



LIFE Project Number  
<**LIFE05 TCY/MA/000141**>

## **INTERIM REPORT**

**Covering the project activities from 01/02/2006 to 31/07/2007**

Submission Date

07/08/2007

FULL PROJECT TITLE

**‘Design and Application of an Innovative Composting Unit for the Effective Treatment of Sludge and other Biodegradable Organic Waste in Morocco, MOROCOMP’**

### **Data Project**

<b>Project location</b>	El Jadida, Morocco
<b>Project start date</b>	01/02/2006
<b>Project end date</b>	01/08/2008
<b>Total Budget (€)</b>	637,808
<b>Community Contribution (€)</b>	438,228
<b>Total Project duration</b>	30 months (after extension of 6 months)

### Data Beneficiary

<b>Name Beneficiary</b>	University of Chouaib Doukkali (UCD)
<b>Postal address</b>	Avenue Mohamed Ben Larbi Alaoui, 2, El Jadida, Morocco
<b>Legal Representative</b>	Mohamed Kouam
<b>Telephone</b>	+ 212 23 34 44 47/48
<b>Fax</b>	+ 212 23 34 44 49
<b>Contact person</b>	Professor Omar Assobhei
<b>Tel</b>	+ 212 23 34 3003
<b>Fax</b>	+ 212 23 34 2187
<b>E-mail</b>	<a href="mailto:assobhei1@yahoo.fr">assobhei1@yahoo.fr</a> <a href="mailto:assobhei@ucd.ac.ma">assobhei@ucd.ac.ma</a>
<b>Website</b>	<a href="http://www.ucd.ac.ma/fs/">www.ucd.ac.ma/fs/</a>

### Authors

<b>UCD</b>	Prof. Omar Assobhei Prof. Mohammed Mountadar
<b>NTUA</b>	Prof. Maria Loizidou Mr Simos Malamis Mr Konstantinos Moustakas

## **Contents**

### **SECTION I - TECHNICAL REPORT**

SUMMARY OF ACTIVITIES AND RESULTS SINCE THE START	5
PROJECT MANAGEMENT	11
PROGRESS DURING THE REPORTING DATE	17
ASSESSMENT OF THE PROGRESS	27
FUTURE PLANNING	32

### **SECTION II - FINANCIAL REPORT**

## **LIST OF KEYWORDS AND ABBREVIATIONS**

### Keywords:

Morocco, Greece, sludge, biodegradable organic waste, waste management, composting, in-vessel system, bioreactor, compost, legislation, guidelines

### Abbreviations:

University of Chouaib Doukkali:

UCD

National Technical University of Athens:

NTUA

Regional Office of Agricultural Development:

ORMVAD

Biodegradable Organic Waste:

BOW

# SECTION I

## TECHNICAL REPORT

### SUMMARY OF ACTIVITIES AND RESULTS SINCE THE START

- Project objectives
- Project actions and expected results
- List of key deliverables

#### **The main objectives of the project are the following:**

This project seeks to develop an innovative in-vessel composting system for the treatment of sludge generated by Urban Wastewater Treatment Plants (UWWTP) and other biodegradable organic waste (BOW) in Morocco. This composting unit will enable the operators and National Authorities to treat, control and use sludge and other BOW effectively and in consistence with the European Environmental Policy. The project implementation will protect the water-bodies and soil from untreated and uncontrolled sludge disposal in order to promote the protection of public health and the environment in Morocco. At the same time, the use of treated sludge and other BOW as soil improver will prevent the use of chemical fertilizers and subsequently protect arable land from degredation and the surface and ground water from contamination. This composting system will be used as a pilot-demonstration unit for further applications in large-scale plants in Morocco and in European geographical areas with similar characteristics that face similar problems.

**The main activities of the project include:**

- Assessment of the existing situation in the European Union and in Morocco regarding sludge and other BOW generation and management (treatment, reuse and disposal). COMPLETED
- Assessment of the related legislation in the EU and in Morocco concerning sludge and other BOW. COMPLETED
- Review of composting success stories and best practices in the European Union and internationally. COMPLETED
- Design and construction of an innovative in-vessel composting system for treating sludge and other BOW. COMPLETED
- Installation and start-up of the in-vessel composting system in Morocco. COMPLETED
- Development of sludge and other BOW aerobic composting processes – Optimization of the operation of the demonstration composting system IN PROGRESS
- Use of alternative effective additives of Mediterranean origin in the composting process IN PROGRESS
- Determination of the most efficient compost mixture. IN PROGRESS
- Evaluation of the compost products as soil improvers in laboratory and open field applications
- Development of specifications and guidelines covering the area of sludge and other BOW composting, characterization and use of compost as soil improver in large scale
- Examination of alternative uses of the end products

- Assessment of compost market and jobs opportunities in Morocco
- Dissemination of the project progress and results (trips, conferences, workshops, meetings, website, printed material, etc). IN PROGRESS
- Training of the staff of the competent authorities and personnel that shall be involved in the compost production and distribution
- Public information and participation. IN PROGRESS
- Management of the project and reporting to the EC. IN PROGRESS

These actions are implemented by specialized personnel, including project manager, scientific staff, engineers, computer experts and technical staff.

**The expected project results include:**

- Development and transfer of know-how for the efficient management of sludge and other BOW in Morocco
- Development of instruments for the competent authorities in order to design and apply appropriate schemes for the management of sludge and other BOW
- Autarchy in the technology means for the management of sludge and other BOW
- Reduction of the use of chemical fertilizers and protection of sensitive water bodies from eutrophication
- Well-trained staff that can be involved in the development of the technology under examination
- Adoption of the priorities of the EU concerning the recovery and reuse of materials

- Convergence towards the existing EU legislative framework and environmental policy concerning the management of sludge and other BOW
  
- Solving out the problem of the disposal of sludge and other BOW
  
- Promotion of sustainable agricultural practices
  
- Utilization of Mediterranean materials as additives
  
- Production of compost materials that can be used as soil improvers

Task No.	Deliverables
Task 1	<ul style="list-style-type: none"> <li>• Report on the existing situation in Morocco regarding the production and management of sludge and other biodegradable organic waste (<b>Deliverable 1 &amp; ANNEXES 1-5</b>)</li> <li>• Report on the existing situation in EU in connection to sludge and other biodegradable waste and the related legislation (<b>Deliverables 2-3</b>)</li> <li>• Report on sludge and other biodegradable waste composting practices and success stories in EU and internationally (<b>Deliverable 4A</b>)</li> <li>• Report on Site Visits performed in Germany (<b>Deliverable 4B</b>)</li> </ul>
Task 2	<ul style="list-style-type: none"> <li>• In-vessel composting system <ul style="list-style-type: none"> <li>- Technical description of system (<b>Deliverable 5A</b>)</li> <li>- Detailed drawings of the completed unit and its components (<b>Deliverable 5B</b>)</li> <li>- Detailed pictures of the various components of the composting system (<b>Deliverable 5C</b>)</li> <li>- Description of the Zemamra Site (<b>Deliverable 5D</b>)</li> </ul> </li> </ul>
Task 3	<ul style="list-style-type: none"> <li>• Report on the physicochemical analysis of sludge, other biodegradable waste and additives</li> <li>• Report on the optimum operating conditions for the in-vessel composting unit</li> <li>• Report concerning the evaluation of compost products (level A)</li> </ul>
Task 4	<ul style="list-style-type: none"> <li>• Report on the phytotoxicity tests - Evaluation of compost products (level B)</li> <li>• Report on the effects of compost on the tested cultivations - Final evaluation of compost products (level C)</li> </ul>
Task 5	<ul style="list-style-type: none"> <li>• Report on the alternative uses of compost</li> <li>• Report on the market opportunities for the compost products</li> </ul>
Task 6	<ul style="list-style-type: none"> <li>• Technical specifications concerning optimum operation of compost units</li> <li>• Technical specifications concerning the quality and compost products and their potential uses</li> <li>• Development of guidelines concerning the requirements for compost uses</li> <li>• Manual for physicochemical compost analysis</li> </ul>

Task 7	<ul style="list-style-type: none"> <li>• Complete set of training material and minutes from workshops</li> <li>• Printed material describing the project and its results</li> <li>• Website describing the project and its outcomes</li> <li>• Proceedings from the International Conference</li> <li>• Technical papers-publications (<b>Deliverable 11</b>)</li> <li>• Minutes of the kick-off meeting in Morocco (<b>Deliverable 6</b>)</li> <li>• Minutes of the kick-off meeting of Life Third Countries Projects in Brussels (<b>Deliverable 7</b>)</li> <li>• English and French Leaflet (<b>Deliverable 8</b>)</li> <li>• Publications in press (<b>Deliverable 9</b>)</li> <li>• International conference proceedings</li> </ul>
Task 8	<ul style="list-style-type: none"> <li>• Endorsed action plan (<b>Deliverable 10</b>)</li> <li>• Interim report</li> <li>• 2<sup>nd</sup> progress report</li> <li>• Final report</li> <li>• Minutes of the management meeting in Marrakech on 09/06/2006 (<b>Deliverable 12A</b>)</li> <li>• Minutes of the management meeting in Greece on 27/10/2006 (<b>Deliverable 12B</b>)</li> <li>• Minutes of the management meeting at the Zemamra Site on 15/03/2007 (<b>Deliverable 12C</b>)</li> </ul>

## PROJECT MANAGEMENT

### Describe the management structure of the project

The beneficiary of the project is the University of Chouaib Doukkali (UCD) which is solely legally and financially responsible for the Project implementation and Project Management.

The project partners are:

National Technical University of Athens (NTUA) from Greece and

Regional Office of Agricultural Development of Doukkala from Morocco (ORMVAD)

In the period covered by the Interim Report, the Steering Committee met once during the kick-off meeting (9<sup>th</sup> of February 2006), while the Management team met four (4) times:

- Meeting 1: during the kick-off meeting 09/02/2006
- Meeting 2: on the 9<sup>th</sup> of June 2006 in Marrakech during the International Conference on Sustainable Water Management, Rational Water Use, Wastewater Treatment and Reuse organized in the Framework of the Euro-Mediterranean program MEDAWARE
- Meeting 3: on the 27<sup>th</sup> of October 2006 in Marrakech of Morocco
- Meeting 4: on the 15<sup>th</sup> of March 2007 at the site where the composting system has been installed (Zemamra site)

During the kick-off meeting in Morocco on the 9<sup>th</sup> of February 2006, the Steering Committee was formulated. In the Table below the name and organization of each member of the Steering Committee is given. Furthermore, during the kick-off meeting the management team was formulated consisting of members of UCD, NTUA and ORMVAD. The Steering Committee discussed the Action plan of the project. The Action plan was endorsed by all institutions that participate in the Steering Committee by the end of March 2006 (Deliverable 10). The second meeting took place between NTUA and UCD in Marrakech of Morocco on the 9<sup>th</sup> of June 2006. During this meeting the quality of deliverables of Task 1 was discussed as well as the indicators that must be used. Furthermore, the beneficiary was informed by the NTUA on the progress of the design of the composting system and a discussion was made on various details concerning the design (aeration system, material used for the system etc) (Deliverable 12A). UCD provided their suggestions according to their needs and became more familiar with the technology under

development. The third management team meeting took place in Athens on the 27<sup>th</sup> of October 2006. During this meeting the final design of the composting system was presented by NTUA at its laboratory premises. Furthermore the UCD and the ORMVAD were able to visit the laboratory premises of NTUA (Deliverable 12A). The fourth management meeting took place on the 15<sup>th</sup> of March 2007 at the Zemamra site where the in-vessel composting system was installed. In this meeting, the NTUA team clarified to UCD and ORMVAD certain issues concerning the operation and maintenance of the in-vessel system. Also an expensive discussion took place concerning the protocol that must be followed concerning analyses as well the different operational trials that must take place.

### **Members of the Steering Committee**

<b>Name</b>	<b>Organisation</b>
M. Kouam	President, University Chouaib Doukkali
A. El Hattab	Director of Sciences, Ministry of National Education, Higher Education, Executives Training and Scientific Research
A. Moulid	Director of Regional Office of Agricultural Development of Doukkala
K. El Hariry	Member of Moroccan Parliament
Y. Boughaleb	Dean of Faculty of Sciences El Jadida
A. Sahibi	Chief of the Cooperation Division, Ministry of Regional Planning, Water and Environment
M. Loizidou	Professor, National Technical University of Athens
O. Assobhei	Professor, Faculty of Sciences of El Jadida
S. Bakkas	President, Association ANDALOUS
N. Brine	Regional Inspection of Doukkala Abda, Ministry of Regional Planning, Water and Environment
K. El Moutai	Vice President, Association ANNAMAE for Self-employment
M. Fekhaoui	General Secretary, Moroccan Association of Limnology
M. Lahlou	Ministry of National Education, Higher Education, Executives Training and Scientific Research

M. Mountadar	Professor, Faculty of Sciences of El Jadida
M. Rafrafi	Regional Office of Agricultural Development of Doukkala (ORMVAD)
K. Zourarah	President, Association GREPEN

---

### **Members of the Management Team**

<b>Name</b>	<b>Organisation</b>
O. Assobhei	University Chouaib Doukkali – Co-ordinator
M. Mountadar	University Chouaib Doukkali
A. Aajjane	University Chouaib Doukkali
J. Amine	University Chouaib Doukkali
S. Etahiri	University Chouaib Doukkali
M. Kabil	University Chouaib Doukkali
M. Loizidou	National Technical University of Athens
S. Malamis	National Technical University of Athens
E. Kapetanios	National Technical University of Athens
M. Rafrafi	Regional Office of Agricultural Development of Doukkala
B. Droussi	Regional Office of Agricultural Development of Doukkala

The working group of the beneficiary is in regular contact with the working groups of the partners in order to organise their tasks, discuss the progress on their field of activities and find suitable solutions when problems arise. The project management structure has not changed since its formulation and is running smoothly.

### **Report appointment of new staff and changes to new staff**

The project's management structure has not changed since its formulation.

## **The role and the responsibilities of the beneficiary and the two partners**

### **Who did what in the reporting period**

**The University of Chouaib Doukkali (UCD)** is legally, technically and financially responsible for the project implementation. UCD organized the kick-off meeting and has produced the reports that assess the existing situation in Morocco with respect to sludge and other BOW management and related legislation. UCD has also provided remarks on the design of the composting system, according to its needs and has actively participated in the site visits in Germany. The UCD personnel has contributed significantly to the installation and start-up of the composting system in the premises of ORMVAD by providing specialized personnel and technicians. The UCD personnel are currently in charge of operating the system and for conducting all the required analyses.

The UCD is responsible for performing complete physico-chemical analysis of sludge and other BOW that is used in the composting unit. Furthermore, UCD in collaboration with the NTUA and the ORMVAD operate the composting unit. UCD will perform most of the chemical analysis required for the compost end product and for the leachate and will aid in the development of phytotoxicity tests for compost evaluation. In addition, UCD is responsible for evaluating and determining feasible compost markets in Morocco and for the organization of all project meetings taking place in Morocco (management team and Steering Committee meetings).

Finally, being the project beneficiary, UCD is responsible for all dissemination and training activities such as the creation and updating of the project web-site, organization of workshops, training events and an International Conference, the development and distribution of printed material, site visits to the composting unit, publications in technical papers as well as for the Management of the project and the reporting to the European Community. UCD continuously mobilizes all relevant Moroccan organizations in order to increase the project's impact.

The **National Technical University of Athens (NTUA)** is mainly responsible for developing certain technical tasks of the project. NTUA has assessed the current situation in the EU regarding sewage sludge and other BOW management. Furthermore, NTUA has designed and constructed the in-vessel composting system and has successfully installed the system with the aid of UCD and ORMVAD personnel. NTUA has adequately trained UCD and ORMVAD personnel on the

system's operation and maintenance. NTUA organized and participated in the site visits in Germany and is responsible for the organization of all project meetings held in Greece. More specifically, NTUA organized the management meeting that took place on the 27<sup>th</sup> of October 2006 in Athens.

NTUA is responsible for developing alternative composting processes and for optimizing the composting system operation. The latter shall be performed in close collaboration with UCD and ORMVAD. Moreover, NTUA is responsible for the development of guidelines and specifications on sludge composting processes and for the characterization and use of compost as soil improver through the conduction of phytotoxicity tests and by supervising the conduction of open field experiments. To this purpose, NTUA provides the necessary staff, i.e. senior technical manager/scientific and technical responsible, experienced researchers and engineers, technical staff, computer experts, secretariat support, etc.

The **Regional Office of Agricultural Development of Doukkala (ORMVAD)** actively participated in the site visits in Germany, in all project meetings and has provided land within its premises for the installation of the composting system. Furthermore, ORMVAD has contributed significantly in the drafting of the reports related to the examination of the existing situation in Morocco with respect to sludge and other BOW. ORMVAD has provided personnel for the daily maintenance and operation of the composting unit and will be actively involved in the conduction of open field experiments.

**More specifically (per Task, in brief):**

**Task 1:** The UCD was responsible for the successful implementation of this task, in close collaboration with NTUA.

**Task 2:** The NTUA team was responsible for the successful implementation of this Task, in close collaboration with the beneficiary and the Moroccan partner. NTUA working group was responsible for the design, construction, installation and start-up of the in-vessel composting system.

**Task 3:** The NTUA team is responsible for the successful implementation of this Task, in close collaboration with UCD. More specifically, the development and optimization of aerobic composting processes using sludge, individually and in combination with and other BOW, as well as the development and optimization of alternative aerobic composting processes using sludge and

other BOW in combination with alternative additives will be carried out by NTUA working group in collaboration with UCD.

**Task 4:** UCD and NTUA in close collaboration with ORMVAD are responsible for the evaluation of the suitability of the compost product for using it as soil improver. Extended series of laboratory and open field experiments will be carried out in Morocco by UCD in suitable land that is owned by ORMVAD. The ORMVAD personnel will be actively involved in order to set out these experiments under the supervision of UCD and NTUA. Furthermore, NTUA and UCD will supervise the experiments and the collection of samples for further laboratory examinations.

**Task 5:** UCD will be responsible for the assessment of alternative uses of compost products and for the development of a compost market network in Morocco in collaboration with NTUA.

**Task 6:** The NTUA team in close collaboration with UCD will support the development of specifications and guidelines covering the area of sludge and other BOW composting process, the characterization and the use of compost as soil improver in large-scale applications.

**Task 7:** UCD and NTUA are responsible for the organization of dissemination and training activities in close collaboration with ORMVAD.

**Task 8:** The beneficiary, (UCD) supported mainly by NTUA and by ORMVAD, is the director – coordinator of the project and has the supervision of all the work packages.

### **Report appointment of new staff and changes to new staff**

The project's management structure has not changed since its formulation.

## **PROGRESS DURING THE REPORTING DATE**

**Describe what has been done regarding the different technical/substantial components of the project. Indicate what has been done regarding each task**

### **Task 1: Assessment of the existing situation in Morocco and in the EU**

*Start date: 01/02/2006      End date: 01/06/2006 Duration: 4 months*

The Deliverables of Task 1 have been successfully completed. This Task aimed to provide the following output:

- Assessment of the existing situation in Morocco regarding the production and management of sludge and other biodegradable waste
- Assessment of the existing situation in EU in connection to sludge and other biodegradable waste and the related legislation
- Review of best practices and success stories of composting of sludge and other BOW in the EU and internationally
- Effective transfer of know-how concerning waste treatment technology, mainly through the conduction of site visits

The following Deliverables have been produced in the framework of Task 1 (they were provided with the second progress report, submitted on 25.04.2007):

- Deliverable 1: Evaluation of the Production of Sludge and other BOW in Morocco
- Deliverable 2: Assessment of the existing situation and the related legislation in EU in connection to sludge management
- Deliverable 3: Assessment of the existing situation and the related legislation in EU in connection to other BOW
- Deliverable 4A: Review of best practices and success stories of composting of sludge and other BOW in the EU and internationally
- Deliverable 4B: Site Visits

Deliverable 1 also includes the following Annexes:

**Annex 1: Production of Sludge from Wastewater Treatment Plants in Morocco**

Annex 2: Sewage Sludge production in Morocco

Annex 3: Production of biodegradable organic waste generated by the food industry in Morocco

Annex 4: Examination of the residues of timber processing and the waste of slaughterhouses of red meat in Morocco

Annex 5: Evaluation of the production of agricultural residues in Morocco

The assessment of the EU situation regarding sludge and other BOW and the success stories were carried out by NTUA based on the team's experience and prior work, on information from the European Environmental Agency and from Eurostat and on Reports of the European Commission. This was complemented by several other relevant bibliographic references and internet sites. In addition, for the report on success stories various operators of specific sites were contacted to provide information on their composting site. Also, well-known construction companies were contacted (i.e. GICOM, BTA, Herhof, Orgaworld and others) in order to provide information on the composting facilities they have designed and constructed.

The assessment of the Moroccan situation was based on the collaboration of UCD with ORMVAD and by contacting several relevant Moroccan authorities in order to obtain the required information. Originally, under the framework of this project, two site visits were envisaged, one in Germany and one in Switzerland. Since Switzerland has banned the composting of sludge it was decided to perform the site visits in the plants of the company BTA at Munich (Germany) and in the plants of company Herhof at Rennerod (100 km outside Frankfurt). The site visits took place during the 11-15<sup>th</sup> of September. It was decided to move the visits from the initially planned dates of April in order to allow for some time for the beneficiary and the Moroccan partner to first evaluate the generation of sludge and other organics in their country. Furthermore, more time was allowed in order to select interesting sites that will maximize the transfer of know-how. In total 4 waste treatment facilities were visited, 2 in Munich and 2 in Rennerod. The site visits were very successful. The participants were able to acquaint themselves with a wide range of waste treatment technologies, including composting, anaerobic digestion, mechanical separation, pre-treatment of waste.

A description of each site has been included in Deliverable 4B.

The indicators for Task 1 are the following:

- Number of bibliographic sources used in the reports > 150

- Total number of bibliographic sources used which are more recent than the year 2000 (in order to assess how up to date this information is) > 70
- Number of Moroccan competent authorities from which valuable information was taken concerning the existing situation in Morocco related to composting, number of other projects (National and European) the findings of which were used = 15
- Number of relevant websites utilized > 50
- Number of success stories considered = 44
- Number of companies involved in composting that were contacted > 15
- Number of operators of plants that were contacted > 30
- Number of waste treatment plants visited = 4

## **Task 2: Design and construction of an innovative sludge aerobic composting system**

*Planned Start date: 10/04/2006 End date: 10/10/2006 Duration: 6 months*

Actual Start Date: 10/04/06 Revised End Date: 10/03/07

This Task has been completed with significant delay. The design of the composting system finished on time on the 20<sup>th</sup> of July 2006. The construction of the system was completed at the beginning of December with a 2-month delay. This delay was due to the late arrival of certain system components (motor, fan) that were necessary in order to complete the construction of the unit. Although the materials were ordered on time, the supplier did not provide this equipment on time.

The prototype composting unit has been successfully designed, constructed and installed by NTUA in collaboration with UCD at the Zemamra site that is located approximately 70 km away from the town of El Jadida and at the premises of ORMVAD. The system was ready to be shipped on the beginning of December; however, the personnel at the port of Peiraias (Greece) responsible for loading and unloading cargoes was on a very long strike that lasted the whole of December, January and part of February. As a result, during this period, no cargos left or entered the port of Peiraias for other destinations. This created a long delay; even after the cessation of the strike it was difficult to send the shipment as many other shipments had to leave the port. The system was finally shipped at the beginning of February and arrived at the port of Casablanca at the end of February. The composting system has been successfully installed at the premises of ORMVAD. A special room

has been built to house the composting system. UCD has produced a description of the Zemamra site where the composting system has been installed.

The following Deliverables have been produced in the framework of Task 2 and were provided with the second progress report on 25.04.2007:

- **Deliverable 5A:** Technical description of the in-vessel system designed by NTUA
- **Deliverable 5B:** Detailed drawings of the complete unit and its components
- **Deliverable 5C:** Pictures of the composting system and its components
- **Deliverable 5D:** Description of the Zemamra Site

The technical and operational specifications are described in Deliverable 5A. The design has taken into consideration the following factors: use of state-of-the-art in-vessel composting technology, minimization of environmental impacts and risks to public health, compliance with European Union environmental legislation and policy and production of a high quality compost that can be marketed.

For to the implementation of this task the beneficiary and the Moroccan partner performed a visit to Greece. The trip of the beneficiary and the Moroccan partner to Greece took place between the 25<sup>th</sup> and 31<sup>th</sup> of October 2006. In the 1<sup>st</sup> progress report it was mentioned that it will take place on the 21<sup>st</sup>-24<sup>th</sup> of September 2006. However, it was transferred a month later due to the Ramadan. During this meeting, the NTUA presented to the Moroccan partners the design of the composting system. Furthermore, the details of the transportation, installation and start-up of the system were discussed among the beneficiary and the partners.

The trip of the Greek team to Morocco for the system installation was performed on 14-19 of March 2007, instead of 19/09/07 due to the aforementioned delays in the construction and the shipping of the bioreactor.

The indicator for Task 2 is the following:

- Number of different design options which are considered = 2

### **Task 3: Development of sludge aerobic composting processes – Optimisation of the operation of the pilot composting systems**

*Proposal Start date: 10/10/06 End date: 10/04/07 Duration: 6 months*

Actual Start Date: 15/03/07 Revised End Date: 10/09/07

Task 3 will be completed on 10.09.2007 as its initiation relied on the successful installation and start-up of the bioreactor system. The proposed starting date of the system was on the 10<sup>th</sup> of October 2006, but the actual starting date was on March the 15<sup>th</sup> of 2007. The implementation of this task is under progress. This Task aims to provide the following output:

- Physicochemical analysis of sludge and other BOW and additives.
- Development and optimisation of aerobic composting processes using sludge, individually and in combination with and other BOW.
- Optimisation of alternative aerobic composting processes using sludge and other BOW in combination with alternative additives

The start-up of the composting process took place with the collaboration of all partners. The NTUA team trained the UCD and ORMVAD partners to operate and maintain the composting system. At present (31.07.2007), the activities of Task 3 are in progress and they will be completed on 10.09.2007, according to the revised time schedule. In particular:

Physicochemical analysis of the sludge that is used in the system is carried out, applying standard methods. Also, additives are subjected to physicochemical analysis in order to determine their composition characteristics. The required laboratory analysis for the input waste material (physicochemical analysis of sludge and other BOW) are taking place in the premises of UCD.

In parallel to the characterization of the raw sludge, the operation of the system is monitored and the optimization of the aerobic composting processes using sludge and other BOW (green waste) is studied, using additives in combination with the above-mentioned waste. The daily operation of the composting system is performed by UCD in collaboration with ORMVAD personnel, while NTUA provides expertise for optimizing the system's operation. The system optimization is taking place by varying parameters such as the reactor residence time and the additives to be used to optimize the composting process.

The achieved quality of the end product is a main criterion for evaluating the composting process. For this purpose, complete physicochemical analysis of compost produced during the operation and optimisation of the aerobic process takes place. Also, the maturity level of the end product is determined since compost maturity is one of the main parameters that indicates its quality level and its safe use. Finally, physicochemical analysis of leachates produced from the processes takes place.

During this Task, a trip to the project area in Morocco by the scientific responsible of the project (Prof. M. Loizidou) where the unit operates took place (10–12 of May 2007). The expenses of this trip were covered by the budget of another LIFE-3<sup>rd</sup> Countries project that is implemented in Morocco (WASTESUM). The aim of this trip was the supervision of the experiments, the discussion of issues related to the operation of the composting unit as well as the collection of samples for further laboratory examinations.

This Task is developing smoothly and without any problem and it will result in the operation of the composting unit under optimum conditions. The NTUA team is responsible for the successful implementation of this Task, in close collaboration with UCD.

According to the revised time schedule of the project, the three deliverables of the Task will be prepared as follows:

Report on the physicochemical analysis of sludge, other biodegradable waste and additives: 31.8.07

Report on the optimum operating conditions for the compost unit: 10.9.07

Report concerning the evaluation of compost products (level A): 10.9.07

These Deliverables will be provided with the next progress report (third progress report) that will be submitted on February 2008.

Tasks 4, 5 and 6 have not started yet, according to the revised time schedule of the project.

In particular:

Task 4: “Evaluation of compost products as soil improvers”, will start on 10.9.07 and end on 10.3.08

Task 5: “Alternative uses of compost – Market opportunities in Morocco”, will start on 10.3.08 and end on 10.5.08

Task 6: “Development of guidelines and specifications covering the sludge composting process - Characterization and use of compost as soil improver”, will start on 1.4.08 and end on 1.8.08

### **Task 7: Dissemination and training Activities**

*Start date: 01/02/2006*

*Revised End date: 01/08/2008*

*Duration: 30 months*

Task 7 is currently under progress and it will last until the end of the project. The kick-off meeting and the launching event were held at the Faculty of Sciences of El Jadida of the University of Chouaib Doukkali (UCD) of Morocco on the 9<sup>th</sup> of February 2006. The events were well-attended with 15 relevant organizations participating, including:

- The Ministry of Regional Planning, Water and Environment
- The Ministry of National Education, Higher Education, Managers training and Scientific Research
- The Ministry of Interior
- Mr. K. El Hariry who is Member of the Moroccan Parliament and
- Two journalists

Professor M. Kouam, President of UCD and Prof Y. Boughaleb Dean of the Faculty of Sciences in El Jadida performed opening speeches and welcomed all participants. Introductory speeches were also made by Professor O. Assobhei of UCD and by Professor M. Loizidou of the National Technical University of Athens (NTUA). Professor O. Assobhei briefly presented the project and then each partner (UCD, NTUA and ORMVAD) presented the activities, interests and current status of their organization. Professor Loizidou (NTUA) made a presentation on solid waste management in the EU. The Steering Committee was set up by representatives of the participating organizations. In the last section of the kick-off meeting, each Task was presented in detail, with emphasis on the required actions, the deliverables, the responsibilities of each partner per Task and the time schedule

of each task. The kick-off meeting received high publicity; three articles were published in the Internet informing the public of the kick-off meeting and the project:

- Actualities in El Jadida – Arts and Culture  
[http://www.eljadida.ma/actualite\\_news\\_el\\_jadida/les-fauconniers-lekouassems-d-ouled-frejs-ouvrent-sur-l-europe-a128.html](http://www.eljadida.ma/actualite_news_el_jadida/les-fauconniers-lekouassems-d-ouled-frejs-ouvrent-sur-l-europe-a128.html)
- L’Economiste <http://www.leconomiste.com/article.html?a=68648>
- AllAfrica <http://fr.allafrica.com/stories/200602130356.html>

So far, the MOROCOM project objectives and expected results have been disseminated through 5 newspaper articles: the Moroccan Times (English), L’ Economiste (French) and Liberation (French), El Jadida (French), and in the Arabic newspaper Saout Nass. Furthermore, MOROCOMP was presented in the University newspaper that is published every 6 months. In Deliverable 9 all the articles are given.

Two web-sites have been uploaded for the project since March 2006; one at the premises of the beneficiary ([www.ucd.ac.ma/morocomp](http://www.ucd.ac.ma/morocomp)) and one at the premises of NTUA ([www.uest.gr/Morocomp](http://www.uest.gr/Morocomp)). These sites are regularly updated in order to accurately present the progress of the programme.

Furthermore, the MOROCOMP project is mentioned in more than 30 web-sites (found through Google search). Some indicative websites are the following:

<http://www.rusibis.com/eol/journal/news.asp?dir=actu&ar=2239>

[www.uest.gr/Morocomp/Journal%20Liberation.pdf](http://www.uest.gr/Morocomp/Journal%20Liberation.pdf)

[www.moroccotimes.com/paper/article.asp?idr=2&id=12982](http://www.moroccotimes.com/paper/article.asp?idr=2&id=12982)

[www.uest.gr/Morocomp/L'economiste\\_2\\_newspaper.pdf](http://www.uest.gr/Morocomp/L'economiste_2_newspaper.pdf)

[www.uest.gr/Comwaste](http://www.uest.gr/Comwaste)

[www.magharebia.com/cocoon/awi/xhtml1/en\\_GB/features/awi/newsbriefs/general/2006/02/20/newsbrief-03](http://www.magharebia.com/cocoon/awi/xhtml1/en_GB/features/awi/newsbriefs/general/2006/02/20/newsbrief-03)

[http://www.environmentalhealthnews.org/archives.jsp?sm=fr15%3Bexposurepathway14%3B5Sewage\\_sludge13%3Bsewage+sludgem8%3Bcoverage8%3Bcoverage](http://www.environmentalhealthnews.org/archives.jsp?sm=fr15%3Bexposurepathway14%3B5Sewage_sludge13%3Bsewage+sludgem8%3Bcoverage8%3Bcoverage)

[http://www.eljadida.ma/actualite\\_news\\_el\\_jadida/les-fauconniers-lekouassems-d-ouled-frej-s-ouvrent-sur-l-europe-a128.html](http://www.eljadida.ma/actualite_news_el_jadida/les-fauconniers-lekouassems-d-ouled-frej-s-ouvrent-sur-l-europe-a128.html)

[http://www.formatiscom.com/biotech/Omar\\_Assobhei.htm](http://www.formatiscom.com/biotech/Omar_Assobhei.htm)

[http://ec.europa.eu/environment/life/infoproducts/lifecycompilation\\_05\\_lowres.pdf](http://ec.europa.eu/environment/life/infoproducts/lifecycompilation_05_lowres.pdf)

<http://friendsofmorocco.org/2006News/Feb06/0225News.htm>

<http://fr.allafrica.com/stories/200602130356.html>

<http://eljadidacity.africa-web.org/modules/news/article.php?storyid=117>

<http://www.golfter.com/~friend5/2006News/Feb06/0225News.htm>

A leaflet presenting the project objectives, actions and expected results was prepared and distributed (Deliverable 8). One version was prepared in English and was distributed in Greece and one version was prepared in French and was distributed in Morocco. The NTUA set-up a stand at the Exhibition that was organized by the Committee of Environment of the Hellenic Parliament and the Municipality of Athens (Syntagma Square, Athens) from the 3<sup>rd</sup> to the 5<sup>th</sup> of June 2006 (from 9.00 a.m. until 9.00 p.m. each day) in the framework of the World Day of Environment, where the personnel of the NTUA distributed dissemination material (leaflets) and had discussions with the public related to the MOROCOMP and other European projects that are implemented by its working group (more than 5000 people visited the stand of the NTUA).

A 5-minute presentation of the project in the national TV 2M (program Abouab Al Madida special El Jadida project) took place on Friday the 18<sup>th</sup> March 2006. The program was disseminated through the international Moroccan TV Al Maghreb 3 times in March 2006. Also a 5 minute presentation of the project took place in the regional Radio "Radio Casablanca".

1500 leaflets were distributed to ministries, companies, stockbreeders, farmers and researchers concerning the project. Four (4) billboards have been placed in the university and the Zemamra site where the system has been installed. The project has been presented to 90 students, researchers and engineers dealing with sanitation in the framework of the National seminar on wastewater treatment

and its impact on environment and human health. The Seminar was organised by Sigma Foundation for Education, culture and science and the National Office of water supply in Morocco. The Seminar was organised on the 24<sup>th</sup> January 2007 in Rabat.

The following deliverables which are related to Task 7 were provided with the second progress report submitted on 25.4.07:

**Deliverable 6:** Minutes of the kick-off meeting and of the launching event in Morocco

**Deliverable 7:** Minutes of kick-off meeting of the Life-Third Countries Projects in Brussels

**Deliverable 8:** Printed leaflet (French & English version)

**Deliverable 9:** Publications in Newspapers

**Deliverable 11:** Technical Papers-Publications

The indicators for Task 7 so far are the following:

- Number of participants in the launching event = 15 organizations
- Number of times the project web-site has been updated = 8
- Number of other web-sites in which the project is mentioned > 30
- Number of articles where the project was published = 5
- Number of visitors in the project web-site > 1000
- Number of technical papers in preparation = 3

### **Task 8: Management**

*Start date: 01/02/2006*

*Revised End date: 01/08/2008 Duration: 30 months*

The details of this Task have been described in the Section of Project Management.

The following Deliverables related to Task 8 were provided with the second progress report that was submitted on 25.4.2007:

- **Deliverable 10:** Endorsed Action Plan

- **Deliverable 12A:** Minutes of the management team meeting in Marrakech on 09/06/2006
- **Deliverable 12B:** Minutes of the management team meeting in Greece on 27/10/2006
- **Deliverable 12C:** Minutes of the management team meeting at the Zemamra site of Morocco on 15/03/2007

Summarising, the following deliverables and annexes that have been prepared in accordance to the activities of the project that already have been completed were provided with the second progress report submitted on 25.4.2007:

<b>Deliverable Number</b>	<b>TITLE</b>	<b>Project Task</b>
1	Production and Management of Sludge and other BOW in Morocco	<b>1.1</b>
ANNEX 1	Production of Sludge from Wastewater Treatment Plants in Morocco	
ANNEX 2	Sewage Sludge production in Morocco	
ANNEX 3	Production of biodegradable organic waste generated by food industry in Morocco	
ANNEX 4	Examination of the residues of timber processing and the waste of slaughterhouses of red meat in Morocco	
ANNEX 5	Evaluation of the production of agricultural residues in Morocco	
2	Assessment of the existing situation and the related legislation in the EU in connection to sludge management	<b>1.2</b>
3	Assessment of the existing situation and the related legislation in EU in connection to other BOW	<b>1.2</b>
4A	Review of best practices and success stories of composting of sludge and other BOW in the EU and internationally	<b>1.3</b>
4B	Site Visits	
5A	Technical description of the in-vessel composting system	<b>2</b>
5B	Detailed Drawings of the composting system	
5C	Pictures of the composting system	

5D	Description of the Zemamra Site	
6	Minutes of the kick-off meeting in Morocco	7
7	Minutes of the kick-off meeting of Life-Third Countries Projects in Brussels	7
8	French and English leaflet	7
9	Publications in Press	7
10	Endorsed Action Plan	8
11	Technical papers- publications	7
12A	Minutes of the management meeting in Marrakech on 09/06/2006	8
12B	Minutes of the management meeting in Greece on 27/10/2006	
12C	Minutes of the management meeting at the Zemamra on 15/03/2007	

## ASSESSMENT OF PROGRESS

- **Compare the actual implementation of the project with the proposed work plan**

There was a significant (5-month) delay in the completion of Task 2 (Design and construction of an innovative sludge aerobic composting system). More specifically, Task 2 should have been completed by 10/10/06 and was completed on 10/03/07. As it has been previously explained the design of the composting system was completed on time, but there was a 2-month delay in the construction of the system as a supplier did not provide the required equipment at the specified time frame. Furthermore, another 3-month delay was caused by the inability to transfer the system from Peiraias to Casablanca. This is due to the long period of strikes that took place in the port of Peiraias. Hence, the unit could not be shipped from Greece to Morocco, as it was planned according to the first time schedule.

The 5-month delay for the completion of Task 2 has inevitably caused a delay in the completion of Task 3, as it involves the operation and optimization of Task 3. Task 3 was supposed to start on

10/10/06, but started on 10/03/07 due to the late arrival of the bioreactor. As this Task involved biological processes, it is not possible to make it shorter than the originally planned 6 months. It is expected that Task 3 will be finished by September 2007. For Task 4 to commence, several runs of the system are required so that there is available end compost of high quality. Therefore, Task 3 must be well under way before Task 4 commences. As it is evident, the delay in Task 2 caused a series of delays in the implementation of the future Tasks. For this reason, a 6-month extension was requested by the beneficiary and was provided by the European Commission.

Since the 6-month extension has been granted, everything runs smoothly and the project is implemented according to the revised time schedule.

The other deviations from the proposal are the following:

- The trip of the NTUA to Morocco for the installation and start-up of the composting system took place on the 14-19<sup>th</sup> of March 2007 (not October 2006 as it was planned) due to the delay in the construction and shipping of the bioreactor system
- The site visits took place in two (2) locations in Germany (Munich and in Rennerod, close to Frankfurt) on the 11-15<sup>th</sup> of September 2006 instead of April 2006. It was decided to move the visits to allow for some time for the beneficiary and the Moroccan partners to first evaluate the generation of sludge and other organic waste in their country. Furthermore, more time was allowed in order to select interesting sites that will maximize the transfer of know-how. No site visits were made in Switzerland, as the country has banned the composting of sludge. The German companies of Herhof and BTA were selected because they are companies that focus solely on waste treatment, having no other activities. They offer innovative technologies for organic waste treatment. Furthermore, these two companies were the only ones that could assure us that we could visit two of their plants and not just one, thus maximizing technology transfer. So, by performing two site visits we were able to visit four (4) waste treatment facilities. Finally, by selecting site visits within the same country some cost savings were made, thus allowing for more Moroccans from UCD and ORMVAD to visit the sites (8 instead of 4, in each visit).
- The 1<sup>st</sup> trip of the Moroccan team to Greece took place on the 25-31<sup>st</sup> of October 2006. This trip was planned to take place in June. However, it was decided to move the 1<sup>st</sup> Moroccan trip to Greece for October since a meeting in Morocco already took place in June in the

framework of an International Conference. This resulted in some cost savings as most travel expenses were covered by the MEDAWARE program.

- All the construction activities took place in Greece. This is more efficient and facilitates the NTUA team in its construction task. Initially, certain construction activities were planned to take place in Morocco. The construction of the composting unit in Morocco would be problematic as certain equipment is difficult to find. Furthermore, this would require several NTUA personnel (particularly engineers and technicians) to stay in Morocco for a significant amount of time (more than 3 months), thus increasing excessively the travel and accommodation cost. The meetings that took place in Athens on the 27<sup>th</sup> of October 2007 and in Marrakech-Morocco on the 9<sup>th</sup> of June 2006 as well as the system start-up and training session provided by NTUA to UCD and ORMVAD personnel that took place during 14-19<sup>th</sup> of March 2007 compensates for this change. During the visits of the UCD and ORMVAD teams to Athens effective transfer of the system design took place, while during the system installation and start-up in Morocco, the NTUA staff explained in detail the system operation (process of waste loading, unit operation, PLC operation etc) and maintenance requirements. The UCD and ORMVAD were able to have hands on experience on the system operation together with NTUA personnel.

Several of the Activities of the MOROCOMP project have been carried out as planned. In particular:

- The kick-off meeting and the launching event took place in February as planned
- The beneficiary attended the kick-off meeting for Life-Third countries in Brussels
- All the deliverables that are required in the 1<sup>st</sup> year during which the program is running, have been granted.
- The project website was launched in March 2006 and since then it is regularly up-dated
- The Management team and the Steering Committee were formulated at the kick-of meeting as planned
- The Action Plan was drafted and endorsed by the relevant Moroccan authorities

All the deliverables are of high quality.

- **Evaluate how well the project is going**

Tasks 1 and 2 have been completed and the project (after the provision of the 6-month extension) is currently running smoothly, as the in-vessel composting system has been successfully installed and is currently operating at the premises of ORMVAD. The cooperation and the internal communication among the project partners are effective and they are working according to the roles assigned in the project proposal and the kick-off meeting.

- **Describe dissemination of successes or corrective actions if needed**

The project is well disseminated in Morocco, so many potential investors and companies contacted the project manager to learn about this new technology in Morocco. 1500 leaflets were distributed (ministries, companies, stockbreeders, farmers and researchers). Four (4) billboards have been placed in the university and the unit at the experimental station of ORMVAD to inform about the project, its website and its location in Zemamra. The project has been presented to 90 students, researchers and engineers dealing with sanitation in the framework of the National seminar on wastewater treatment and its impact on environment and human health. The Seminar was organised by Sigma Foundation for Education, culture and science and the National Office of water supply in Morocco. The Seminar was organised on the 24<sup>th</sup> January 2007 in Rabat.

- **Include the successes you have identified and how you will make sure that will be sustainable**

The area of Zemamra is located about 70 km south of El Jadida, at the centre of the irrigated perimeter of Doukkala (approximately 60 000 Hectars). This area is a rural area and contributes with approximately 20 % of the production of the sugar in Morocco and with approximately 25 % of the dairy production of the country. The ORMVAD has installed an experimental station to promote new technologies such as new irrigation technologies, choice of performing seeds and formation of farmers. The Zemamra station is a platform of experimentation of various different seeds and farming techniques. It is also an important meeting place for the stakeholders in this field of agricultural development such as farmers, industrialists, administrations, associations, researchers. The composting system has been installed in this station. Thus the unit profits from all this structure and it will be easier to achieve the highest possible dissemination level.

- **Describe problems or difficulties encountered or foreseen and their implications for future actions**

As it has been explained in detail in the previous sections, there has been a delay in the completion of Task 2. This impacted in the development of the future Tasks and in particular, of Tasks 3 and 4. The 6-month extension that was granted by the EC lead to the overcoming of the problems arisen from this delay and now everything is proceeding efficiently.

- **Lessons learned and suggestions for improvement for the remaining period**

All efforts will be made so that there are no delays in the future.

The active involvement of the Management and Steering Committees is a major success factor of the project. The joint meetings of the project are considered to be very essential and contribute to the progress of the project and to the effective internal communication of the Partners. It is important for all the employees involved to participate in all the future actions of the project in order to maintain their interest and effectiveness.

## FUTURE PLANNING

- **What will be done during next 6 months, i.e. up to the next progress report. Describe the development of different tasks or entities and envision the milestones to be achieved**

This Section describes the future planned activities-tasks for the next 6 months until the 31/01/08.

### **Task 1: Assessment of the existing situation in Morocco and in the EU**

*Start date: 01/02/2006      End date: 01/06/2006      Duration: 4 months*

This Task has been completed.

### **Task 2: Design and construction of an innovative sludge aerobic composting system**

*Start date: 10/04/2006      Revised End date: 15/03/2007      Duration: 6 months*

This Task has been completed.

### **Task 3: Development of sludge aerobic composting processes – Optimisation of the operation of the pilot composting systems**

*Actual start date: 10/03/2007      Revised end date: 10/09/2007      Duration: 6 months*

This Task is currently under progress, as described analytically in Section “Progress during the reporting date”. Most of the required analyses have been performed and the Task is expected to finish on time.

### **Task 4: Evaluation of compost products as soil improvers**

*Revised start date: 10/09/2007      Revised end date: 10/03/2008      Duration: 6 months*

This Task will start at September 2007 and end in the middle of March 2008, once the operation of the bioreactor system has been optimized. The Task involves the conduction of specific tests in order to evaluate the suitability of the produced compost as soil improver. The compost characterized by appropriate quality characteristics will be used for further evaluation experiments in this Task. More specifically, phytotoxicity tests will take place in the laboratory as well as open

field experiments. The land where the open field experiments will take place is very close to the composting site and belongs to ORMVAD.

### **Task 7: Dissemination and training**

*Start date: 01/02/2006      Revised End date: 01/08/2008      Duration: 30 months*

The following dissemination and training activities are foreseen for the period from 01/08/07 until 31/01/08:

- Continuous up-dating of the web-site to include the progress of the project
- Formulation of the 1<sup>st</sup> workshop and the 1<sup>st</sup> training session addressed to Moroccan competent authorities. The Competent Authorities will be informed early enough by UCD and ORMVAD about this event.
- Formulation and distribution of the 2<sup>nd</sup> set of printed material that will describe the progress of the project so far.
- A technical paper will be produced by NTUA and UCD concerning the system design
- The Steering Committee will be informed about the project progress
- Efforts will be made to continue the project dissemination in newspapers and in articles on the Internet.
- Dissemination of the project in other web-sites

### **Task 8: Management**

*Start date: 01/02/2006      Revised End date: 01/08/2008      Duration: 30 months*

The following activities of Task 8 are foreseen:

- Meeting of the management team and the Steering Committee
- Preparation and submission of the 3<sup>rd</sup> progress report (February 2008)