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LIFE06 TCY/MA/000254

1st PROGRESS REPORT

Period covered by the report: from 01/01/2007 to 30/06/07

Reporting Date

15/06/2007

LIFE PROJECT NAME

Development of domestic solid waste management schemes for small urban Communities in Morocco

Data Project

Project location	Morocco
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Project end date:	31/03/2009
Total Project duration (in months)	27 months
Total budget	622.500 €
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(%) of total costs	70
(%) of eligible costs	70

Data Beneficiary

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Project website	www.uest.gr/wastesum

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1. LIST (I) KEY-WORDS AND (II) ABBREVIATIONS (WHEN APPROPRIATE)

i. The key-words of the Life-3rd Countries Project WasteSUM are: domestic solid waste, management schemes and systems, generation of waste, recovery, reuse, recycling, legislative priorities, environment, Morocco.

ii. The abbreviations used are:

FSJ: Faculty of Sciences of of El Jadida

NTUA: National Technical University of Athens

EU: European Union

EC: European Commission

GIS: Geographical Information System

EIA: Environmental Impact Assessment

LCA: Life Cycle Assessment

2. EXECUTIVE SUMMARY

This is the first progress report for the Life-3rd Countries project: “WasteSUM–Development of domestic solid waste management schemes for small urban Communities in Morocco” with project number ‘LIFE03 TCY/MA//000254’.

The beneficiary/coordinator of the project is the Faculty of Sciences of El Jadida (FSJ), while National Technical University of Athens (NTUA) and the Municipality of the Urban Community of Azemmour are the partners of the project.

The project deals with the development and establishment of an integrated system for the management of domestic solid waste for urban communities in Morocco comprising of a software tool, an Environmental Impact Assessment a Life Cycle Analysis and relevant data-bases. This system will enable the National Authorities to develop and manage cost-effective waste management systems using a step-by-step strategic planning approach, and set priorities in the waste management area in an effective and consistent with the European environmental policy way. The project implementation will support the attempts for solving the problems arising from untreated and uncontrolled waste disposal in Morocco. The system will be demonstrated in a specific urban area in Morocco (Municipality of Azemmourand – Moroccan partner of the project) and will constitute the basis for future applications in the whole country.

According to the action plan of the project, a series of activities were carried out till 30.6.2007 (date of preparation of this first progress report). In particular:

The existing situation in Morocco regarding waste generation and composition as well as to the management schemes, systems and practices that are currently applied in the country were recorded and assessed and the problems and needs concerning the management of domestic solid waste were identified.

Also, the existing national and European legislative framework related to waste management was recorded and analysed (content, topics that are covered, principles, priorities, responsibilities, requirements, etc.) and then, the Moroccan legislation was compared with the European one (gap analysis).

Additionally, a review of waste disposal practices and success stories took place. Specifically, these cases include pilot programs that have been applied in various areas and countries at European and international level. A description of the programs and the

systems as well as their technical details were carried out, aiming at the acquisition of a complete picture with regard to their application.

Then, an appropriate multi-criteria analysis method was developed for the examination of alternative systems/schemes that could be applied for the effective management of domestic solid waste in the country. In particular: i. the appropriate groups of criteria as well as all the individual criteria that would be inserted into the multi-criteria software tool were set, described and numerically weighed according to their importance and ii. all the scenarios- management systems that are possible for implementation for the management of the domestic solid waste were recorded and examined. iii. the characteristics of each individual criterion are being examined and quantified according to their actual performance for each alternative scenario and the data obtained was an input into the developed multi-criteria model. As a result, all the alternative scenarios – management schemes were ranked and the most suitable ones were selected.

According to the results that were obtained from the application of the multi-criteria method, a plan for the effective management of the domestic solid waste generated in Morocco was developed. In particular, the type of management systems as well as the number of the corresponding facilities/installations were set, taking into consideration the i. ranking of all the alternative management systems ii. quantities of domestic solid waste that are generated at local, regional and national level in the country, iii. population density of each area of the country iv. the geo- morphological characteristics of the country.

Furthermore, the framework of technical specifications for the application of the appropriate technologies and systems and the construction of the relative plants were set.

Regarding the project dissemination, several efforts have been made with notable results until 30.6.2007. The activities will continue according to the dissemination plan, till the end of the project (31.3.2009), in order to achieve the highest diffusion of the know-how developed through the project, the mobilization of the various stakeholders, actors and authorities and the maximum public awareness.

As far as the management of the project is concerned, everything is proceeding according to the established time schedule and the collaboration between the Beneficiary, the partners and all the actors involved is smooth and efficient. No changes in the project's management structure have been made or are foreseen. Everything proceeds as initially planned.

3. LIFE-PROJECT FRAMEWORK

Objectives of the project:

The project will develop and establish an integrated system for the management of domestic solid waste for urban communities in Morocco comprising of a software tool, an Environmental Impact Assessment a Life Cycle Analysis and relevant data-bases. This system will enable the National Authorities to develop and manage cost-effective waste management systems using a step-by-step strategic planning approach, and set priorities in the waste management area in an effective and consistent with the European environmental policy way. Since appropriate waste management systems require large investments and several governments depend on external funding sources, a strategic approach for planning and project preparation is often a precondition for financing, as well as for a successful and sustainable waste management system. The implementation

of this project shall assist Morocco to organise, implement and monitor strategic planning for its waste management needs. The project implementation will support the attempts for solving the problems arising from untreated and uncontrolled waste disposal in Morocco. This system will be implemented as a pilot-demonstration system in a specific urban area in Morocco and will constitute the basis for training applications in the country.

Expected results of the project

The main expected results of the project are:

- Development of know-how for the efficient waste management systems in Morocco
- Development of instruments for the competent authorities in order to design and apply appropriate schemes for the management of domestic solid waste in Morocco
- Developed software tool for the promotion of planning and decision-making in solid waste management
- Autarchy in the technology means for waste management (in the fields of solid waste collection and transfer, waste minimization, recycling of various waste fractions, resource recovery)
- Minimization of public health problems and of important medical risks arising from bad or insufficient waste collection
- Solving out the problem of the presence of uncontrolled dumping sites within the residential areas
- Well-trained staff that can be involved in the development of the technology under examination
- Adoption of EU priorities on recovery and reuse of materials
- Convergence towards the existing EU legislative framework and environmental policy concerning waste management
- Promotion of sustainable practices and environmentally friendly techniques of waste disposal
- Detailed planning and design activities, a database and a creation of a base map with thematic layers of solid waste disposal
- Dissemination material: Newsletters, conference, publications, website development, preparation of informative printed material and leaflets, announcements in mass media, meetings with those interested in being informed about the project.
- The existing capacity building will be improved and will become more effective. In that way, it is believed that the project implementation will help Morocco promote the suitable management of waste management.

The project consists of five technical tasks apart from the dissemination/training and management task. In particular:

Task A: Assessment of the existing situation in Morocco concerning domestic solid waste generation and management (1.1.2007 – 31.3.2007)

This Task consists of three Actions (A.1-A.3), as described below:

Action A.1: Assessment of the existing situation in Morocco concerning domestic waste generation and management

This action refers to the assessment of the existing situation in Morocco with regard to domestic solid waste generation and composition as well as to the management schemes,

systems and practices that are applied in the country. The targets of this subtask is to obtain a representative and complete picture related to the sector of domestic solid waste in the country, to assess the efficiency of the existing management schemes and also to identify problems and needs concerning domestic solid waste management for urban communities.

Action A.2: National legislative framework related to waste management in comparison with that of European Union

Within this Action, the current national legislative framework will be analysed, assessed and then it will be compared with the European one (content, topics that are covered, principles, priorities, responsibilities, requirements, etc.) through a gap analysis procedure. The procedures of this Action aim at the development of suggestions for the compliance of the national legislation with the provisions of the European one.

Action A.3: Review of waste disposal practices in the EU and internationally – Success stories

In this Action, a review of waste disposal practices and success stories shall take place. Specifically, these cases include pilot programs that have been applied in various municipalities and communities in the countries of European Union, or in other countries, aiming to highlight existing disposal practices which are economically viable. A description of the programs and the systems as well as of their technical details will be given, aiming at the acquisition of a complete picture with regard to their application (problems and difficulties that were faced during the implementation, ways of resolution of these problems, conditions of application, degree of attendance of the citizens, results from their application, etc.).

Task B: Development of a national plan concerning domestic solid waste management -Guidelines for the materialization of the appropriate management systems (1.4.2007 – 30.6.2007)

Task B consists of two Actions (B.1-B.2). In particular:

Action B.1: Description and analysis of the alternative treatment systems/technologies/scenarios according to their applicability, effectiveness and viability

During Action B.1, the systems and technologies that could be applied for waste management in Morocco shall be examined and assessed. The assessment of the alternative management systems and schemes will be carried out by developing a multi-criteria supporting tool. An adequate number of individual criteria will be set, described and calibrated, which refer to four groups of criteria (social - legislative, economic, environmental and technical criteria). From the application of the multi-criteria method the alternative management systems will be ranked according to their performance and most efficient of the of them shall be selected for the development of the national plan for the management of the domestic solid waste in Morocco.

Action B.2: Development of a national plan for the management of the domestic solid waste and development of relevant specifications

According to the results obtained through Action B.1, a master plan for the effective management of the domestic solid waste generated in Morocco will be developed. Furthermore, the framework of technical specifications for the implementation of the appropriate technologies/systems will be set.

Task C: Development of software tool to support waste management decision-making (1.7.2007 – 31.12.2007)

Task C consists of two Actions, C.1 and C.2, as described below:

Action C.1: Development of the data-base and software tool

Through Action C.1, a software tool will be developed in order to support waste management planning and decision making. The software tool will perform the following functions: optimize the routes performed for the collection of solid waste and its transfer to waste transfer stations and from the transfer stations to the landfill site, rank the available landfill sites in terms of their suitability and therefore select appropriate landfill sites based on the examination and quantification of institutional, economic and environmental factors. Additionally, the software will be supported by an appropriate data-base and it shall be linked to a GIS system in order to display the information in an environmentally friendly way. The aim of this Action is to provide the Moroccan authorities with a powerful tool that will aid the decision-making process of waste management in relation to the selection of appropriate landfill sites and the routing of waste from the collection bins towards the landfill site.

Action C.2: Development of an operation and maintenance manual of the software

In Action C.2, an operation and maintenance manual of the developed software shall be prepared. The manual shall explain step by step the function of the software, the weighting system applied, the parameters taken into consideration for landfill site allocation, instructions on how to alter the weighting applied to each sitting parameter and instruction on how to regularly update the data base.

Task D: Demonstration of the developed software tool for the management of waste in a selected region of Morocco (1.1.2008 – 30.6.2008)

Task D consists of three Actions (D.1-D.3) which are presented below:

Action D.1: Demonstration-Operation of the software tool for a specific region of Morocco

In Action D.1 the software tool developed during Task C shall be demonstrated at a selected region of Morocco (area of the Municipality of Azemmour which has a population of 40,000 people). Through the software the current situation of waste collection and disposal shall be evaluated. Furthermore, the software will be utilized to identify potential landfill sites and determine the suitability of these landfill sites. In addition, the routes that optimize the collection of waste and its transfer to the selected site will be determined from the collection points to the waste transfer stations (where these exist) and from the waste transfer stations to the final disposal site. Moreover, the optimal locations for the bins and the waste transfer stations will be specified.

Action D.2: Optimization of the operation of the system

In Action D2 corrections will be made to the developed software system. The successful completeness of this Action will result in the optimisation of the software system's operation. This will be based on the experience gained from the operation of the system for the case study of the Municipality of Azemmour. Once the software system is optimised, the local operators of the system will be trained to use it in order to have a holistic diachronic picture concerning the implementation of the system.

Action D.3: Development of an info-library on the pilot cases, based on the characteristics of the system

The implementation of Action D3 will result in the development of a database, an info-library, which shall record all relevant data on solid waste management, recycling, solid waste production processes, technology, legislation and case studies.

Task E: Environmental Impact Assessment (EIA) and Life Cycle Assessment (LCA) (1.7.2008 – 31.12.2008)

Task E consists of three actions (E.1-E.2) as illustrated below:

Action E.1: Environmental Impact Assessment study for the region of Morocco under examination

In Action E.1 an Environmental Impact Assessment (EIA) study will be performed for the current situation of solid waste management in the Municipality of Azemmour and it will be compared to the EIA study performed for the proposed waste management plan developed in the previous Task for this region. Environmental assessment is a procedure that ensures that the environmental implications of decisions are taken into consideration before the decisions are made.

Action E.2: Inventory Analysis and LCA study on the selected region

In Action E2, a Life Cycle Assessment (LCA) on the emissions and on the consumed materials resulting from the waste management activities (transportation activities, landfills) of the proposed waste management plan developed in the previous Task shall be performed. This LCA (accompanied with an appropriate data-base) will be compared with an LCA study developed for the existing situation for the municipality of Azemmour. To perform the LCA, analysis suitable measurements shall be undertaken as well as an assessment of the environmental impacts.

Task F: Training and dissemination activities (1.1.2007 – 31.3.2009)

Task F is divided in 2 individual actions (F.1-F.2), one for training and one for dissemination activities. In particular:

Action F.1: Training activities - Capacity building

This Action includes all training activities of the project as well as activities for capacity building. Capacity building will be achieved within the framework of the project through the evaluation of the current institutional system and determination of the needs for training of staff and through the development of guidelines. The training sessions will be addressed to the competent authorities and will aim to promote capacity building (discuss related European law, ways to improve the existing Moroccan administrative structure, the efficient enforcement of current legislation and personnel training in the field of waste management) and waste management. The 1st training session will involve effective methods of waste disposal, technical and operational specifications. The 2nd training session will be implemented for the development and the promotion of national planning for the waste management in Morocco and for the training of the operators to utilize the developed software. The 3rd training session will be held for the competent authorities in order to promote capacity building (discuss relative national legislative framework in comparison with the European one, ways to improve the existing Moroccan administrative structure and personnel training) and to promote the proposed strategy of waste management in Morocco.

Action F.2: Dissemination activities

The means that shall be used for the dissemination of the project will include: (i) An International Conference, which shall take place in Morocco and where all relevant

parties from Morocco and from European countries shall be invited. The international conference will be held in Morocco during the last month of the project in order to present the project findings (ii) Publications in National and International scientific journals and technical editions, (iii) Tours to project area where the software tool will be applied. The Municipality of Azemmour will organize tours to the project area, in which the target groups and many other individuals will be able to participate. (iv) Development and continuously updating of the project's website (v) Printed material, leaflets and brochures describing the project and its results. (vi) internal meetings of the working groups with those interested in being informed about the project during the whole project implementation. (vii) Public information: organisation of meetings and establishment of information hotline.

Task G: Management and reporting to EC (1.1.2007 – 31.3.2009)

The Management task includes all the necessary activities for the unobstructed development of the project and the achievement of all its targets set, qualitatively and quantitatively. Also, through this task all the reports and other documents required according to the Standard Common Provisions of LIFE projects will be prepared and submitted to the EC, according to the time schedule of the project.

4. PROGRESS OF THE PROJECT'S IMPLEMENTATION - ASSESSMENT OF PROGRESS

According to the time schedule of the project, till the end of June 2007, the following activities were carried out:

Task A: Assessment of the existing situation in Morocco concerning domestic solid waste generation and management (1.1.2007 – 31.3.2007)

Within this task, three individual Actions, A.1-A.3, were developed. In particular:

Action A.1: Assessment of the existing situation in Morocco concerning domestic waste generation and management

During this action, the existing situation in Morocco regarding waste generation and composition as well as to the management schemes, systems and practices that currently applied in the country was recorded and assessed. The primary data and other information about the Moroccan situation was collected by the beneficiary (FSJ) via on-site visits, literature review, reports already prepared by European Organizations, Institutes and Technical Committees, other Mediterranean projects (PRO.NA.G.DE.S, METAP) as well as via meetings with Moroccan actors involved in the field. The activities of Action A.1 were implemented mainly by the beneficiary and the Moroccan partner and its completeness resulted in the determination and assessment of the current situation in Morocco and the identification of problems and needs concerning domestic solid waste management for urban communities.

The outcome of Action A.1, is a technical report that refers to the recording and assessment of the existing situation in Morocco concerning the generation, composition and management of domestic solid waste in the country and is attached as Deliverable 1.

Action A.2: National legislative framework related to waste management in comparison with that of European Union

During Action A.2, the existing national and European legislative framework related to waste management was recorded and analysed (content, topics that are covered, principles, priorities, responsibilities, requirements, etc.) and then, the Moroccan legislation was compared with the European one (gap analysis).

The analysis of the Moroccan legislation was performed by the beneficiary, while the assessment, the gap analysis and the suggestions for the harmonisation with the European legislation was carried out by the partner (NTUA). The means and methods that were used for the implementation of this action will include full examination of the Moroccan Laws and regulations, as well as of the European Directives and Decisions.

The outcome of Action A.2, is a report on the national and European waste management legislation, including gap analysis and is attached as Deliverable 2.

Action A.3: Review of waste disposal practices in the EU and internationally – Success stories

During Action A.3, a review of waste disposal practices and success stories took place. Specifically, these cases include pilot programs that have been applied in various areas and countries at European and international level. A description of the programs and the systems as well as of their technical details were carried out, aiming at the acquisition of a complete picture with regard to their application. The required data and information for the development of Action A.3 were collected through literature review, internet survey, technical reports, contacts with actors involved in the field at European and international level, site visits, meetings that the members of the working group of NTUA had with experts and scientists in the framework of its participation in European and international programmes.

The NTUA was responsible for the implementation of this Action, in collaboration with the Moroccan parties (FSJ and Municipality of the Urban Community of Azzemour).

During Action A.3, trips to Slovakia and Croatia were foreseen in order the member of the working groups to visit installations of solid waste management. According to the development of the Action, this was not considered necessary due to the fact that: i. the required data and information were collected through other sources, as described previously. As a result, these trips had not been held as they were planned, and they will take place in a next stage of the implementation of the project and in particular, during the development of Tasks D and E that refer to the application of the tools that will be prepared in the framework of the project (software tool and GIS for optimisation of the management practices in the Municipality of Azemmour, EIA and LCA study).

The outcome of Action A.3, is a technical report on best practices and success stories related to the management of domestic solid waste at European level and internationally, which is attached as Deliverable 3.

Task A was completed successfully and in accordance with the planned time schedule.

Task B: Development of a national plan concerning domestic solid waste management -Guidelines for the materialization of the appropriate management systems (1.4.2007 – 30.6.2007)

Within Task B, two individual Actions, B.1 and B.2 were implemented, as described below:

Action B.1: Description and analysis of the alternative treatment systems/technologies/scenarios according to their applicability, effectiveness and viability

Taking into consideration the findings and the outcomes of Task A, the systems and technologies that could be applied for the management of domestic solid waste in

Morocco were examined, by developing and applying an appropriate multi-criteria analysis method. In particular:

Setting and calibration of criteria

All the assessment criteria used for the evaluation of the alternative systems and technologies were set, described and calibrated, as summarised in Table 1. The groups of criteria (social-institutional, environmental, economic and technical) as well as the individual criteria were set specifically for the purposes of the project, since they focus on the examination of systems for the management of waste (adaptation of the multi-criteria method to the subject under examination). The following Table presents the groups of criteria and individual criteria that were examined and calibrated.

Table: Groups of criteria and individual criteria that were examined and calibrated

Social - Institutional	Environmental	Economic	Technical
Harmonization with the legislative framework	Level of potential effects to the environment – Demands on anti-pollution systems	Cost of construction and installation of the facility (investment cost)	Performance/ Functionality
Application of priorities of legislation	Air emissions	Operational and maintenance costs	Existing experience - reliability
Social acceptance	Generation of wastewater	Land use requirement	Adaptability to local conditions
Possibility of creation of new jobs	Generation of solid waste – residues	Production of secondary materials	Flexibility
	Noise pollution		
	Visual nuisance		

Weighing of criteria

All the criteria were weighed according to their significance, through setting weight coefficient per groups of criteria and then per individual criterion. The determination of the criteria weight coefficients was based on:

- i. the experience of the working team of the NTUA in relative applications
- ii. the opinion/suggestions of all the Moroccan actors involved in the field such as Ministries (Ministry of Regional Planning, Water and Environment of Morocco, Ministry of Higher Education, Executive Training and Scientific Research, Ministry of Health - Délégation de la Province d' El Jadida, companies, the Association of self-employment ANNAMAE, the National Association of Environment and of Sustainable Development, the Regional Office of Agricultural Development of Doukkala and Local Authorities.

Description and examination of alternative management systems/technologies

Then, all the potential alternative management systems and technologies were examined according to their efficiency and performance. In total, 18 alternative scenarios were examined which are presented synoptically, below:

- Scenario/Scheme 1: Landfill

- Scenario/Scheme 2: Collection in one bin of recyclable materials that are transferred to Mechanical Recovery Facility (recovery of glass, paper, plastics, Fe and non Fe metals) and in another the remaining waste that is transferred to landfill
- Scenario/Scheme 3: Collection in one bin of recyclable materials that are transferred to Mechanical Recovery Facility (recovery of glass, paper, plastics, Fe and non Fe metals) and in another bin the biodegradable stream that is transferred to Composting Plant. The residues are transferred to landfill
- Scenario/Scheme 4: Collection of mixed waste that is transferred to Mechanical Sorting Plant (recovery of glass, paper, plastics, Fe and non Fe metals) and the remaining waste is disposed to landfill
- Scenario/Scheme 5a: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics which are forwarded to end users, Biological treatment where the biodegradable fraction is subjected to composting. The residues from both the processes are disposed to landfill.
- Scenario/Scheme 5b: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical Sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics. The recovered combustible material is transferred to thermal treatment Plant for energy recovery. Biological treatment where the biodegradable fraction is subjected to composting. The residues from both the processes are disposed to landfill.
- Scenario/Scheme 6a: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics which are forwarded to end users, Biological treatment where the biodegradable fraction is subjected to anaerobic digestion. The residues from both the processes are disposed to landfill.
- Scenario/Scheme 6b: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical Sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics. The recovered combustible material is transferred to thermal treatment Plant for energy recovery. Biological treatment where the biodegradable fraction is subjected to anaerobic digestion. The residues from both the processes are disposed to landfill.
- Scenario/Scheme 7a: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics which are forwarded to end users, Biological treatment where the biodegradable fraction is subjected to a combination of anaerobic digestion and composting with green waste. The residues from both the processes are disposed to landfill.
- Scenario/Scheme 7b: Collection of mixed waste which is transferred to Mechanical - Biological Treatment Plant: Mechanical Sorting where glass, Fe and non Fe metals are sorted and recovered as well as paper and plastics. The recovered combustible material is transferred to thermal treatment Plant for energy recovery. Biological treatment where the biodegradable fraction is subjected to a combination of anaerobic digestion and composting with green waste. The residues from both the processes are disposed to landfill.

- Scenario/Scheme 8a: Collection of mixed waste that is subjected to Biodrying and Mechanical sorting (recovery of Fe and non Fe metals). The combustible materials are transferred to end users and the residues to landfill.
- Scenario/Scheme 8b: Collection of mixed waste which is subjected to Biodrying and primary Mechanical sorting (recovery of Fe and non Fe metals). The combustible materials are transferred to Thermal treatment Plant for energy recovery and the residues to landfill.
- Scenario/Scheme 9: Collection of mixed waste that is subjected to Mass Burn Incineration for energy recovery. The residues are transferred to landfill.
- Scenario/Scheme 10: Collection of mixed waste that is subjected to primary Mechanical Sorting (recovery of Fe and non Fe metals). The remaining combustible materials are subjected to Incineration. The residues are transferred to landfill
- Scenario/Scheme 11: Collection of mixed waste that is subjected to primary Mechanical Sorting (recovery of Fe and non Fe metals). The remaining combustible materials are subjected to Pyrolysis. The residues are transferred to landfill
- Scenario/Scheme 12: Collection of mixed waste that is subjected to primary Mechanical Sorting (recovery of Fe and non Fe metals). The remaining combustible materials are subjected to Gasification. The residues are transferred to landfill
- Scenario/Scheme 13: Collection of mixed waste which is subjected to thermal treatment (Autoclave) and primary Mechanical processing (recovery of Fe and non Fe metals). The residues are transferred to landfill.
- Scenario/Scheme 14: Utilization of the organic fraction of the waste for ethanol Fermentation

Quantification of the criteria for each alternative management system/technology

Each criterion was quantified according to its performance for each alternative scenario and in specific, its actual performance was compared to the criterion's calibration set, scale from 1 (the most unfavourable) to 10 (the most favourable cases). The quantification of the criteria was finalised by the working groups of the beneficiary and the partner, after discussions which had the beneficiary with the Moroccan actors involved in the field (the same actors that had contribution in the weighing of criteria).

Insertion of data into the multi-criteria software tool – Ranking of alternative scenarios

The data and information related to the weighing of criteria as well as to the quantification of each criterion for each alternative scenario were inserted into the software tool (PROMETHEE II multi-criteria method). Then through the running of the software programme, all the alternative scenarios were evaluated and the management systems/technologies were ranked according to their performance/applicability. Furthermore, sensitivity analysis took place through the software, changing the weigh coefficient of some criteria. The aim was to examine if these alterations affect the results obtained. According to the results obtained through the application of the multi-criteria method, the alternative management scenarios were ranked as illustrates in the following Figure 1. The obtained results show that:

Scheme 3 that includes i. collection of recyclable materials in bins which then are transferred to Mechanical Recovery Facility for recovery of glass, paper, plastics, Fe and non Fe metals, ii. collection of the biodegradable sub stream in another bin which then is

subjected to Composting and iii. the residues and non recovered materials are disposed to sanitary landfill, is the most favorable solution.

The second most favorable scenario is Scheme 5a that includes the i. collection of mixed waste that are transferred to Mechanical Biological Treatment (MBT) Plant. At MBT plant, mechanical sorting process is applied for recovery of glass, Fe and non Fe metals as well as paper and plastics that are forwarded to the end users. Additionally, the biodegradable portion of the mixed waste is recovered and subjected to composting. The residues of the processes are disposed to sanitary landfill.

Third preferable scenario is Scheme 10, where the processes that are applied include the primary mechanical sorting for metal recovery while the remaining combustible materials are subjected to thermal treatment (incineration) for energy recovery.

Schemes 6a, 13, 2, 8a and 12 follow, presenting lower positive efficiency level, while the most unfavorable scenarios refer to the management Schemes 4, 5b, 14, 6b, 8b and 7b.

The application of the sensitivity analysis indicated that by modifying the weigh coefficient of main criteria, the results and the ranking of the scenarios remain the same. The NTUA was responsible for the implementation of this Action, in closed collaboration with the beneficiary (FSJ), the Moroccan partner (Municipality of the Urban Community of Azemmour) and the Moroccan actors and Authorities involved in the field of waste generation and management.

The methodology and the results that were obtained from the implementation of Action B.1. are presented in the Deliverable 4.

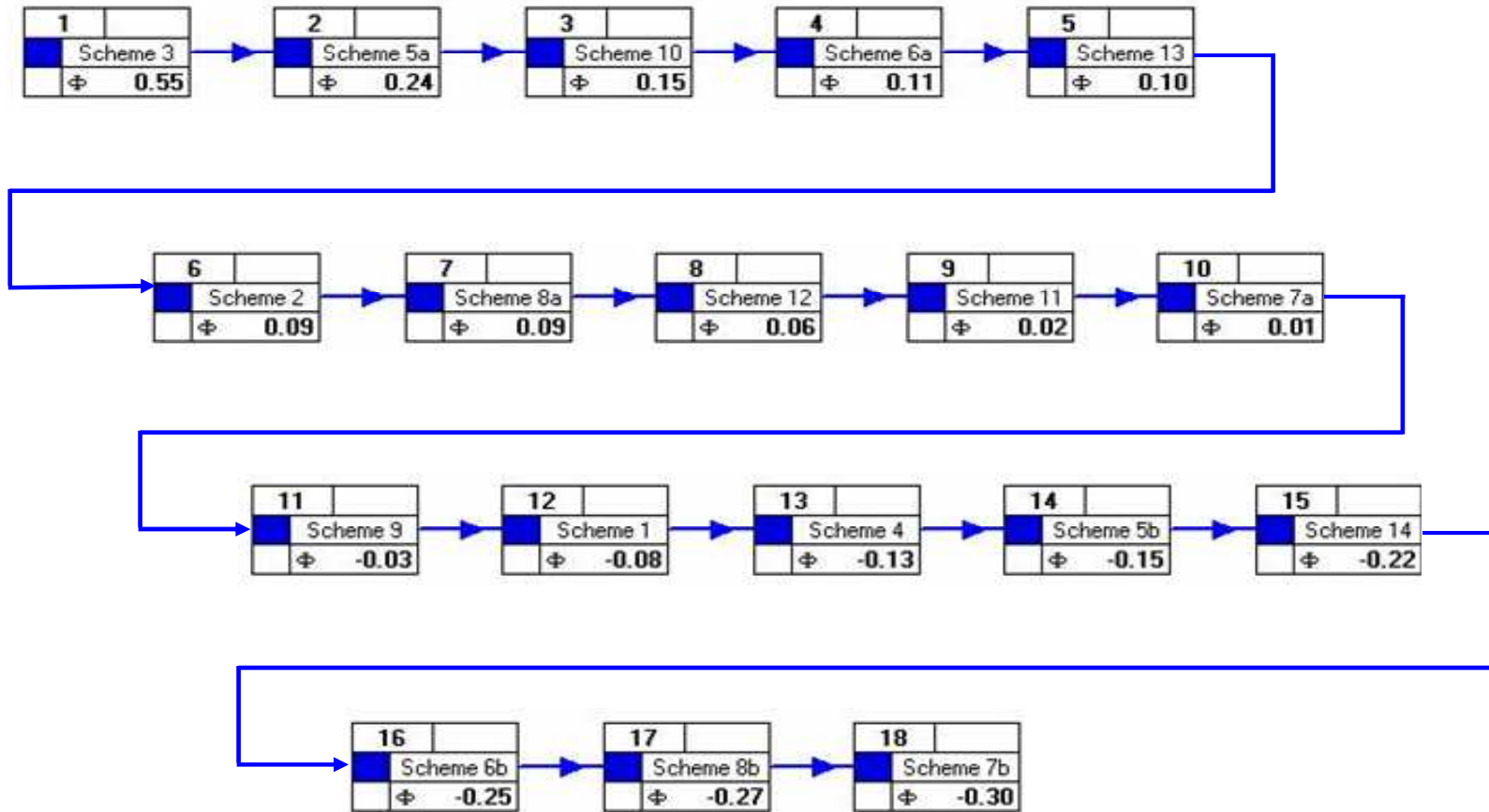


Figure 1: PROMETHEE II ranking of the alternative schemes that were examined for the management of MSW in Morocco

Action B.2: Development of a national plan for the management of the domestic solid waste and development of relevant specifications

According to the results obtained through Action B.1, a plan for the effective management of the domestic solid waste generated in Morocco was developed. In particular, the type of management systems as well as the number of the corresponding facilities/installations were set, taking into consideration the i. ranking of all the alternative management systems as obtained from Action B.1 ii. quantities of domestic solid waste that were generated at regional and national level in the country, iii. population density of each area of the country. These suggestions for the development of a plan for the management of the domestic solid waste in the country were incorporated into the Deliverable 4.

Furthermore, the framework of technical specifications for the application of the appropriate technologies and systems and the construction of the relative plants were set and they are included in Deliverable 5.

The activities of action B were performed by the NTUA in close collaboration with the beneficiary, the Moroccan partner (Municipality of the Urban Community of Azemmour) and the Moroccan actors and Authorities involved in the field.

Task B was completed successfully and in accordance with the planned time schedule.

5. PROJECT MANAGEMENT

The management of the project (Task G) refers to the:

- effective management of the project and fulfilment of the activities included
- preparation and submission of reports to the EC

The organigram of the project is presented below:

Management Committee:

The Management Committee consists of members of the beneficiary (Faculty of Sciences of El Jadida) and the two partners (National Technical University of Athens and Municipality of Azzemour) as presented below:

Members of the Management Team

Name	Organisation
O. Assobhei	Faculty of Sciences of El Jadida, Co-ordinator
M. Mountadar	Faculty of Sciences of El Jadida
M. Loizidou	National Technical University of Athens, scientific responsible
S. Malamis	National Technical University of Athens
A. Papadopoulos	National Technical University of Athens
M. Baidori	Municipality of Azemmour
M. Hardane	Municipality of Azemmour

Steering Committee:

The Steering Committee consists of representatives of all the Moroccan actors involved in the field of the domestic solid waste, as presented below:

Members of the Steering Committee

Name	Organisation
A. Elhachimi	Vice President, University Chouaib Doukkali
M. El Baidori	Vice President, Municipality of Azemmour
M. Hardane	SECRETARE GENERALE, , Municipality of Azemmour
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
S. Jemjami	Ministère des Affaires Economiques et Générale Déléguée auprès de Premier Ministre
M. Mountadar	Professor, Faculty of Sciences of El Jadida
B. Daraoui	Province of El Jadida

For the managerial purposes of the project, the first meeting took place in Athens on 3rd of March 2007, where members of the working group of the beneficiary discussed the development of the project and the progress of the activities that had been achieved until that date (Actions A.1 and A.2 of the project). The meeting was held during the trip that the Moroccan people done to Athens (from 1st to 4th of March 2007), in the framework of another European project (MEDAWARE project) which is being coordinated by the NTUA and the FSJ is one of the partners.

The official kick-off meeting of the WasteSUM project took place on 11th of May 2007 in the premises of the Faculty of Sciences of El Jadida, in Morocco, where representatives of the beneficiary (FSJ), the Greek partner (NTUA) the Moroccan partner as well as of the Moroccan actors involved in the field of domestic solid waste participated. Information related to the official kick-off meeting are given in Deliverable 6.

6. FUTURE PLANNING OF PROJECT UNTIL 31.12.2007

Until 31.12.2007 (next six months), the planned activities as well as the reports that will be delivered refer to Task C: **“Development of software tool to support waste management decision-making”** (period from 1.7.2007 to 31.12.2007). Within Task C, the following activities will take place:

Action C.1: Development of the data-base and software tool

A software tool will be developed in order to support waste management planning and decision making. The software tool will perform the following functions: optimize the routes performed for the collection of solid waste and its transfer to waste transfer stations and from the transfer stations to the landfill site, rank the available landfill sites in terms of their suitability and therefore select appropriate landfill sites based on the examination and quantification of institutional, economic and environmental factors. Additionally, the software will be supported by an appropriate data-base and it shall be linked to a GIS system in order to display the information in an environmentally friendly way. The aim of this Action is to provide the Moroccan authorities with a powerful toll that will aid the decision-making process of waste management in relation to the selection of appropriate landfill sites and the routing of waste from the collection bins towards the landfill site.

Action C.2: Development of an operation and maintenance manual of the software

An operation and maintenance manual of the developed software shall be prepared. The manual shall explain step by step the function of the software, the weighting system applied, the parameters taken into consideration for landfill site allocation, instructions on how to alter the weighting applied to each sitting parameter and instruction on how to regularly update the data base.

The deliverables of Task C that will be prepared are:

- Developed data-base
- Software tool that will support solid waste planning and management
- Operational and maintenance manual for the users of the software

Also, the dissemination and managerial activities of the project will be continued, according to the time schedule of the project.

7. DISSEMINATION ACTIVITIES

For the dissemination purposes, the project's website was developed and updated according to the progress of the project until 30.6.2007 (www.uest.gr/wastesum). Also, a leaflet was prepared in French, English and Greek language (Deliverable 7). The French version of the leaflet was distributed by the beneficiary and the partner 2 to Moroccan actors and Authorities involved as well as to the public, the English one was distributed by the NTUA and the beneficiary to European actors involved while the Greek one was distributed by the NTUA to actors, Authorities and citizens in Greece and Cyprus (more than 5000 copies of this leaflet were reproduced and distributed, in total).

9. FINANCIAL ISSUES – CONSOLIDATED STATEMENT OF EXPENDITURE

All the expenses incurred through the project, till 30th of June 2007 were according to the LIFE Common Provisions as well as according to the cost allocation per category and partner in the project's proposal. No budget modifications have been made. The consolidated statement of expenditure until 30.6.2007 is given below.

Consolidated Statement of Expenditure

Budget categories	Total project's amount	Expenses incurred till 30.6.2007
Personnel	467.955	133.250
Travel	45.180	3.800
Consumables	37.000	10.250
Other costs	34.000	-
Overheads	38.365	10.302
TOTAL	622.500	157.602

10. APPENDICES

Deliverable 1: Existing situation in Morocco concerning the generation and management of domestic solid waste

Deliverable 2: Analysis and assessment of the Moroccan waste management legislation and comparison to the EU legislative framework

Deliverable 3: Report presents domestic solid waste management practices in EU and internationally – Best practices and success stories

Deliverable 4: Report on the development and application of a multi-criteria method – Ranking of alternative management systems – Suggestions for the development of a plan for the management of solid waste

Deliverable 5: Development of a framework of specifications for the application of technologies for the domestic solid waste management

Deliverable 6: Information on kick-off meeting

Deliverable 7: Leaflet