrology, geology, soil type, flora, fauna, meteorology and socio-economical aspects for the above mentioned sites, in order to proceed to the elaboration of the required studies.

As regards Bulgaria, an Associate German partner visited Bulgaria, to provide advice to Bulgarian partners on the site selection and the collection of the data needed to elaborate the required studies.

Action 5: Organisation of meetings

During the project period, the following meetings were held (for details see also Annex 1):

1st Local Committee Meeting of Greek partners (21/02/2000, Syros, Greece)

During the 1st Local Committee meeting of Greek partners, the objectives, work packages, time schedule and progress of the project were discussed. Priorities for actions were agreed.

1st Steering Committee meeting (13/04/2000, Thessaloniki, Greece)

During the 1st Steering Committee meeting, the partners presented their activities since the initiation of the project. The participants pointed out the difficulties in the implementation of the project. EKBY presented to the participants the Wastreat logo prepared for the project, in order to be used in every official document of the project.

1st Management Committee meeting (14/04/2000, Thessaloniki, Greece)

During the 1st Management Committee meeting, the following issues had been discussed:

a) The ERDF Policy Management Delegation Agreement.
b) The co-operation principles between the Project Leader (Prefecture of Cyclades) and the Management Body of the ERDF funds (Greek Biotope/Wetland Centre) for the transfer of the ERDF funds from the Project Leader to the Management Body.

Meeting among project partners (27-29/05/2000, Bauckhof, Germany)

Aim of the meeting was to promote the cooperation between partners and to know previous efforts of wastewater treatment using constructed wetlands in Germany.

2nd Local Committee meeting of Greek partners (25/10/2000, Tinos, Greece)

During the 2nd Local Committee meeting, the implementation of the project as well as the design and operation of the constructed wetlands in Greece were discussed in detail. A visit was also made to the sites where the constructed wetlands were to be established.

Meeting among the European Commission, the Project Leader and the Management Body

On 24th April 2001, representatives of the European Commission (Officer responsible for the project), the Project Leader (Prefect of Cyclades) and the ERDF Management Body (representative of the Greek Biotope/Wetland Centre) met in Brussels and the following issues were discussed:

a) progress of the project,
b) difficulties faced with regard to the collaboration with the German partners,
c) difficulties faced regarding EU funds transfer from the Project Leader to the Management Body, and
d) the possibility of extending the project duration for 12 months.

After this meeting, through a letter dated 13/8/2001 signed by Mr. Guy Grauser, the European Commission agreed to the request for a 12-month extension of the ERDF part of the project.

2nd Management Committee meeting (08/02/2002, Athens, Greece)

During this meeting, the following issues were discussed:

a) Developments regarding the PHARE partners and action to be taken.
b) Overview of the ERDF project progress and progress of the feasibility studies in Greece.
c) Modification of the German partners' budget
d) Partnership Agreement
e) Future planning
f) Other issues

Action 6: Elaboration of studies

According to the Greek legislation, the procedure required to obtain permission for major constructions involves: Siting Approval, Environmental Impact Assessment and a final technical study. More specifically, after Siting Approval, the submission of an Environmental Impact Assessment follows for approval of Environmental Terms.

The final technical study is then elaborated, allowing for the construction of the wetlands.

Within this project the following studies were elaborated:

- Study for the Siting Approval of Mirsini site.
- Study for the Siting Approval of Smardakito site.
- Study for the Environmental Impact Statement of Mirsini site.
- Study for the Environmental Impact Statement of Smardakito site.
- Technical report for the site Broutsi-Kamari site, Amorgos.
- Technical report for the site Episkopi, Kythnos.
- Reuse study for the Mirsini site.
- Reuse study for the Smardakito site.

The elaborated studies for the two sites namely Smardakito and Mirsini determined the design parameters such as depth, type and number of ponds, surface loading of the system, expected effluent quality of the water, construction materials and techniques, as well as proposals for reuse of treated wastewater (see also Annex 2).

Note: The studies for the Smardakito site were prepared by the project team while the studies for the Mirsini site were carried out in the context of a wider project of the Municipality of Exomburgo at its own funding.

Action 7: A request for extension

The Project Leader submitted a request to the European Commission, for a 12 months extension of the ERDF part of the project.

Action 8: Proposals for reuse

The project team collected the necessary data and elaborated two reuse studies for Smardakito and Mirsini sites in Tinos island, Greece. These studies described the alternative solutions for the disposal of the treated wastewater. According to these studies, the disposal area was proposed to be planted with trees, bushes and lawns, and irrigated by the treated wastewater (see also Annex 2).

Action 9: Web page registration

The web page of the "Wastreat" project was constructed and runs under www.wastreat.gr.

Action 10: Dissemination of results

- Information material (leaflets) (see also Annex 3) were produced in both the Greek and English language aiming at:

a) Giving general information, on the project and presenting its aims and expected benefits.
b) Outlining the main advantages of the constructed wetlands for wastewater treatment.

Moreover, an article (in Greek) entitled "Transbountary collaboration for the creation of constructed wetlands as means of wastewater treatment and re-use" was published in EKBY's bimonthly newsletter "Amphivion", outlining the "Wastreat" project and presenting brief information on the constructed wetlands.

- Web page construction (see Action 9).

The timetable of the above mentioned activities is indicated in the following table:

Actions	***Year 2000***	***Year 2001***	***Year 2002***
	0 12	0 12	0 12
Ecos-Ouverture Seminar	01/2000		
Management Delegation Agreement	<----------> 10/2000		
Visits of constructed wetlands in Greece and Germany	<-------> (by 05/2000)		
Site selection	<------->		<------->
1st Local Committee Meeting	02/2000		
1st Steering Committee meeting	04/2000		
1st Management Committee meeting	04/2000		
Meeting among project partners	05/2000		
2nd Local Committee meeting	10/2000		
Meeting among the European Commission, Project Leader and Management Body		04/2001	
2nd Management Committee meeting			02/2002
Siting Approval for the Mirsini site	Study submission: 10/2000	Approval: 03/2001	
Siting Approval for the Smardakito site		Study submission: 01/2001 Approval: 11/2001	
Environmental Impact Statement for the Mirsini site		Study submission: 05/2001	Approval is pending
Environmental Impact Statement for the Smardakito site			Study submission: 02/2002 Approval: 11/2002
Technical report for the site Broutsi-Kamari, Amorgos			08/2002
Technical report for the Episkopi site, Kythnos			08/2002
Reuse study for the Mirsini site			08/2002
Reuse study for the Smardakito site			07/2002
A request for 12 months extension		<--> (13/08/2001)	
Web page registration			07/2002
Leaflets		04/2001	
An article in newsletter “Amphivion” (in Greek)		03/2001	

Actions carried out by the Phare partners

During the PHARE project period 27/12/1999 – 27/10/2001, the following activities were carried out by the Phare partners:

Action 1. Participation in the Ecos-Ouverture seminar for Project Co-ordinators

Action 2. Establishment of the organizational scheme at local level. Forming Committees.

Action 3. Forwarding a proposal to the Municipal Council of Varna for including the design of the whole sewage system of Zvezditsa

Action 4. Preparation for participation in the 1st Steering and Management Committees meeting

Action 5. Visit in constructed wetlands in Bauckhof farm, in Germany

Action 6. Final wetland site selection

Action 7. Design of the sewage system of Zvezditsa and the inlet channel

Action 8. Consultations with regard to the local bioenvironment

Action 9. Determination of the parameters of wastewater purification

Action 10. Call for proposals for geological and hydrologic study of the wetland site

Action 11. A tender procedure for the construction of the inlet channel to the wetlands has been announced and carried out.

Explanation of difficulties encountered and of changes decided during the course of the project

Major difficulties encountered during the course of the project were:

- Flow of Project's funds

  According to the project proposal submitted to and approved by the European Commission, EKBY was the managing body of the ERDF funds. Therefore, following the request for the first advance (after communication with the European Commission), EKBY's bank account was given to the Commission's financial services. However, the European Commission notified EKBY that only the Prefecture of Cyclades could receive the ERDF funds. After this notification, the Project Leader made the necessary changes to the request for payment and resubmitted the documents to the European Commission. Nevertheless, the

Prefecture had clearly stated in the project proposal that the procedures, which would have to be followed, if the ERDF funds were not paid directly to EKBY, would be complex and time consuming. Moreover, the Prefect's decision and signature is invalid unless it is approved and validated by a Pertinent Body (Council of Prefecture that meets about three times a year).

After this change an ERDF Policy Management Delegation Agreement between EKBY and the Prefecture of Cyclades was drafted, was signed by the authorised representatives of the two partners, and approved by the European Commission thus making the funds available to the Management Body, only in July 2001.

This procedure delayed the Project's actions.

- Project duration

  According to the Grant Letter, the outset date of the project was the 1st September 1999. Nevertheless, the Project Leader received the Grant Letter only during the last week of November 1999. The Project Leader, requested 12 months extension of the ERDF part of the Project. The European Commission approved the request on the 13th August 2001.

- Difficulties in inter-regional co-operation

  It took some time before uncertainty in the co-operation with German partners as regards their specific involvement in the project, their budget allocation amongst partners and their co-financing of the project were resolved. However, an agreement was finally reached and the level of cooperation among partners increased dramatically.

- Delays in the approvals of studies by the pertinent Greek public services

  According to Greek law, issuing approvals is a time-consuming procedure because it requires positive recommendation from several government bodies, such as the Ministries of Agriculture and Development, the Forestry Service, the Archaeological Service and the Ministry of Health. The approvals for each of the project studies, by the relevant central and regional services, were provided in a timeframe that exceeded by far the initial estimations.

To accelerate the process, there was continuous communication with the competent authorities.

Actual results versus expected results

Results of Action 1 (Participation in the Ecos-Ouverture seminar)

The participants were informed in the seminar about all the technical, organizational and financial aspects of the project.

In the bilateral meeting between the Greek and Bulgarian partners, the participants discussed and clarified the tasks and the obligations connected with the studies and the construction of wetlands.

Results of action 2 (Preparation of Management Delegation Agreement)

An effective Project Administration Scheme was launched. The first advance of the ERDF funds, was transferred to the Management Body, and in turn, to the German partners.

Results of action 3 (Visits in constructed wetlands in Greece and Germany)

During the site visits in Greece and Germany (See also Appendix 1), the participants exchanged their experiences on the operation and maintenance of constructed wetlands, discussed site selection procedures and design characteristics of these systems, and discussed the differences between constructed wetlands and conventional wastewater treatment facilities.

Results of action 4 (Site selection)

The most suitable sites for wetlands construction were selected in both Greece (by EKBY) and Bulgaria (by an Associate German partner in collaboration with Bulgarian project partners).

Results of action 5 (Organization of meetings)

- *1st Local Committee Meeting*

a) The Local Authorities were briefed on the project and they committed to support its implementation.
b) Recommendation by experts on site selection. The proposed sites for the construction of the wetlands were described, together with the technical and environmental constraints for each one of these.
c) Routes of communication among the Greek partners were promoted.
d) Establishment of project bodies: The members to form the Local Committee in Greece were identified as well as the representatives of the local authorities to be involved in the implementation of the project and the monitoring of its progress.
e) Future planning: Prioritisation of the future activities and the necessary actions for the on-time implementation of the project.

- *1st Steering Committee meeting*

a) The project logo was presented to the partners and was approved.
b) The members of the project Committees were appointed.
c) The participants were briefed on the specific factors, which must be taken into consideration in designing and maintaining constructed wetlands under the prevailing environmental conditions in countries like Greece, Bulgaria, Cyprus.

- *1st Management Committee meeting*

a) The contexts and objectives of the ERDF Policy Management Delegation Agreement were determined.
b) The procedure through which funds were to be transferred from Project Leader to Management Body was determined.

- *Meeting among project partners*

Discussed issues:

a) Modification of German partners budget.
b) Planning of future meetings.

- *2nd Local Committee meeting*

a) The Prefecture of Cyclades and the Municipality of Exomburgo would take all the necessary actions to ensure access to the wetland sites of village Smardakito.

b) Future planning: Prioritisation of the future activities and the necessary actions for the timely implementation of the project.

- *Meeting among the European Commission, Project Leader and Management Body*

The conclusions of the meeting in Brussels were the following:

a) Extra efforts would have to be made so that the partnership scheme remained unchanged.

b) The restoration of collaboration among the partners at an acceptable level was a prerequisite for the successful completion of the project.

c) The EU approval of the Management Delegation Agreement was a prerequisite for the transfer of EU funds to the ERDF Management Body.

- *2nd Management Committee meeting*

The conclusions of the 2nd Management Committee meeting were the following:

a) All parties involved, were made aware of the need to make all efforts needed in order to speed up the procedures for the elaboration of the necessary studies (according to Bulgarian legislation) for the proposed constructed wetland in the Municipality of Varna.

b) It was agreed that the Project Leader would take personally all the necessary action to facilitate and accelerate the issuing of approvals by the pertinent authorities for the sites in Greece.

c) The Project Leader and the Management Body agreed on the proposed modification of the budget of the German partners, provided that the European Commission would approve it. The German partner representative, the Project Leader and the Management Body, undertook to submit to the European Commission an official request for approval of the modified budget.

d) The Partnership Agreement was agreed to be signed by the German principal and associate partners, as well as by the Greek partners.

e) It was agreed to:

  – Speed up the procedures regarding wetlands construction in Greece. To this end, the Management Body undertook to deliver in time all the necessary studies, while the Project Leader agreed to take responsibility for fast approval

of studies and efficient implementation of administrative procedures by the Prefecture's services.

- Speed up the procedures regarding the elaboration of the studies for the constructed wetland in Bulgaria.
- Register the web page immediately after the signing of the Partnership Agreement.

Results of action 6 (Elaboration of studies)

As was described in the approved project proposal, the elaborated studies for two sites, namely the Mirsini and Smardakito sites, were submitted for Siting Approval and Approval of Environmental Terms according to the Greek legislation. The Siting Approval and the Approval of Environmental Terms had been issued by pertinent Greek authorities for the Smardakito site. For the Mirsini site, Siting Approval has been issued while the Approval of Environmental Terms is due.

The approval of the reuse study for the Smardakito site was prerequisite for the submission of the Environmental Impact Statement. This approval had been issued on 01/07/2002 by the Health and Welfare department of the Prefecture of Cyclades.

The approval of the reuse study for the Mirsini site was not required by the pertinent authorities.

The technical reports in Amorgos and Kythnos were prepared according to the approved project proposal. The two Municipalities will identify the funding mechanisms for the elaboration of missing studies and the construction of the two wetlands.

As regards Bulgaria, following the visit of the associate German partner Mr. Uwe Burka, report on the site selection was prepared and is presented in Annex 4.

Results of action 7 (A request for extension)

The European Commission has approved a 12-months extension of the ERDF part of the Project.

Results of action 8 (Proposals for reuse)

Two reuse studies have been elaborated, for the Mirsini site and the Smardakito site respectively.

Results of Action 9 (Web page registration)
The web page provides information concerning the "Wastreat" project as well as constructed wetlands as a means for wastewater treatment.

Results of action 10 (Dissemination of results)
The produced leaflets have been distributed locally to inform interested bodies (e.g. local authorities) or people (e.g. hotel owners) on the current project. Furthermore, this material has been used as a means for the promotion of constructed wetlands for wastewater treatment in various occasions (e.g. interviews, presentations).

Overall, actions regarding the construction of wetlands in Greece and Bulgaria and the monitoring of their operation was not made possible in the time frame of the project. The reasons mainly relate to delays in administrative procedures. The postponement of these actions also reflects to the facts that only part of the project budget has been actually spent (please see the financial report). It is however encouraging that action is taken for the continuation of the work that has been initiated through the Wastreat project, as described in section 4-Future of the project.

Analysis of the added value created by the co-operation

a. Increased level of stakeholders' awareness, regarding wastewater treatment and water management. Through the meetings and visits to constructed wetlands, an analysis of the uses and values of constructed wetlands was made, making clear, especially to local authorities and decision makers, that wetlands may be constructed and operate either as isolated ecosystems or as part of a wide management plan in a watershed, providing society with economic benefits, helping to control pollution, and increasing biodiversity at a specific watershed. This integrated approach of the use of constructed wetlands, was appreciated by all local stakeholders.
b. The issues, ideas and constraints identified by the current project have been used until now and will be used as means to promote the use of natural systems for wastewater treatment.
c. Local authorities in Greece gained significant experience regarding the actions and the steps which should be followed for the construction of natural ecosystems

for treating wastewater (site selection, constraints etc.). Based on this experience, pertinent authorities can promote and faster proceed to the establishment of such systems in other sites in Cyclades.

d. In Bulgaria, a wide range of stakeholders such as local authorities, academic circles, citizens and researchers gained experience regarding the use of constructed wetlands as a method for wastewater treatment. Additionally links were established with ERDF partners experienced in constructed wetlands.

4. Future of the project

The project in the future: actions development plan

- ✓ The Prefecture of Cyclades has started to identify additional sites in the islands where constructed wetlands may be constructed.
- ✓ The Prefecture of Cycladees is contacting specialised consulting firms in order to promote construction.
- ✓ EKBY will inform the study group which will undertake the study of the water resources of Cyclades (in response to Directive 2000/60) on the results of the project and on the role of constructed wetlands.

The project in the future: financing plan

The Prefecture of Cyclades has started requesting government funds for implementing the pertinent studies.

More specifically, the following efforts will be made:

- ✓ Identification of potential funding mechanisms for the elaboration of the final technical studies (Mirsini and Smardakito sites), and construction of treatment wetlands in these sites.
- ✓ Identification of potential funding mechanisms for the elaboration of missing studies for the construction of treatment wetlands in Kythnos and Amorgos islands.

Phare partners searching potential funding mechanisms for the continuation of the project (e.g. funding programmes of the Ministry of Ecology).

Communication plan and dissemination of results

Printed material will continue circulating in Greece and abroad, concerning transfer of gained knowledge and experience, in the field of constructed wetlands for wastewater treatment.

The web site of the project will be maintained and updated regarding wastewater treatment issues.

EKBY will seek the continuation of contacts with the Municipality of Varna.

Project consolidation and expansion plan (demonstration and transfer of experience)

Since no wetland was actually constructed, no demonstration is possible. However, in the event that the Prefecture of Cyclades is successful in obtaining funds for construction, all wetlands will be excellent demostration plots for all South-East European countries.

5. Overall comments

In projects such as the present one the main challenge is to promote inter-regional cooperation. This challenge was met with a variable degree of success depending on the subject. For example, a good degree of success may be noted on the subjects of exchanging technical aspects of planning and of realising the wide potential of using constructed wetlands as a means not only to treat wastewaters but also as a means to assist in the sustainable management of water resources in rural areas especially the ones which are subjected to seasonal pressures from tourism. On the other hand, the fact that none of the three wetlands which were scheduled to be constructed was actually constructed prevented any exchange of experiences regarding operation and monitoring.

The project was constrained by factors whose magnitude was impossible to be foreseen at the project proposal stage: (a) difficulties in communication among partners (b) time-consuming decisions to clarify the appropriate flow of funds and (c) long procedures which the Project Leader had to follow in order to obtain Site Approval and Approval of Environmental Terms. The latter factor was due to the very geographical setting of the Prefecture of Cyclades. This prefecture is perhaps unique in the European Union in the sense and it covers numerous small islands. This means that travelling among those islands is not easy therefore decision making in the

Prefecture Council is unavoidably slow because council members live in various islands. More over, this prefecture employs fewer staff as compared to other prefectures, which cover larger area, which include urban centres.

Some differences of opinion among partners on how to carry out some of the project activities have truly constrained progress. Nevertheless, it is encouraging that those differences were gradually resolved and finally the project was able to deliver a number of very useful and good quality deliverables.

If one sees the project from the viewpoint of number of concrete deliverables then it was only partially successful. If one sees it from the viewpoint of the benefits obtained in relation to the funds spent then it was successful. One of the important benefits is the lessons learned from the errors made. This was, of course, expected due to the experimental nature of the project. All experiments teach useful lessons even the ones whose hypotheses are not fully verified. Another important benefit is the motivation it caused. In the case of Greece, it motivated the Prefecture of Cyclades as seen by the fact that it is currently seeking funds to implement the studies. It has motivated other small communities in other parts of Greece to ask for more information on the potential of constructed wetlands. It has also caused the interest of various scientists such as ornithologists who started to see the role of constructed wetlands as means to partially substitute for the deteriorating natural wetlands of the islands in order to conserve migratory bird diversity. Landscape architects in Greece are seeking information on constructed wetlands.

Finally, this project in its final stage became interactive with three other projects which are also co-financed by the European Commission. Two publications from other EC projects were distributed by EKBY to all partners (MedWet publication on wetlands restroration and publication on ecotourism from the LIFE project on "Conservation measures for the Palm Forest of Vai, Greece"). The experience from the project is also being used in the LIFE project entitled "*Conservation management of Cheimaditida-Zazari wetlands*"

Annex 1

Minutes of meetings

ECOS-OUVERTURE 1997-1999
External Inter-regional Co-operation projects

"NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE"

Proceedings of the 1st Greek partners (1st Local Committee) meeting held in Ermoupolis, Syros, Greece on 21 of February 2000

Ermoupolis

February 2000

Introduction

On Monday 21 February 2000, in Ermoupolis, took place the 1st meeting of the Greek partners, within the scope of the "ECOS-OUVERTURE 1997-1999- External Inter-regional Co-operation projects" project entitled "Natural systems for wastewater treatment and reuse" (WASTREAT). The European Commission, Directorate GENERAL XVI, funds this project which aims to: a) promote the use of constructed wetlands for the wastewater treatment in middle and small size towns, b) train the partners of the project on the use, management, and monitoring of constructed wetlands, and c) study the potential reuse of the constructed wetland effluents.

Place: Central building of Regional Development Agency of Cyclades, Ermoupolis, Syros island, Greece.

The participants of the meeting were:

1. Panagiotis Rigas

Prefect of Cyclades

2. Konstantinos Voltis

Regional Development Agency of Cyclades

3. Dimitrios Drimpetas

Technical Services of Municipalities and Communities, Prefecture of Cyclades

4. Lefteris Kastrisios

Community Support Framework Management Organization Unit

5. Giolanta Ziaka

Community Support Framework Management Organization Unit

6. Stavros Gousgounelis

Regional Development Agency of Cyclades

7. Georgios Alexiou

Community Support Framework Management Organization Unit

8. Konstantinos Katagas

Regional Forest Devision of South Aegean

9. Ioannis Kopelos

Community Support Framework Management Organization Unit

10. Evagelia Mitskidou

Community Support Framework Management Organization Unit
11. Georgios Zalidis
Greek Biotope/Wetland Centre
12. Sotiria Katsavouni
Greek Biotope/Wetland Centre
13. Vasilios Takavakoglou
Greek Biotope/Wetland Centre

The municipals of Exombourgo Tinos and Amorgos were also invited in the meeting, but they were unable to participate.

In the opening of the meeting, the representatives of Greek Biotope/Wetland Centre, made a brief description of the project "Wastreat". The briefing included the aims and objectives of the project, the timeline and the workpackages. Additionally, the participants informed about the constructed wetlands and their ability to treat municipal wastewaters.

The issues that have been discussed in the followed conversation were:

- **The site selection for the wetlands construction and the related problems**

According to the original plans, 2 constructed wetlands where going to be established in the Prefecture of Cyclades, one in the municipality of Amorgos (Amorgos island) and one in the municipality of Exomburgo (Tinos island). The main problem, in the case of Amorgos Municipality, is the lack of sewage drainage system. This means that there is going to be a delay in the construction of the wetland, which must be build until the end of 2000. Concerning the Municipality of Ejombourgo, three negative points for the selected site have been mentioned: a) the slope of the site, b) the lack of road access, and c) that the site is within the boundaries of a "Natura 2000" area (GR4220019 "Tinos: Mirsini-Akrotirio Livada").

- **Workplan setup and future activities**

According to the project proposal, 4 committees should be established, for the successful implementation of the project, that is: a) the Steering Committee, b) the Management Committee, c) the Technical Advisory Committee and d) the Local Partnership Committee. During the meeting has been decided that the Greek representatives in each committee would be:

1. George Martinos, Mayor of Kithnos, representative of Steering Committee,

2. Konstantinos Voltis, Regional Development Agency of Cyclades, representative of Management Committee and

3. Peter Karvonis, Technical Services of Municipalities and Communities Prefecture of Cyclades, representative of Technical Advisory Committee.

4.The Local partnership Committee will be formed according to the needs of the project.

During the realization of the project the Prefecture of Cyclades will be represent by Konstantinos Voltis and/or Stavros Gousgounelis.

The future activities concerning the project will also include:

- Visit of a scientific group, to Tinos and Amorgos islands, in order to finalize the sites where the wetlands are going to be constructed.
- Organization of a meeting between all the partners from Greece, Germany and Bulgaria involved in the project. The meeting will take place in Thessaloniki and will include a visit to the constructed wetland build next to Gallikos River, and discussion between partners about priorities of action, obligations, technical issues and work programme establishment.
- Meeting of the "Steering Committee" and "Management Committee" during the partners meeting in Thessaloniki
- Public awareness through the organization of open seminars in the islands where the wetlands are going to be established. Aim of the seminars will be the presentation of the constructed wetland as an alternative system for wastewater treatment in order to inform the local communities and gain their active involvement in the project.

ECOS-OUVERTURE 1997-1999
External Inter-regional Co-operation projects

"NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE"

Proceedings of the
1st Steering and 1st Management Committee meeting
held in Thessaloniki, Greece on 13-14 of April 2000

Thessaloniki

April 2000

On the 13th and 14th of April 2000 and within the scope of the WASTREAT project, took place in Thessaloniki the first meeting of partners and the meeting of the project's Steering and Management Committee. The meetings held in the building of the Greek Biotope/Wetland Centre, Thessaloniki, Greece.

The participants of the meeting were:

1. Konstantinos Voltis
   Regional Development Agency of Cyclades
2. Nikiforos Delasoudas
   Mayor of Exomburgo
3. Dimitrios Prekas
   Vise-Mayor of Amorgos
4. George Martinos
   Mayor of Kithnos
5. Dimitrios Drimpetas
   Technical Services of Municipalities and Communities, Prefecture of Cyclades
6. George Paganelis
   Province of Tinos
7. Stavros Gousgounelis
   Regional Development Agency of Cyclades
8. Georgios Zalidis
   Greek Biotope/Wetland Centre
9. Sotiria Katsavouni
   Greek Biotope/Wetland Centre
10. Vasilios Takavakoglou
    Greek Biotope/Wetland Centre
11. Nikolaos Nikolaidis
    Technical consultant of the Greek Biotope/Wetland Centre
12. Uwe Burka
    Director of "Planungsburo Burka"

The Bulgarian partners were unable to participate in the meetings but they were engaged to be present in the following meetings.

Aim of the 1st partners meeting was to bring together all the participants of the project in order to know each other and to experience the operation of a Constructed wetland established near the city of Thessaloniki.

In the opening of the meeting took place a brief presentation of the project (aims, workpackages, time line, and status) and of the participants. After that followed a free discussion about the priorities of action and future activities.
The participants pointed out the difficulties in the implementation of the project (including the luck of time, the site selection for the establishment of the constructed wetlands, the public acceptance etc.).

During the meeting of the **Steering committee** decided that the project's committees (steering, management, and technical) will be consisted by:

Steering Committee

- Konstantinos Voltis
  Regional Development Agency of Cyclades
- Nikiforos Delasoudas
  Mayor of Exomburgo
- Michalis Kovaios
  Mayor of Amorgos
- George Martinos
  Mayor of Kithnos
- Georgios Zalidis
  Greek Biotope/Wetland Centre
- Uwe Burka
  Director of "Planungsburo Burka"
- Representatives of the Bulgarian partners (to be decided).

Management Committee

- Konstantinos Voltis
  Regional Development Agency of Cyclades
- Georgios Zalidis
  Greek Biotope/Wetland Centre
- Uwe Burka
  Director of "Planungsburo Burka
- Representative of the Bulgarian partners (to be decided).

Technical Advisory Committee

- Petros Karvonis
  Technical Services of Municipalities and Communities, Prefecture of Cyclades
- George Paganelis
  Province of Tinos
- Nikolaos Nikolaidis
  Technical Consultant of the Greek Biotope/Wetland Centre
- Uwe Burka
  Director of "Planungsburo Burka"
- Representative of the Bulgarian partners (to be decided).

Furthermore, during this meeting have been decided the following:

1. Two constructed wetlands are going to be established in Greece, both of them in the island of Tinos.
2. Four feasibility studies are going to be prepared (in case of Greece). The studies will concern the construction of wetland treating systems in four locations in the islands of Tinos, Amorgos, and Kithnos.
3. The technical committee should pay a visit to the areas where the wetlands are going to be built.
4. Open seminars should take place as soon as possible, both in Greek islands and in Bulgaria, in order to inform the public about the natural systems for wastewater treatment and the WASTREAT project.

5. The second partners meeting is going to take place in Germany either at May 12-14 or May 26-28.
6. The management committee should meet in Bulgaria within November 2000 (to be discussed with the Bulgarian partners).
7. The use of a logotype in all the official documents of the project (the final form of the logo presented to the participants).

The meeting of the **Management Committee** took place in the morning of the second day (14th of April) and the following points have been discussed:

1. The efficient cooperation and between partners and the management of the programme. A Management Delegation Agreement is already under preparation for the needs of the project. A first draft of this Agreement sent to Brussels in order to have the comments of the Commission.
2. The cooperation principals between the project leader (Prefecture of Cyclades) and the management body of the ERDF funds (Greek Biotope/Wetland Centre).
3. The promotion of sustainable development in the areas where the wetlands are going to be established.
4. The need for a detailed discussion of the project needs in the meeting in Germany, with the active involvement of the Bulgarian partners, in order to have final decisions for the workplan of the project.

The participants, after the meeting of the Management committee, visit the constructed wetland build next to Gallikos river, near Thessaloniki. The representatives of the Greek Biotope/Wetland Centre made a presentation of the system providing information about the principals of its construction and operation.

ECOS-OUVERTURE 1997-1999
External Inter-regional Co-operation projects

"NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE"

Proceedings of the meeting among project partners held in Germany on 27-29 of May 2000

Germany

May 2000

On the 27th and 29th of May 2000 and within the scope of the WASTREAT project, took place in Germany the meeting among project partners. The meetings held in the Bauckhof farm in Amelinghousen.

The participants of the meeting were:

1. Uwe Burka
   Director of "Planungsburo Burka"
2. Rainier von Karmen
   Head of the Bauckhof Community
3. Dietmar Witting
   Director of Rosche
4. Kiril Vidolov
   Chief engineer of Varna municipality
5. Dimitrios Drimpetas
   Technical Services of Municipalities and Communities, Prefecture of Cyclades
6. George Paganelis
   Province of Tinos
7. Stavros Gousgounelis
   Regional Development Agency of Cyclades
8. Vasilios Takavakoglou
   Greek Biotope/Wetland Centre

Aim of the meeting was to promote the cooperation between partners and to make know previous efforts of wastewater treatment using constructed wetlands.

During the meeting have been discussed the following:

The own contribution of the Stuttensen Community should be reduced by 20.000 EURO and the own contribution of the Burka company should be raised by 20.000 EURO

(15.000 in kind and 5.000 in personnel). This kind of transfer will be decided after communication with the EC and according to the ERDF rules.

The meetings of the Management Committee decided to take place:
In Greece (October 2000)
In Bulgaria (May 2001)
In Greece (October 2001)

The remaining meeting of the Steering Committee will be held in Bulgaria in May 2001.

The Technical Committee will have one meeting in Greece and one in Bulgaria by the end of June 2000 or within the first weeks of July 2000. On the side of the meetings there will be held open seminars for the public, concerning the wastewater treatment using constructed wetlands.

The Bulgarian partners requested a preliminary cost estimation for the construction of the wetland in Bulgaria in order to finalize the design and the construction of the wastewater drainage system in Svezditsa village.

Site visits

The meeting included site visits in two constructed wetlands and one conventional wastewater treatment plant.

- Constructed wetland in Bokel

Consists of 3 ponds and 1 vertical flow reedbed system. Treats 50 m^3 of municipal wastewaters per day and covers an area of 6 ha. The construction cost estimated to 1000 DM/habitant and the operational cost is 1 DM/habitant.

- Constructed wetland in Stuttensen

Vertical flow reedbed system for the wastewater treatment needs of the Bauckhof community. The system was build 15 years ago and is one of the first systems build in Germany.

- Conventional wastewater treatment plant in Rosche

Centralized system to treat the wastewaters of the Rosche communities and villages.
Its worth to be mention that, the cost of the drainage system to collect the wastewaters of the whole area was more that double than the cost of the treatment plant.

ECOS-OUVERTURE 1997-1999
External Inter-regional Co-operation projects

"NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE"

Proceedings of the 2nd Local Committee meeting held in Tinos, Greece on 25 of October 2000

Tinos

October 2000

In the frame of the project “Natural systems for wastewater treatment and reuse”, the 2nd local committee meeting was held on Tinos island on Wednesday, 25 October 2000. Issues as regards to the course of project were discussed and participants visited the proposed sites for construction of wetlands.

The participants that attended the meeting were:

1. Nikiforos Delasoudas, Mayor Municipality of Exomburgo, Tinos,
2. Giorgios Paganelis, representative of the Prefecture of Cyclades,
3. Sotiria Katsavouni, representative of Greek Biotope/Wetland Centre (EKBY),
4. Andreas Kounadis, external contractor of EKBY,
5. Ino Katsiardi, external contractor of EKBY.

During the meeting, the following were discussed:

- The feasibility study for the construction of wetland in the village Smardakito would be carried out expressly.
- The Mayor of the Municipality of Exomburgo proposed that the system of constructed wetland in Smardakito should be designed to treat such a volume of wastewater that it could also treat the wastewater of the nearest village when it prepares its sewage system.
- The Prefecture of Cyclades and the Municipality of Exomburgo made a commitment to seek additional funds for works, which are necessary to ensure access to the wetland site.

ECOS-OUVERTURE 1997-1999
External Inter-regional Co-operation projects

"NATURAL SYSTEMS FOR WASTEWATER TREATMENT AND REUSE"

Proceedings of the 2nd Management Committee meeting held in Athens, Greece on 8 of February 2002

Athens
February 2002

On the 8th of February 2002 and within the scope of the WASTREAT project, the 2nd Management Committee meeting took place in Athens, Greece. The meeting was held at the Goulandris Natural History Museum – GAIA Centre.

The participants that attended the meeting were:

1. Mr. Panagiotis Rigas (Project Leader)
2. Mr. Konstantinos Voltis (Representing Associate Greek partner "Regional Development Agency of Cyclades S.A.)
3. Mr. Pavlos Giamas (Representing the Management Body, "Greek Biotope / Wetland Centre")
4. Mr. Manolis Anastasiadis (Representing the Management Body, "Greek Biotope/Wetland Centre")
5. Mr. Uwe Burka (Associate German partner, representing all German partners)
6. Mrs. Snejana Angelova (Representing all PHARE partners)

Mr. Giamas opened the meeting, welcoming everyone and thanking partners for attending the Management Committee meeting.

The following items were discussed during this meeting:

1. Developments regarding the PHARE partners and action to be taken.

Mr. Anastasiadis introduced the subject, informing the participants that the PHARE part of the project had come to an end, as a result of decision of the European Commission not to approve a project extension for administrative reasons. Mr Anastasiadis mentioned that, regardless the ending of the PHARE part of the project, and since a) the implementation of the project joining the ERDF and the PHARE partners is still in progress, b) the ERDF project end date is the 31st of August 2002, and c) the special scope of the project is to enhance collaboration and transfer of know-how and experience as regards wastewater treatment and reuse, there should be no further delay, which means that there is a high need to put all the effort needed in order to speed up the procedures for the elaboration of the necessary studies (according to Bulgarian legislation) for the

proposed constructed wetland in the Municipality of Varna (as referred to in the approved project proposal).

On behalf of the PHARE partners, Mrs Angelova stated the willingness of her project team to continue co-operation with the ERDF partners, in order to both exchange know-how on the use of natural systems for wastewater treatment – reuse, and also be provided with the studies for the proposed wetland in their country. She also informed the partners that their project team has prepared the following studies:

a) A feasibility and technical study for the construction of the sewage network (a small part of this network has already been constructed),
b) A geological and hydrological study, that could provide inputs to the studies for the constructed wetland.

In addition, Mrs. Angelova mentioned that after the elaboration of the necessary studies, they will investigate for potential sources of funding for the construction of wetland in question.

2. Overview of the ERDF project progress and progress of the feasibility studies in Greece.

Mr. Anastasiadis informed the participants on the overall progress of the project. The following items were discussed:

a. As regards the studies for the constructed wetland in Mirsini, and after the Siting Approval (issued on 29/3/2001), an Environmental Impact Statement was prepared and submitted; its approval is pending. Special attention and more effort should be placed, on the communication with pertinent authorities in order to speed-up the approval process and be able to proceed the soonest possible with the elaboration of the final technical study.
b. As regards the studies for the constructed wetland in Smardakito, and after the Siting Approval (issued on 9/11/2001), the Environmental Impact Statement is under preparation, and will be submitted for approval within the next two weeks.
c. As regards the feasibility study in Kithnos and the technical report in Amorgos, a visit has been scheduled to be held by an EKBY scientist until the end of March, for the collection of the necessary data.

d. The registration of the web page should be considered as an immediate priority.

The Project leader was briefed in detail on the time constraints the project has, and on the delays which have been- and are- encountered during the approval of the prepared studies. It was agreed that the Project Leader will take personally all the necessary action to facilitate and accelerate the issuing of approvals by the pertinent authorities.

3. Modification of the German partners' budget

Mr. Burka, acting as representative of the German partners, proposed a modified budget explaining the reasons for such a modification. The Project Leader and the Management Body agreed on the proposed modification, provided that the European Commission would approve it. Mr. Burka undertook to submit to the European Commission an official request for approval of the modified budget.

The proposed modified budget is attached. The total amount to 81,000 Euros, include cash and in kind contributions of the German partners.

4. Partnership Agreement

The Partnership Agreement will be signed by the German principal and associate partners (and will be forwarded for execution to the other partners), after the European Commission has approved the proposed modified budget of the German partners.

5. Other items

Mr Burka came back to the issue regarding Mr. Nikolaides, and the partners agreed to consider aspects related to Mr. Burka's statement within the following weeks.

6. Future planning

It was commonly agreed to:

- Speed up the procedures regarding wetlands construction in Greece. To this end, the Management Body undertook to deliver timely all the necessary studies, while the Project Leader agreed to take responsibility for fast approval of studies and efficient implementation of administrative procedures by the Prefecture's services.

- Speed up the procedures regarding the elaboration of the studies for the constructed wetland in Bulgaria. A joint visit (by representatives of both the Management body and the German partner) to Bulgaria, will take place in the near future, for the final site selection and for the collection of any other required data that will help the elaboration of the studies. A specific date, will be finalised after personal communication between Mr. Burka, Mr Anastasiadis and Mrs Angelova.
- To organise a Technical Committee meeting, after the visit to Bulgaria, in order to evaluate the available data, and discuss the method and procedure for the elaboration of the studies for the construction of the wetland in the Municipality of Varna.
- Register the web page immediately after the signing of the Partnership Agreement.

German Partners modified budged (in EUROs)

FORMER BUDGET				
	Rosche	**Burka**	**Stutensen**	**Total**
Stuff Costs	3,000		17,250	**20,500**
Studies, Experts		37,000		**37,000**
Travel Costs	3,000	5,500	6,000	**14,500**
Equipments			1,500	**1,500**
Other expenses			7,750	**7,750**
Total	**6,000**	**42,500**	**32,500**	**81,000**
Own Contribution	3,000	12,500	25,000	40,500
EU Payment	3,000	30,000	7,500	40,500

NEW BUDGET				
	Rosche	**Burka**	**Stutensen**	**Total**
Stuff Costs	3,000		10,500	**13,500**
Studies, Experts		51,500		**51,500**
Travel Costs	3,000	7,500	4,000	**14,500**
Equipments			500	**500**
Other expenses			1,000	**1,000**
Total	**6,000**	**59,000**	**16,000**	**81,000**
Own Contribution	3,000	29,500	8,000	40,500
EU Payment	3,000	29,500	8,000	40,500

Annex 2

Contents of elaborated studies

STUDY FOR THE SITING APPROVAL OF A CONSTRUCTED WETLAND FOR WASTEWATER TREATMENT (COMMUNITY OF SMARDAKITO, TINOS ISLAND, CYCLADES)

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ANNEX IV
MAPS

The study concluded the construction of a wastewater treatment facility, including the following parts:

- Primary treatment (screening and primary sedimentation)
- Secondary and tertiary treatment with the use of constructed wetland
- Additional disinfection (chlorination – dechlorination unit)
- Sludge treatment through an anaerobic lagoon and a constructed wetland
- Storage lagoon
- Reuse of treated wastewater for irrigation purposes.
- Reuse of treated sludge, as soil amendment.

ENVIRONMENTAL IMPACT ASSESSMENT OF A CONSTRUCTED WETLAND FOR WASTEWATER TREATMENT (COMMUNITY OF SMARDAKITO, TINOS ISLAND, CYCLADES)

TABLE OF CONTENTS

The study concluded the construction of a wastewater treatment facility, including the following parts:

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- Reuse of treated sludge, as soil amendment.

REUSE AND IRRIGATION STUDY OF TREATED WASTEWATER BY CONSTRUCTED WETLAND IN SMARDAKITO, TINOS ISLAND

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The study proposes the irrigation of an area of approximately 6,855 m^2, cultivated with trees, bushes and lawns, with the use of a drip irrigation network. The design characteristics of the irrigation network are presented.

STUDY FOR THE SITING APPROVAL OF A CONSTRUCTED WETLAND FOR WASTEWATER TREATMENT (COMMUNITY OF "PANO MEROI", TINOS ISLAND, CYCLADES)

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CHAPTER 9. MAPS

The study was carried out in the context of a wider project funded by the Municipality of Exomburgo.
The objective of this study is the construction of a facility for the treatment of municipal wastewater produced by 6 communities of the Municipality of Exombourgo (including the community of Mirsini).
The study concluded the construction of a wastewater treatment facility, including the following parts:

- Primary treatment (screening and primary sedimentation)
- Secondary and tertiary treatment with the use of constructed wetland
- Additional disinfection (UV disinfection)
- Sludge treatment
- Disposal

REUSE AND IRRIGATION STUDY OF TREATED WASTEWATER BY CONSTRUCTED WETLAND IN MIRSINI, TINOS ISLAND

TABLE OF CONTENTS

The study proposes the irrigation of an area of approximately 32,177 m^2, cultivated with trees, bushes and lawns, with the use of a drip irrigation network. The design characteristics of the irrigation network are presented.

SITING APPROVAL FOR THE CONSTRUCTION OF A CONSTRUCTED WETLAND FOR WASTEWATER TREATMENT (COMMUNITY OF EPISKOPI, KYTHNOS ISLAND, CYCLADES)

TABLE OF CONTENTS

The study concluded the construction of a wastewater treatment facility, including the following parts:

- Primary treatment (screening and primary sedimentation)
- Secondary and tertiary treatment with the use of constructed wetland
- Additional disinfection (chlorination – dechlorination unit)
- Sludge treatment through an anaerobic lagoon and a constructed wetland
- Storage lagoon
- Reuse of treated wastewater for irrigation purposes.
- Reuse of treated sludge, as soil amendment.

TECHNICAL REPORT FOR THE CONSTRUCTION OF A CONSTRUCTED WETLAND FOR WASTEWATER TREATMENT (COMMUNITIES OF VROUTSI – KAMARI, AMORGOS ISLAND, CYCLADES)

TABLE OF CONTENTS

The study concluded the construction of a wastewater treatment facility, including the following parts:

- Primary treatment (screening and primary sedimentation)
- Secondary and tertiary treatment with the use of constructed wetland
- Additional disinfection (chlorination – dechlorination unit)
- Sludge treatment through an anaerobic lagoon and a constructed wetland
- Storage lagoon
- Reuse of treated wastewater for irrigation purposes.
- Reuse of treated sludge, as soil amendment.

Annex 3

Leaflet

Annex 4

Report of the visit in Bulgaria

ECOS OUVERTURE Programme (ERDF Article 10(1)(b) NO 98.08.29.007)

Bulgaria

Visit to the Varna district

from 19.june to 25. June 2002

Report of visit

by Uwe Burka

Objective:

1.) Studying the local situation with the view on sewage treatment

2.) Giving seminars on economic and natural treatment systems to municipal authorities and civil engineers

3.) Giving advise for economic and natural sewage treatment possibilities of the village of Zvzditsa, acting us an pilot village

1. The sewage situation of Varna district

Varna is one of the largest towns of Bulgaria with a population of more then 350 000 inhabitants, built near the estuaries of the River Provadin. Varna has the biggest port of the country and an important economic and industrial centre. Vodosnabdiavane I Kanalizatsia Co. Ltd. (water supply and sewerage Co. Ltd.) is a company involved in water supply, sewerage, purification of wastewater and engineering in Bulgaria. It provides its services to about 500 000 inhabitants in Varna district and supervises 13 waste water purification stations. This organisation is acting as an Associate Partner to the Municipality of Varna in this ECOS-OUVERTURE Project.

General observations:

- The number of people in the area are varying greatly because of tourism
- The most densely populated areas are connected to sewage plants
- The most sewage plants and the wastewater pipes are in need of improving
- Rainwater entering the systems on to many places resulting in overloading during rain
- The most villages at the out site of the town are not connected to sewage plants (like the most villages in the hole country)
- Financial shortages (extreme) makes it impossible to solve the problems (at least in the way us sewage treatment is dealt with in middle Europe)
- Environmental (and wastewater) awareness is generally underdeveloped

2. Seminars on economic and natural treatment systems (to municipal authorities and civil engineers)

2.1. Most important is the consideration of decentralised sewage systems (!!!) be course of:

a) The cost of the sewage piping system towards the treatment system is many fold of that of the treatment system. In rural areas up to 20 times (!!!).

b) A discharge of the treated effluent on many decentralised places brings more balance to the water household. Especially if given to plants (not for human consumption) and / or soaked away (the ground brings the best pre-treatment !)

c) The local awareness and responsibility for the own waste is growing

2.2. Rainwater should never enter any sewage system (!!!) be course of:

a) Rainwater on to plants and in to the ground for recharge of the groundwater. Dirty surfs water can be easily clean up through ditches planted up with reeds.

b) The sewage pipe system will be much smaller and cheaper

c) Expensive rain retention basins and overflow systems would be needed (The rain / sewage mix is a great polluter)

2.3. Natural Sewage systems should be conceder, because they are:

a) Robust through there vellum

b) No or little energy is needed

c) Simple and reliable operation

d) Simple building

e) Fits in to the landscape

There are different natural systems:

2.3.1. Sewage ponds

These are also known as waste stabilisations ponds, settlement ponds, lagoons or solar ponds. Original installations were in hot countries with a small anaerobic pond at the start, followed by larger aerobic ponds. Oxygen for the treatment organisms is provided by diffusion from the air over the large surface and by a symbiosis with photosynthesising algae. Although a large surface area is required to ensure sufficient treatment (10 qm / pe.), smaller versions of these systems have been made possible by pumping the water or by using wind powered mixing devices (5-7 qm / pe.)

2.3.2. Horizontal flow red beds (5 qm / pe.)

Details vary, but there are two main types, subsurface flow and overland flow. The former is more usual, although some have blocked (recourse of wrong design) and so have been neatly renamed as overland flow beds. Here will be describe the

subsurface flow bed in which sewage flows horizontally through the gravel, sand or sometimes soil. The arrangement can be likened to a bath, filled with the media and planted with reeds. As one top up the bath, water overflows at the far end. Thus, a depth of water of some 30 – 60 cm is maintained in the bed, unlike vertical flow beds which are free- draining, with the plug removed. This means less oxygen is available for aerobic treatment. The lower levels of oxygen create ideal conditions for nitrogen removal.

Whilst they are occasionally used for secondary treatment of sewage, the presence of high levels of organic matter, the low levels of oxygen, and the tendency to block make horizontal flow reed beds better suited to tertiary treatment, where they do an excellent job removing fine particles of organic matter that are to small to be removed in a settlement tank. Adequate settlement before the horizontal flow bed will extend the beds life.

2.3.3. Vertical flow reed beds (2 qm / pe)

Vertical flow reed beds are usually preceded by some form of primary treatment, although some have been build to receive row sewage. Each bed resembles a percolating filter except that it has a layer of sand on top and is planted with reeds. The wastewater is introduced in such a way as to cover the surface of the bed and percolate down throw the sand and gravel matrix and out at the base. Intermittent dosing of the bed by pump or flushing device improves distribution and aerates the sand layer by the ´piston effect´ as the dose of sewage passes through the bed. As with percolating filters, secondary humus solids are generated and these are usually removed by a humus tank, another vertical flow reed bed or a horizontal flow reed bed.

The sand provides physical filtration as well as an active biological layer and keeps the bed moist during long periods of rest, an advantage where use is intermittent.

Vertical flow reed beds can also been used for extremely strong industrial effluent since the media is full of air.

2.3.4. Sludge reed beds (0,25 qm / pe)

These are vertical flow reed beds like in 2.3.3. . Sludge can be filled in 1- 3 times the week in layers from 3-6 cm. A humus layer is slowly growing (in 10 years app. 50cm)

3. Recommendations for the village of Zvezdisa

The village of Zvezdisa was chosen us the pilot village showing wastewater treatment through a natural treatment system. Zvezditsa has app. 1500 inhabitants and is situated within Varna region, close to the navigable channel Varna- Devnia, a region of a higher level of ecological harm. The purification system will cover the wastewater of the public (Municipality, school, medical centre) and housing buildings. The topography of the village leads the surface water in two different directions. The, from the municipality , suggested site for the natural treatment plant has app. 2500 m² and would be to small for the hole village.

Recommendations (see also notes from the seminars):

1. Two public natural sewage systems at the two lower parts of the village are recommended. One, the bigger one (app. for 1000 people), should be on the (from the municipality) suggested site. The smaller one, on to the other slope of the village.
2. Some houses out site the village could have there own sewage system in order to save expensive piping. A horizontal reed bed system will be connected with the existing septic tank. The treated effluent from the reed bed will be soaked away or better be used for irrigation (not for human food).
3. Trough this, it is possible that all sewage can flow by gravity. no pumping station should be needed

4. No rain water should enter the sewage systems. Run off Water should be leaded in ditches and soak aways.
5. The two public natural sewage systems at the two lower parts of the village should be vertical reed beds in two stages. The 1. stage = 1,2 m^2 / pe.. The 2. stage = 0,6 m^2 / pe..
6. The pre treatment could be done by a Imhoff tank.
7. The sludge treatment could be done by a vertical reed sludge bed (0,25 m^2 / pe.).
8. The cleaned effluent should be used for irrigation of crops (not for human consumption) or to be meandered down through bushes and trees for nutrient and water take up.