LIFE Project Number
LIFE10 ENV/GR/000605

FINAL Report
Covering the project activities from 01/09/2011 to 31/08/2014

Reporting Date
17/04/2015

LIFE+ PROJECT NAME or Acronym
ATHENS-BIOWASTE

## Project Data

<table>
<thead>
<tr>
<th>Project location</th>
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<td>(%) of eligible costs</td>
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## Beneficiary Data

<table>
<thead>
<tr>
<th>Name Beneficiary</th>
<th>National Technical University of Athens</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Project Website</td>
<td><a href="http://www.biowaste.gr">www.biowaste.gr</a></td>
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**Background**

This report has been prepared under co-finance of the European financial instrument for the Environment (LIFE+). It is the Final Report covering the project activities from 01.09.2011 to 31.08.2018 and comprises a self-assessment of the viability of the “ATHENS-BIOWASTE” project (LIFE10/ENV/GR/00605) entitled: “Integrated management of bio-waste in Greece – The case study of Athens”.

**Acknowledgements**

The ATHENS-BIOWASTE team would like to acknowledge the European financial instrument for the Environment (LIFE+) for the financial support.
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2. Executive Summary

This report is the final report of the ATHENS-BIOWASTE project entitled: “Integrated management of bio-waste in Greece – The case study of Athens”, covering the project activities from 01.09.2011 to 31.08.2018. ATHENS-BIOWASTE (LIFE10/ENV/GR/000605) is a co-financed project by the European financial instrument for the Environment (LIFE+). The project was implemented in Athens, Greece and had a total duration of thirty six (36) months (start: 1.9.2011, end: 31.8.2014). For the successful implementation of the project the ten (10) interconnected Actions were foreseen and implemented successfully.

The beneficiaries of the ATHENS-BIOWASTE project were: Coordinating Beneficiary: National Technical University of Athens (NTUA), Associated Beneficiaries: Association of Municipalities in the Attica Region – Solid Waste Management (EDSNA) (ex Association of Communities and Municipalities in the Attica Region (ESDKNA), EPTA SA – Environmental Engineers – Consultants (EPTA), Municipality of Athens (MoA) and Municipality of Kifissia (MoK).

The main objective of ATHENS-BIOWASTE was to establish and promote sustainable bio-waste management in Greece using the Municipalities of Athens and Kifissia as case study areas where two separate collection systems have been launched and the collected material was composted in the MBT facility of EDSNA. In addition, main objective of the project was to create an innovative software tool that evaluates the chain of bio-waste management through life cycle thinking in order to disseminate and evaluate the benefits of sustainable bio-waste management in terms of greenhouse gas emissions. Furthermore, the quality of the produced compost was assessed and a model was created that correlates compost quality to parameters. Through the aforementioned objectives the creation of a compost market and awareness raising regarding bio-waste management in citizens and other stakeholders has been promoted and a practical guide for bio-waste management targeting local authorities was developed.

This report describes the progress that has been made by the ATHENS-BIOWASTE team up throughout the project comparing to the initial targets and objectives set at the original proposal. The assessment of the viability of the project’s objectives and of the work plan was based upon the prepared deliverables and achieved milestones within the 36 months of the project implementation.

The ATHENS-BIOWASTE team worked hard in order to fulfill all objectives and implement all technical activities with careful planning and detailed methodology in all stages. The main technical achievements included the selection of the pilot areas in the two Municipalities where the ATHENS-BIOWASTE initiative was applied, the planning of a biowaste separate collection system based on the special characteristics of each selected area, the implementation of the separate collection program in the areas of the two municipalities leading 557.5 tones biowaste to the specific channel of the Mechanical Recycling and Composting facility of EDSNA in Ano Liosia producing approximately 130 tonnes of high quality compost. The collected biowaste, as well as the final compost product were measured and analysed by the experienced EDSNA and NTUA personnel and the NTUA certified laboratory (ISO 9000 & ISO 17025), proving in practice the higher quality of the produced compost comparing with the quality of the currently produced compost deriving from mixed waste with actually no market potential.

In parallel, NTUA and EPTA developed a model in order to help municipalities build a separate biowaste collection scheme, estimate the direct investment and operational costs and identify the areas where substantial GHG savings in CO2 equiv. could be achieved. The model has been developed in Microsoft Excel platform in order to be user friendly and is accompanied by a Guidance Manual in English and Greek. The model is available upon request, while a simplified version is available online.

All scenarios modelled, in the framework of model validation, showed that the investment cost for establishing a separate collection scheme was approximately 10€ per inhabitant,
without new vehicles. Operational cost is directly linked with the type of the collection scheme applied in the area, the participation rate and the collection frequency. Increasing the participation rate from 25% to 64%, the operational cost per tonne of biowaste was reduced approximately by 50%, while by doubling the collection frequency, the operational cost increased by 40 to 60% in all examined cases. GHG emissions were mostly dependant on waste treatment methods and to less extent on collection and transportation method. The model can assist Municipalities in evaluating all these parameters and having an overview of how biowaste separate collection can influence the total waste management cost and ensure GHG emission savings. **It shall be noted that in the framework of the project, 150 tonnes of CO₂ equiv. have been saved, as landfilling was replaced by composting. This value was automatically calculated in the Athens Biowaste model.**

Furthermore, in order to transfer the experience and knowledge of the ATHENS-BIOWASTE team to other Local Authorities, a Guide has been prepared so as to guide them how to handle biowaste by organizing and implementing biowaste source separation in Municipalities. In addition, the recommendations of the ATHENS-BIOWASTE team at institutional level have been formulated and promoted to all competent authorities on biowaste at national level so as to improve the current situation and support relevant future initiatives in other areas in Greece.

Apart from the technical actions that have performed effectively, it should be stressed that the ATHENS-BIOWASTE project had to get in contact with citizens in order to be implemented. As a result, the ATHENS-BIOWASTE team put significant efforts in order to get publicity by planning and executing numerous multiple dissemination activities at all applicable levels (TV coverage, radio coverage, press releases in all Greek mass media, including news portals, environmental magazines and newspapers, set up of information kiosk, distribution of newsletters, organization of events at Schools and distribution of suitable informative material for pupils, development of animation videos for pupils, press conferences, organization of a well attended conference event with more than 800 participants, preparation of a large number of publications in conferences, seminars and journals, organization of local events for the citizens, development of videos presenting the actions of the ATHENS-BIOWASTE beneficiaries from the collection of separated at source biowaste, the transportation to the treatment facility until the production of high quality compost).

In general, it can be supported that the activities of the ATHENS-BIOWASTE project have been implemented with significant success and the impact of the project is considered high for Greece and generally all EU members with poor biowaste separate collection. Its high innovation and demonstration value at national level can be justified as following:

- **The first pilot and up to now the sole biowaste separate collection system** was planned and implemented by two Municipalities.
- EDSNA, the waste management authority of the Region of Attika, **accepted for the first time, source separated biowaste**. For this reason, EDSNA adjusted its composting plant so as to further accept biowaste from different Municipalities in Attika Region. This is of great importance as no other infrastructure is available at the moment.
- **Compost quality analysis** (from source separated biowaste) took place for the first time in Greece, allowing better planning and design of future composting plants.
- **Awareness on biowaste source separation** took place for the first time in Greece disseminating new terms to public such as biowaste, composting, etc.
- **All project results and deliverables** have been widely disseminated throughout the project via the website, social media, conferences, etc. and have approached a large number of stakeholders.
- **Above all, it boosted separate collection of biowaste**, as it provided the reference point for Greek stakeholders, including the Ministry for the
Environment. It shall be noted that separate collection and composting of biowaste will be one of the core priorities for funding under the national structural funds.

At international level, Athens Biowaste has already been acknowledged in the framework of the international conference taken place in June 2014 with more than 800 participants worldwide. The Athens Biowaste model is its main innovation and demonstration value as it can be applied worldwide, allowing local authorities to evaluate biowaste separate collection and treatment schemes starting from scratch.

Finally, the after-LIFE impact of the project can be also considered very high, taking into account that the Region of Attica with more than 66 Municipalities representing approximately 35% of the national population has adopted ATHENS-BIOWASTE deliverables and promotes biowaste separate collection as a high priority. Additionally, at national level, the project has been acknowledged as a reference point for biowaste source separation, as it is still the only exemplary initiative in this field. The ATHENS-BIOWASTE team is committed to continue efforts in promoting project activities, either through continuing separate collection in the Municipality (the case of MoA and MoK), either by accepting biowaste from all Municipalities in the Region (EDSNA) or by supporting local authorities in designing and operating such systems (NTUA and EPTA).

3. Introduction

The objectives of the ATHENS-BIOWASTE project can be considered fully achieved and satisfied with considerable added value for Greece as a whole and other countries with poor biowaste separate collection.

The topic of biowaste source separation and composting is currently at the top priorities of the Ministry for the Environment, Energy & Climate Change (YPEKA) in Greece and is encouraged and promoted in many Municipalities. This was reflected in the Call for Proposals (June 2013) under the Operational Programme for the Environment addressing Municipalities and Waste Management Authorities. This Call (total available budget: 25 million €.) aimed at promoting separate collection of biowaste over Greece by funding all necessary equipment and dissemination material.

It must be noted that following the Directive 2008/98/EC on waste, the Greek Law 4042/2012 set for the first time specific targets for biowaste collection and more specifically:

- Separate collection of biowaste at least 5% by weight of the total quantities produced until 2015
- Separate collection of biowaste at least 10% by weight of the total quantities produced until 2020.

As a result, the establishment and promotion of a biowaste collection and management system is critical and requires innovative and exemplary actions, such as the ones implemented within the ATHENS-BIOWASTE project.

The project is also in line with the ‘Proposal for a Directive of the European Parliament and of the Council amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, ....’ (COM/2014/0397). According to this proposal, Member States shall ensure separate collection of bio-waste by 2025. In addition, the project covers the objectives of the Resource Efficiency Roadmap and the 7th Environment Action Programme, as these promote high quality recycling and turning waste into a resource. More specifically, the latter refers that the EC should present a comprehensive strategy to combat unnecessary food waste and work with Member States in the fight against excessive food waste generation. Measures to increase composting and anaerobic digestion of discarded food, as appropriate, would be helpful in this regard.
4. Administrative part

4.1 Description of the project management

The National Technical University of Athens (NTUA) was the coordinating beneficiary of the ATHENS-BIOWASTE project, being solely legally and financially responsible for the project implementation and project management. The project associated beneficiaries were: Association of Municipalities in the Attica region – Solid Waste Management, EDSNA (ex Association of Communities and Municipalities in the Attica Region, ESDKNA), EPTA SA – Environmental Engineers – Consultants (EPTA), Municipality of Athens (MoA) and Municipality of Kifissia (MoK).

Project management (Action 1) comprised one of the most significant actions and it was strongly connected with the successful implementation of the project. The following management activities took place:

- **Kick-off meeting in Athens, Greece**
  The project kick-off meeting took place in Athens at the premises of MoA on 20.09.2011 and was organized by NTUA in collaboration with MoA. Prior to the kick-off meeting, the agenda was prepared and sent to all beneficiaries. In the kick-off meeting the following were specified:
    1. Project presentation (objectives, actions, deliverables, milestones)
    2. Allocation of responsibilities – Action plan - Assignment of action leaders for each action who shall be responsible for the successful completion of the actions
    3. Agreement on the communication methods
    4. Planning of the next actions of the project
    5. Formulation of the management committee and proposals for the synthesis of the Steering Committee.

The management committee was formed in the kick-off meeting, composed from representatives of the five (5) beneficiaries of the project. The responsibility of the management committee is to discuss the progress of the project, to resolve any potential problems, to enhance communication among the participants in the project and to make sure that all deliverables and required reports are submitted on time and represent work of high standard. The members of the management committee are presented in Figure 1.

- **Meetings of ATHENS-BIOWASTE team with the External Monitoring Team**
  On 12th March 2012, the first official annual monitoring meeting of the ATHENS-BIOWASTE working team with Dr. Georgia Valaoras from the external monitoring team took place at the Library Building of NTUA. Representatives from all beneficiaries were present. During this meeting the project progress, both technical and financial, was presented, discussed and analyzed. The 2nd one took place on Wednesday 3rd April 2013 at the Library Building of NTUA with the presence of the EC technical officer Mr. Alexis Tsalas, EC financial officer Ms. Paraskevi Tsourounaki, the External Monitoring team, Mr. Yorgos Mousouris and Dr. Georgia Valaoras and representatives of all five beneficiaries. The 3rd one took place on Wednesday 19th February 2014 at the MoA premises with the presence of the External Monitoring team, Mr. Yorgos Mousouris and Mr. Elias Demian and representatives of all five beneficiaries, while a last one took place on Thursday 2nd April 2015 at the EPTA SA premises with the presence of the External Monitoring team, Ms. Sophia Papageorgiou and representatives of all five beneficiaries.

- **Reporting to EC**
  The inception report contained the necessary information for the European Commission to evaluate the state of implementation of the ATHENS-BIOWASTE project, the respect of the work plan, the financial situation of the project and whether the project is on track towards achieving its objectives. The midterm report (technical and financial part) covering the time period until 30th June 2013 was submitted in the first days of August 2013. The final report was submitted in April 2015.

- **2nd Project meeting in Kifissia, Greece**
The Municipality of Kifissia hosted the 2nd Project Meeting of the ATHENS-BIOWASTE Project at “Villa Konsta” in Kifissia on Wednesday 30th May 2012 with the active participation of all ATHENS-BIOWASTE beneficiaries. The aim of the meeting was to discuss and finalise all the necessary procedures for two main actions: 1) the selection and planning of separate collection method for the case study areas in Athens and Kifissia and 2) the awareness campaign plan.

- **3rd Project meeting at the EDSNA Mechanical Recycling & Composting Facility at Ano Liosia, Greece**
  EDSNA hosted the 3rd Project Meeting of the Athens-Biowaste Project (26/02/2013). Aim of the meeting was to visit the composting unit operating with the biowaste collected in Kifissia and discuss the implementation of the separation at source, as well as the composting process and the measurements and analyses referring to the product of the composting process.

- **4th Project meeting at the premises of EPTA SA**
  EPTA SA hosted the 4th Project Meeting of the Athens-Biowaste Project (30/10/2013). Aim of the meeting was to discuss the implementation of the separation at source, especially for the case of Athens, as well as the composting process and finalize that the ATHENS 2014 2nd Sustainable Solid Waste Management will be held in Athens from 12th to 14th June 2014, focusing on biowaste. Another supplementary meeting-seminar on the potential of telematics for fleet management took place at the headquarters of the Department of Cleaning, Recycling and Maintenance of Mechanical Equipment of the Municipality of Athens, on October 24, 2013 with the presence of representatives of all project beneficiaries in order to discuss telematics for fleet management and functions, such as collection and data collection on waste disposal vehicles routes, weight of waste containers, fuel consumption, etc.

- **5th Project meeting at Roval Olympic Hotel**
  The ATHENS-BIOWASTE management team held the 5th Project Meeting of the Athens-Biowaste Project (12/06/2014). Aim of the meeting was to discuss the details and assess the implementation of the last Actions of the ATHENS-BIOWASTE project. The meeting took place at the end of the sessions of the first day in the afternoon, prior to the Gala Dinner of the Conference.

A huge number of meetings and skype contacts between representatives of two, three, four or five ATHENS-BIOWASTE beneficiaries also took place in order to ensure the effective management and implementation of the project. Meetings also took place after the end of the project for the promotion of the biowaste separate collection in practice by EDSNA in collaboration with other Municipalities of the Attica Region.
4.2. Organization diagram of the ATHENS-BIOWASTE management committee

![Organization diagram of the ATHENS-BIOWASTE management committee](image)

**Management committee:**
Responsible for the effective management of the project

**NTUA**
Prof. M. Loizidou
Dr. Konstantinos Moustakas (Cost Center)

**EDSNA**
Olga Skiadi

**MoA**
Sofia Giannaki

**MoK**
Vassilis Xipolitas replaced by Anestis Nikolelis (the New Vice Mayor in 2013)

**EPTA**
Athena Bourka

**Figure 1: Organization diagram of the ATHENS-BIOWASTE management committee**
ATHENS-BIOWASTE Project Team:
Personnel involved for the implementation of Actions 1, 2, 3, 4, 7, 8 & 10

### ATHENS

- Bourkas K.: Senior Expert
- Iliopoulos G.: Senior Expert
- Bourka A.: Project Manager
- Venetis Chr.: Junior Expert
- Bourka O.: Junior Expert
- Stergiou V.: Junior Expert
- Grammatikopoulos P.: Administrative Staff
- Nicolopoulos E.: Junior Expert

### EDSA

- Skiadi O.: Chemical Engineer
- Giannopoulos P.: Mechanical Engineer, Head of Solid Waste Treatment & Management of Specific Waste Sector
- Zampoulis Th.: Mechanical Engineer
- Eleftheratos St.: Chemist
- Stamatopoulou E.: Chemical Engineer
- Tsakalou K.: Mechanical Engineer
- Zavaliannis G.: Mining Engineer

### EPTA

- Iliopoulos G.: Senior Expert
- Bourkas K.: Senior Expert
- Venetis Chr.: Junior Expert
- Bourka A.: Project Manager

### MoK

- Thymakis, N.: Agronomist
- Pappas P.: Director
- Christofis G.: Director
- Xipolitas V.: Vice Mayor
- Sakavelli A.: Administrator
- Raditas N.: Computers-Logistics
- Fouka P.: Citizen Service
- Patsavou P.: Secretary
- Hatzopoulos K.: Distributor
- Papagalinis N.: Distributor
- Zafis D.: Distribution Supervisor
- Tsaldaris D.: Driver
- Chrysomeris N.: Driver
- Zikas A.: Waste Collector
- Maroulis P.: Distribution Assistant
- Kanellakis G.: Distribution Assistant
- Karantinos N.: Distribution Assistant
- Panagopoulos P.: Distribution Assistant
- Lambos Ch.: Distribution Assistant
- Miaris G.: Distribution Assistant
- Belenioti A.: Assistant
- Christaki P.: Assistant
- Batziaka M.: Assistant
- Haimala N.: Assistant
- Bitzilaiou G.: Waste Collector
- Housein M.: Waste Collector
- Bratels P.: Driver
- Thomaidis I.: Waste Collector
- Vinos I.: Waste Collector
- Patelis K.: Driver
- Pavidis S.: Driver
- Bakas A.: Biowaste Collector

### MoA

- Giannaki S.: Environmental Engineer
- Tsimpirakis K.: Head of the Department of Recycling, Studies & Planning
- Nepmegeoriotis E.: Director of Sanitation & Recycling Direction
- Paraskagas D.: Administrative Staff
- Michalopoulos E.: Agronomist
- Varelas A.: Vice Mayor
- Kromidas A.: Mayor Consultant
- Stamoulou A.: Head of Accounting
- Samperis K.: Head of Department of Advertising Fees & other Fees & Rights
- Ataloniou A.: Administrative Staff
- Bafes C.: Safety technician
- Kosmatos D.: Head of Department of Waste Transportation & Recyclable packaging materials
- Kolliyis I.: Administrator
- Sparagis G.: Head of Office Movement
- Nikolaou N.: Driver
- Markopoulou E.: Sanitation Supervisor
- Giannopoulos K.: Procurement Office
- Gania F.: Procurement Office
- Nakou G.: Administrator
- Kottara M.: Head of Department of Recycling & Studies
- Kakaris A.: Driver of garbage truck
- Tsitsos N.: Driver of the laundry
- Melios K.: Worker for the laundry
- Antonopoulou A.: Worker for sanitation
- Kouretas V.: Worker for sanitation
- Armyras Y.: Worker for the laundry
- Petrakis K.: Driver of garbage truck

### NTUA

- Loizidou M.: Professor
- Haralambous K.-J.: Professor
- Koui M.: Professor
- Loizos Z.: Associate Professor
- Moustakas K.: Chemist, Dr.
- Michalopoulos Chr.: Mechanical Engineer, Dr.
- Chamilakis St.: Assistant Professor
- Souma K.: Researcher
- Malamis S.: Dr. Civil Engineer
- Margaritis M.: Dr. Chemical Engineer
- Tsaldaris D.: Driver
- Chamilakis St.: Assistant Professor
- Moumpanos A.: Agricultural Engineer
- Afaloniatou A.: Administrative Staff
- Bakas A.: Biowaste Collector

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**Figure 2:** Organization diagram of the ATHENS-BIOWASTE working team
4.3. Partnership agreement status

According to the Common Provisions, article 4.8, the coordinating beneficiary (NTUA) concluded partnership agreements with all four (4) associated beneficiaries describing their technical and financial participation in the project. The contents of the agreements were based on the Guidelines to Partnership agreements issued by the European Commission (LIFE+). The four (4) partnership agreements were signed in 2011 and were attached to the Inception report (5.1: ANNEX 1 of the Inception Report). More specifically, the cooperation agreement between NTUA & EPTA SA was signed on 3/10/2011, the one between NTUA and MoA on 14/10/2011, the one between NTUA & MoK on 24/10/2011 and the last between NTUA and EDSNA on 1/11/2011.

4.4 Evaluation of the management system

The project work plan was laid down in ten interconnected actions which can be categorized into the “Project management and monitoring phase” (Actions 1, 8, 9, 10), the “Implementation phase” (Actions 2, 3, 4, 5, 6) and the “Communication and dissemination phase” (Action 7). In addition, for the successful implementation of the ATHENS-BIOWASTE actions, a Management Committee, a Coordination Group and a Coordination Steering Committee were formulated. The project managers of each ATHENS-BIOWASTE beneficiary formed the Management Committee, the action leaders formed the Coordination Group, while the Steering Committee consisted of individuals with large experience and involvement in waste management in Greece. Furthermore, one kick-off meeting, five management meetings, two full Steering committee meetings were organized. Reporting to the EC on the project progress also took place, through the submission of the inception, mid-term and final report (current document).

The partnership between the project beneficiaries was of significant added value for the successful implementation of the project considering: (i) the experience of NTUA and EPTA in the field of solid waste management, (ii) the participation of two key Municipalities in the Attica Region with different characteristics and (iii) the participation of EDSNA which is the competent authority for the management of all generated municipal solid waste management in the Attica Region with close collaboration with all Municipalities in the Attica Region. Overall, it can be supported that the management system and working method set were efficient and effective as there was optimum cooperation between the project beneficiaries and the steering committee and, as a result, the project objectives and expected results were successfully achieved.

Deviations from the initially approved time schedule were noticed mainly in the initiation of the implementation phase of Action 3 in the Municipality of Athens (separate collection of biowaste in the selected neighbourhoods) due to the delay of the tendering procedure for the purchase of brown bins. It is highlighted that that delay did not have an adverse effect on the smooth implementation of the project and no extension of the initial project duration was required. More specifically, the initially foreseen duration of 12-month implementation for each Municipality was satisfied, since for the case of Kifissia, the relevant implementation lasted for 22 months (until the end of the project) and it also continues and was further expanded after the end of the project, since the actual goal it to apply the biowaste separate collection for the whole Municipality in the next months (despite the fact that a New Mayor took over from September 2014), while for the case of Athens, the implementation in the neighbourhoods lasted 11 months, while the relevant experience for the rest specific points of biowaste collection (e.g. Agricultural University of Athens & the Officers’ Restaurant of Armed Forces for about 16 months, since mid April 2013). Furthermore, the initiative is also applied in Athens after the end of the project like in Kifissia, which proved the great success and sustainability of the ATHENS-BIOWASTE project, while a large number of municipalities in the Attica Region try to find the relevant resources in order to implement similar initiatives and use the existing EDSNA infrastructure for composting the separately collected biowaste.
Following, the communication with the European Commission and the Monitoring team on the ATHENS-BIOWASTE project is summarized in Table 1.

### Table 1: Communication between NTUA and the European Commission

<table>
<thead>
<tr>
<th>Commission and Monitoring team</th>
<th>NTUA</th>
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<tbody>
<tr>
<td>EC letter of 07/06/2012 {ENV/E-4/AT/nl Ares(2012)} – Project visit</td>
<td>Submission of the Inception report and reply to the EC letter {ENV/E-4/AT/nl ARES(2012)- 07/06/2012} &amp; Request for modification of the legal Status of one Associated Beneficiary (EDSNA) on 27/7/2012</td>
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<td>Submission of additional forms for the Request for modification of the legal Status of one Associated Beneficiary (EDSNA) on 23/8/2012</td>
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</tr>
<tr>
<td>EC letter of 29/01/2014 {ENV E.4/AT/ml/ Ares(2014) 201405} – Mid-term report</td>
<td></td>
</tr>
</tbody>
</table>

5. **Technical part**

The implementation of the ATHENS-BIOWASTE project included the execution of ten (10) Actions, each including various activities as shown in Table 2. All actions have been completed successfully.

### Table 2: Actions of ATHENS-BIOWASTE project

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Title</th>
<th>Initially Foreseen Duration</th>
<th>Actual Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Monitoring &amp; Evaluation</td>
<td>36 months</td>
<td>36 months</td>
</tr>
</tbody>
</table>
In the following chapters, the description of the overall progress, the problems encountered and the ways that the ATHENS-BIOWASTE managed to overcome them with regard to the implemented activities is presented.

5.1. Actions

5.1.1. Action 1: Project Management and Reporting to the EC
Action 1 consists of four (4) individual activities:

Activity 1(a): Action Management
The specific activity focused on the successful implementation of the project and the timely and efficient management of all the actions. The coordinating beneficiary, NTUA, was legally and financially responsible for the action management, which was on-going throughout the whole project duration. For each action of the project an Action Coordinator was assigned to ensure efficient management, monitoring and evaluation. The Action Coordinator, before the beginning of each Action, communicated with the beneficiaries involved in the specific action in order to draw up the work plan and specify the responsibilities of each beneficiary, so as to ensure effective and timely implementation of the action. Following this, the Action Coordinator presented the work plan to NTUA for approval.

Regarding the implementation of the technical tasks of the ATHENS-BIOWASTE project, Ms. Athena Bourka was the Coordinator for Action 2 and Action 5 and Ms. Olga Skiadi for Action 3 and Action 4. All other Actions were coordinated by the NTUA personnel - Maria Loizidou (Action 1), Katherine-Joanne Haralambous (Action 8) Dimitris Malamis (Action 10), Konstantinos Moustakas (Action 7) and Zafeiris Loizos (Action 6).

Activity 1(b): Reporting to EC
The technical and financial progress of the project was communicated to the EC through the submission of the necessary reports. NTUA was responsible for submitting the reports directly to the European Commission. During the whole period of the project three reports were to be submitted: One (1) inception report 9 months after the start date of the project, one (1) mid-term report 22 months after the start date of the project and one (1) final report 3 months after the project end date. The inception report and the midterm report were prepared as foreseen, while there was a delay in the submission of the final report which was attributed to changes to the participating local authorities from September 2014 after the elections (Region of Athens, Municipality of Kifissia) and the workload of the external auditor.

Activity 1(c): Project Meetings
During the project, at least five (5) meetings had been foreseen to take place in Athens. However, since all beneficiaries are located in the same geographical area (Athens), whenever it was considered necessary, unofficial meetings occurred. Five official meetings, the kick-off meeting, the 2nd, the 3rd, the 4th and the 5th project meeting took place, as already mentioned in full agreement with what was foreseen in the ATHENS-BIOWASTE contract. A large number of bilateral meetings have already taken place in neighbourhoods of the two
participating Municipalities, at the Mechanical Recycling and Composting Facility at Ano Liosia, etc.

**Activity 1(d): External Audit**

The external audit report was prepared after the end of the project.

The following Deliverables have been prepared in the framework of Action 1:

1. Agenda, Participant List & Minutes of the kick-off meeting in Athens (**ANNEX 2 of the Inception Report**)
2. Agenda, Participant List & Minutes of the 2nd Project Meeting in Kifissia (**ANNEX 3 of the Inception Report**)
3. Inception report
4. Agenda, Participant List & Minutes of the 1st Meeting of the Steering Committee on Friday 20th July 2012 at the NTUA Library Building (**ANNEX 5.1 of the midterm report**)
5. Agenda, Participant List & Minutes of the 3rd Project Meeting at EDSNA at the Mechanical Recycling and Composting Facility at Ano Liosia (**ANNEX 5.2 of the midterm report**)
6. Midterm Report
7. Photos from the 4th Project Meeting at the premises of EPTA SA (**ANNEX 5.4 of the final report**) and the supplementary meeting that took place a few days earlier (24/10/2013) (**ANNEX 5.3 of the final report**)
8. Photos of the monitoring visit held on 19th February 2014 at MoA (**ANNEX 5.5 of the final report**)

Regarding the ATHENS-BIOWASTE Steering Committee, it has to be noted that it was established in January 2012 and included representatives from:

- NTUA: Maria Loizidou
- EPTA: Athena Bourka
- EDSNA: Olga Skiadi
- MoA: Andreas Varelas
- MoK: Vassilis Xipolitas replaced by Anestis Nikolelis from spring 2013
- ECOREC (Philippos Kirkitsos, Dimitris Chomatidis)
- Greek Recycling Organization (Katia Lasaridi)
- Technical Chamber of Greece (Alexandros Kouidis)
- Hellenic Solid Waste Management Association (Konstantinos Aravosis)
- Peripheral Association of Municipalities in Attica (Nikolaos Chiotakis, Athanasios Orfanos)
- Association of Composting Enterprises (Dimitrios Kanakopoulos)
- Attica Region

It has to be noted that all members of the Steering Committee received the ATHENS-BIOWASTE deliverables and some of them (Dr. Kirkitsos and Prof. Lazaridi) have provided feedback for their enrichment and improvement (mainly referring to the deliverable of Activity 2a, Action 5 and Action 6).

The members of the ATHENS-BIOWASTE working team had a large number of meetings with members of the Steering Committee. Furthermore, two overall meetings of the ATHENS-BIOWASTE Steering Committee took place, the first one at the NTUA Library Building on Friday 20th July 2013. The agenda and the minutes are available at ANNEX 5.1 of the midterm report.
The 2nd meeting of the members of the ATHENS-BIOWASTE Steering Committee took place during the ATHENS-BIOWASTE Conference at the closing session on 13th June 2014 together with other participants of the Conference and the press release of the Conference can also be considered as minutes of the Steering Committee meeting.

5.1.2. Action 2: Planning of a separate collection pilot system in the region of Athens

The overall target of Action 2 was to plan the source separation pilot system in Athens by applying the most suitable methods and taking into account all the special characteristics of the selected areas. Planning also included the design of an awareness campaign. This Action had a duration of 12 months (start date: 01/09/2011 and end date: 31/08/2012) and was completed as scheduled. More details about the Deliverables, Milestones, Progress Indicators, Expected Results, Risks and Problems Encountered as well as the Overall Action Evaluation were summarized in the relevant End of Action Report in ANNEX 3.6 of the midterm report.

Following, there is a description of each Activity:

Activity 2(a): Review and evaluation of the bio-waste source separation methods and programs in the EU and especially in the Mediterranean EU countries

This activity had a duration of 4 months (start date: 01/09/2011 - end date: 31/12/2011) and has been completed as scheduled.

The Site visit to appropriate biowaste source separation and management facilities in Milan, Italy, 12th-13th December 2011 included visits for:

- separate collection in an area with low population density (East Milan Waste Management District, Trezzano Rosa, Population: 5,000 inhabitants, density: 800 inhabitants/square km, majority of the population living in detached or terraced houses), photos
- site visit at an anaerobic digestion plant (Montello), photos
- Site visit at a Recycling Collection Unit photos
- separate collection in an area with high population density (Cinisello Balsamo, in the metropolitan area of Milan, Population: 80,000 inhabitants, density: 6,000 inhabitant/square km, majority of the population living in high-rise buildings), photos
- site visit at a composting plant (ECONORD at Cologno), photos

The site visit was very successful and useful for all nine (9) ATHENS-BIOWASTE participants, since they had the opportunity to get familiar with the 20-year experience of the greater region of Milan in this field. The discussions with the representatives of the Scuola Agraria del Parco di Monza (Enzo Favoino, Valentina Caimi, Alberto Confalonieri) who helped in organizing this site visit were also useful in order to be aware of potential difficulties and how such difficulties could be overcome. It should also be noted that this trip strengthened the unity and relationship of the ATHENS-BIOWASTE working team. The revised version of the relevant report (revision on the basis of the EC letter dated 17/10/2012) is attached (ANNEX 3.1 of the midterm report).

The deliverable “Review and evaluation of the existing bio-waste management practices in the EU” (ANNEX 3.2 of the midterm report) was prepared by the NTUA working team, as foreseen in the ATHENS-BIOWASTE contract by the end of 2011. The report was circulated to the rest ATHENS-BIOWASTE beneficiaries, as well as to all members of the ATHENS-BIOWASTE Steering Committee. The deliverable was prepared in Greek in order to be more useful for the representatives of the Municipalities with a summary in English. The deliverable presented information about (a) the different source separation methods that can be applied for biowaste (door-to-door collection, kerbside collection etc.), (b) the equipment required for the source separation of waste (i.e. bins and vehicles), (c) the main parameters that need to be considered for the effective design of a source separation scheme and (d) the public awareness information in regard to source separation (mass media, education and provision of information to specific target groups, direct information to the public, provision
of incentives, etc.). Additionally, the report extensively presents and examines biowaste source separation practices in selected EU countries and EU regions namely Germany, Austria (both countries acquire high level of expertise in regard to biowaste source separation), Italy, Catalonia - Spain (both countries have common characteristics with Greece) and the UK (recent large scale introduction of biowaste source separation schemes). The aforementioned practices are coupled with the existing legislative framework on biowaste management for each case study. The last section of the deliverable is devoted to present the SWOT analysis that has been developed for each source separation method, considering all the information that has been gathered from the preceding sections of the report. This analysis indicates and analyzes the “strong” and “weak” points of all source separation methods, while it depicts the “opportunities” for their development and diffusion along with the associated “risks” in regard to their effectiveness and efficiency. The revised version available in Annex 3.2 takes into consideration the relevant EC comments included in the EC letter dated 17/10/2012.

Activity 2(b): Identification and description of the case study areas in Athens

The aim of this activity was to identify and evaluate the pilot areas, where the separate collection of biowaste would take place. This activity started in November 2011 and ended, as scheduled, in February 2012.

A separate report for Activity 2b has been prepared by EPTA with the contribution of all the other ATHENS-BIOWASTE beneficiaries. This report, which is included in ANNEX 3.3 of the Midterm Report, is part of the “Report on the selection of the case study areas and of the biowaste separate collection method” foreseen in the Athens Biowaste contract, with submission deadline 31st August 2012.

During the current Activity, the work that has been implemented is divided in three phases:

Phase A: Main Characteristics of the Municipalities and Preparation of Digital Maps

At first phase, a profile of the two participating Municipalities was created, so as to facilitate discussions and further analysis. The profile of each municipality is summarized below:

The Municipality of Athens is the largest city in Greece with a population of 655,780 inhabitants. It covers an area of 3.896 ha and has an average population density 168 inh/ha. In addition, the Municipality of Athens is divided in 7 Local Communities, 38 districts and 129 neighborhoods. The main characteristics of Athens, is its high population density, its high variety on living standards (very high and very low cost areas). The majority of Athens area is covered by mixed residential areas with multi-family building arrangements.

The Municipality of Kifissia is located NE of Athens and has a population of 71,100 inhabitants. It covers an area of 3.510 ha, while its population density is 20 inh/ha (including an open area in the Mountain of Penteli). The Municipality has been formed under the Law 3852/2010 (Kallikratis) by the former Municipalities of Kifissia, Ekali and N. Erythraia. Main characteristic of Kifissia is the high living standard and the detached houses.

In order to screen these areas and conclude to a smaller area of 3,000 inhabitants, required for the pilot system, digital maps were prepared. EPTA was in charge of developing these maps with the use of GIS (Geographical Information Systems). The data were collected from different sources and more specifically from: the Municipalities of Athens and Kifissia, the open source platform geodata.gov.gr, the Hellenic Statistical Authority (EL.STAT.), the Town Plans, etc. More details about each type of information collected and its source are described in the Report of Activity 2b. The aim of the digital maps was to map the two Municipalities at neighborhood level and provide corresponding data, such as population, population density, land price, building coefficient, etc.
During this phase, meetings had taken place in each Municipality in order to co-ordinate different departments and collect the necessary information.

**Phase B: Development and Application of Criteria for the selection of the Pilot Areas**

The second phase included the development of certain criteria for their application in the framework of the GIS model. Each Municipality decided on the criteria to be applied upon consultation with all the project beneficiaries and taking into account the following:

- Each Municipality had to select an area with a population of 3,000 inhabitants
- The areas to be selected in Athens and Kifissia had to be significantly different in order to allow evaluation on how these characteristics influence the implementation of the biowaste source separation scheme.

For the Municipality of Athens, the following were agreed:

- To select two pilot areas within the municipality
- The 1st area to be representative of the municipality that is to have an average population density and an average living standard.
- The 2nd area to have significant biowaste producers, such as restaurants. For this reason, a high number of restaurants and low population density were the criteria for this pilot area.

For Kifissia, the following were agreed:

- at least one area will be selected from the former Municipalities, i.e. Kifissia, Ekali and Erythraia.
- among these areas, one area at least should have a very low building co-efficient (≈0,4) so as to test a door-to-door collection system and
- one with a mixed housing system and a relevant high living standard.

After the application of the aforementioned criteria in the two Municipalities with the use of the GIS model and following consultations among representatives of the two cities, the following areas were selected:

- **Two (2) neighborhoods in Athens: Kypriadou kai Gazi**

  Kypriadou, is a high density residential area in Athens and Gazi is a low density area in Athens with many restaurants and other catering facilities with high production of biowaste.

![](image)

**Figure 2: Aerial Photo of Kypriadou**
Apart from these, two additional points have been added in the pilot scheme. In fact, these two points were the outcome of the high dissemination impact of the ATHENS-BIOWASTE dissemination activities (See Action 7 below). More specifically, initially the Ministry of Defense expressed the willingness to take part in the separation of the biowaste at source and most specifically the Club of officers located at Vasilisis Sofias Avenue within the center of Athens. Additionally, the Agricultural University of Athens, located in Votanikos area, near the center of Athens, expressed the willingness to take part in the separation of the biowaste at source.

- **Four (4) neighborhoods in Kifissia: Kato Kifisia, Ano Kifisia, Ekali, Kastri**
  Kato Kifissia is a medium density area with flats and detached houses, Nea Kifissia is similar to Kato Kifissia, Kato Ekali is a low density residential area with big houses with yard and Kastri combines characteristics from Ano Kifissia, Kato Kifissia and Kato Ekali and is considered to be a relative low density residential area. It must be noted that part of the neighborhoods was selected, in order to avoid a very large number of population.
Apart from these, two additional areas in the Municipality of Kifissia have been added in the pilot scheme (the first in Strofyli and the second in Kefalari).

**Phase C: Description and Analysis of the Pilot areas**
The third phase included the detailed analysis of the pilot areas in terms of:
- Determination of the pilot area border by applying the GIS model to the selected neighborhoods and assessing the detailed population number
- Recording street addresses and numbers
- Identification of other facilities (schools, supermarkets, etc.) covered by the areas
- Aerial photos of the areas
- Site visits
- Existing infrastructures and bins

A large number of site visits took place by MoK and EPTA in those four areas in order to observe free spaces, building arrangements and usage and the placement of the existing collection bins for residual waste. The same has been taken place by the MoA, NTUA, EPTA, EDSNA in the area of Gazi and Kypriadou. In all cases the existing bins have been registered by type and location. More details of the areas are provided in the Report of Activity 2b (ANNEX 3.3 of the midterm report).

**Activity 2(c): Selection and planning of separate collection method for the case study areas**
The aim of this activity was to select and plan the separate collection system in the pilot areas, specified in the framework of Activity 2b. The activity started in March 2012 and ended in August 2012. A separate report for Activity 2b has been prepared by EPTA with the contribution of all the other beneficiaries. This report, “Technical Report for planning a separate biowaste collection system” which is included in ANNEX 3.4 of the Midterm Report, is part of the “Report on the selection of the case study areas and of the biowaste separate collection method” foreseen in the proposal, with submission deadline 31 August 2012.

More analytically, the current activity included the following four Phases:

**Phase A: Defining Basic Parameters of the Separate Biowaste Collection System**
During this phase, the basic parameters for planning the separate collection system for each pilot area were determined. These included the following:
- The type of biowaste to be collected. A list of materials was prepared
- The needs and type of sorting equipment (bins, bags, etc.)
- The type of collection system in each pilot area. Taking into account the special characteristics of each area, the following two collection systems were decided:
  - door-to-door collection in Municipality of Kifissia
  - a road container system in the City of Athens
- The collection frequency and the programme was defined.

All the aforementioned parameters were decided after several consultations among project beneficiaries and municipal employees.

Following, a more detailed analysis of the system took place, as shown in the following two diagrams.

City of Athens

The required equipment included:
- Kitchen caddies for households
- Set of biodegradable bags
- 30lt or 50lt bins for restaurants and bars inside the kitchen
- 660lt or 1.100lt bins for outside use.

Municipality of Kifissia
The required equipment included:
- Kitchen caddies for households
- Set of biodegradable bags
- 35-40lt bins for detached housed
- 120,240,360 lt bins for buildings with many flats

Regarding the collection and transport of biowaste to the recycling plant of EDSNA in Ano Liosia, it was decided that an existing collection vehicle of the Municipalities will be used. An online fleet management system has also been proposed for monitoring biowaste collection.

**Phase B: Household Database and Estimation of the required bins (quantity)**

This phase included the estimation of the required bins in the selected areas through the estimation of the number of households that will participate in the collection scheme. Both Municipalities worked closely with their Financial Department so as to acquire this information. It must be noted that the household inventory in each municipality is not updated, and verification took place in co-operation with the Public Power Corporation (P.P.C.) data. In addition, the MoA created a list of the restaurants, bars and other similar facilities operating in the area of Gazi.

All the above mentioned data were provided to EPTA, which in turn created a database and elaborated the total number of households, number of buildings, households per building and buildings with professional usage. According to this analysis, the number of households per area was estimated as following:

| Selected Areas in Kifissia: 1743 households which correspond to a population of 3.000-4.000 inhabitants |
| Selected Areas in Athens: 2.076 households which correspond to a population of 3.500-4.500 inhabitants |

At the same time, MoA recorded in the selected areas the existing bins for the collection of mixed waste and recycling waste. As kerbside collection system was decided, the number of required bins was finally estimated by the number of the existing bins. The pilot collection areas in Athens also included around 70 businesses (restaurants, bars, etc.) that produce food waste material.
Phase C: Detailed Specifications of Required Equipment and Consumables
This phase included the market research on the available types of bins, biodegradable bags and fleet management system. EPTA was in charge of this activity in co-operation with the Municipalities. Several meetings have taken place with suppliers, where also samples of the equipment and bags have been presented / provided. A first draft of the specifications was prepared by EPTA and was provided to the Municipalities. The latters further elaborated the specifications in close co-operation with different departments within each Municipality (technical department, collection services, etc.). In addition, at this phase the product prices were estimated based on different offers from suppliers, in order to prepare the tender budget. Especially, for the Gazi area, the project team organized meetings and had discussions with representatives of the restaurants and bars located at the area. The purpose of these meetings was firstly to inform them about the biowaste scheme and get feedback for the type and size of bins that they would like to place within their kitchens. Records of the visits and contact details have been kept by the MoA. It must be noted that specifications for bins as well as for the biodegradable bags were not available in Greece, as this is the first time that separate collection of biowaste is taken place. For this reason, this task required great effort from all project beneficiaries to combine European experience in this field, the product availability in the Greek market as well as the special requirements in each pilot area.

Phase D: Tendering Procedures
This phase, which has been completed by both Municipalities, included the preparation of the tender documents for the equipment/consumables required. Each Municipality, in co-operation with its Technical Department and Procurement Office was in charge of proceeding with the tenders according to the Greek laws. More analytically, all the tenders that have taken place in the framework of this project followed the procedures of "EKPOTA" (procurement regulation for Municipalities), according to which the supplier with the lowest price gets the award provided that it fulfills the specifications of the tender. All of the equipment/consumables provided have the LIFE logo stamped or printed. A list of all tenders is presented below in Table 3.
<table>
<thead>
<tr>
<th>Item</th>
<th>Total Budget (€)</th>
<th>Date of tender</th>
<th>Supplier</th>
<th>Final Contract Budget (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bins (MoK)</td>
<td>60.000</td>
<td>10/05/2012</td>
<td>HELLENIC ENVIRONMENTAL SYSTEMS INDUSTRY (HELESI)</td>
<td>59.599,65 €</td>
</tr>
<tr>
<td>2 Biodegradable Bags (MoK)</td>
<td>18.000</td>
<td>14/06/2012</td>
<td>EUROFILM MANTZARIS S.A. PLASTIC FILM INDUSTRY</td>
<td>17.688,94 €</td>
</tr>
<tr>
<td>3 Bins 7 &amp; 10 lt (MoA)</td>
<td>59.999,40</td>
<td>9/11/2012</td>
<td>FIL-ECO</td>
<td>13.837,50 €</td>
</tr>
<tr>
<td>4 Large bins (MoA)</td>
<td>44.624,40</td>
<td>19/04/2013</td>
<td>FIL-ECO (30 lt bins) 1.223,85</td>
<td>1.223,85 €</td>
</tr>
<tr>
<td>5 Biodegradable Bags (MoA)</td>
<td>15.000</td>
<td>08/11/2012</td>
<td>EUROFILM MANTZARIS S.A. PLASTIC FILM INDUSTRY</td>
<td>14.956,80 €</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Amount</td>
<td>Date</td>
<td>Supplier/Recipient</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>----------</td>
<td>------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Online Fleet Management (MoA)</td>
<td>4,991,34</td>
<td>08/11/2012</td>
<td>TRINITY SYSTEMS (27/12/2012)</td>
</tr>
</tbody>
</table>
| 7 | Consumables for awareness campaign (MoA)                                     | 10,410,11| 6/11/2012  | GENESIS ADVERTISING (21/12/2012)         | 7,678,58€
| 8 | Awareness Campaign Material (EDSNA)                                          | 11,931,00| Direct award | GOSPEL CREATIVE (11/10/2012)             | 11,931,00

*the tender documents and the contracts with the suppliers are attached in ANNEX 4
Constraints

Although the tendering procedures in the MoA took place as scheduled, there were no bids/offers for the large bins. This mainly happened due to the strict delivery deadline that no supplier could meet with. As a result a new tender was prepared and took place in April 2013. This constraint has caused a delay on the implementation of Action 3 for the MoA, as described in the relevant Action, without though creating serious risk to overall project progress.

Activity 2(d): Planning of the awareness campaign

The aim of this activity was to develop an awareness plan that was implemented in the selected pilot areas during the implementation of biowaste separate collection system. This activity started in March 2012 and ended in September 2012, while it had been regularly revised. A separate report for Activity 2d has been prepared by EPTA with the contribution of all the other ATHENS-BIOWASTE beneficiaries. This report ‘Report on the planning of the awareness campaign’, which is included in ANNEX 3.5 of the Midterm Report, was completed in September 2013 and was finally revised in March 2013.

The awareness plan has been developed based on the targets of the collection system and the provisions of the Athens-Biowaste contract. Case studies, practices and measures implemented in other European Countries were taken into consideration as well as the experience from the city of Milan during the site visit of the project beneficiaries.

The main objective of the awareness plan was to inform the local population and businesses on the separate collection system and encourage their participation. The gradual increase of the separate collection rate per inhabitant and the quality of the collected bio-waste was also an important objective to be accomplished. The main obstacle anticipated was that thorough information had to be provided in order to familiarize the public with the concept of bio-waste and its separate collection. Although systems for the recycling of packaging and other waste streams have been established for years in Greece, a significant part of the population is not participating due to the lack of proper dissemination and infrastructure. For that reason, the campaign during the project aimed to increase recycling awareness not only for bio-waste, but for other waste streams as well. Since this was the first pilot system in Greece, an intense and successful execution of the awareness plan was essential.

The awareness plan was developed in order to include three levels of audience. The main audience consisted of the population, businesses and schools within the pilot areas. The secondary audience consisted of the population, associations and media within the two participating municipalities. The third level of target audience included local authorities and media at national level. Considering that a national target for bio-waste collection (5% for the year 2015 and 10% for the year 2020) has been set, it was very important to include the latter in the awareness plan.

The awareness campaign was divided into 3 phases, based on the time of initiation of the separate collection.

The horizontal actions to be implemented at the beginning of the pilot and continue throughout its duration were the following:

- Awareness campaign key message
- Desk office & information hotline
- Website
- Utilization of the Existing municipal websites
- Facebook page
The 1st phase of the campaign aimed at providing the basic information to the local population and businesses about the separate collection system. Given that it was the first separate collection system in Greece, terms such as bio-waste, bio-waste separate collection and composting had to be clarified. The awareness created and experiences gained during the previous years through the separate collection of packaging waste contributed towards this direction.

The actions proposed in this phase were the following:
- Brochure on the separate collection system
- Poster (backside of the brochure)
- Explanatory letter from the vice-mayor
- Discussion with the municipal council and employees
- Press conference and release

The 2nd phase, which started at the same time with bins’ distribution, aimed at engaging citizens in order to start participating and separating at source by using the collection equipment (bins, bags, etc.). The citizens must be informed on the materials that should be collected, the collection frequency, how to communicate with the municipality and the informational events that would take place. This phase is crucial in order to enhance the participation rates in the system and includes the following actions:
- Door to door information
- Separate collection manual
- Stickers
- Informational events.

The 3rd phase aimed at the continuous awareness raising of the citizens in order to ensure their participation and enhance the results of the program. It was important to keep the interest in the pilot by informing the participating audience on the achieved results and the future actions.

During this phase actions from the previous phases are repeated in order to attract more participants into the system that were not included initially for various reasons.

The proposed actions included:
- Collection vehicle equipped with campaign logo and slogan
- Info point within the pilot areas
- Letters (3 sets) & Questionnaires to the participating citizens
- Compost in small bags that will be distributed to citizens, schools and other organizations
- Video with the composting process
- Stickers for schools and commercial enterprises
- Calendars and other small presents for schools
- Presentations and other activities in schools
- Press conferences - releases
- Local events
- Information letters to local associations

For monitoring and evaluation of the information campaign two sets of monitoring indicators were developed:
- Output indicators – in order to monitor the implementation rate of the dissemination actions, such as number of brochures distributed, number of call in the desk office, web-page visits, etc.
- Outcome indicators – in order to monitor the impact of the activities to each target group, such as collected bio-waste / person, municipality or household, % of impurities, etc.
Detailed description of all proposed actions and their relevant cost is included in the ‘Report on the planning of the awareness campaign’ in ANNEX 3.5 of the midterm report.

5.1.3. Action 3: Implementation of the separate collection program in the selected areas

Action 3 aimed at implementing the separate collection system in the selected pilot areas, as planned in Action 2. This action started in October 2012 (initially scheduled to start in September 2012) and due to the delay of MoA’s tender for large bins, it was actually completed at the end of the project in August 2014. According to the Athens-Biowaste contract, this action was scheduled to end in September 2013, had 13 months’ duration and each Municipality should implement the pilot scheme at least for 12 months.

The MoK started implementing this Action in October 2012 and according to schedule could have finished the pilot scheme in November 2013. However, the MoK was committed to continue this activity also after the end of the project (expanding the system is also being discussed and planned, the relevant orders for purchasing additional brown bins have already been made). The implementation of Action 3 ended at the end of August 2014. The MoA started this Action at the end of June 2013 and keeping the 12-month duration finished in August 2014 within the ATHENS-BIOWASTE project. Also, MoA was committed to continue this activity after the end of the project and expand it to additional areas.

This Action is separated into 3 Activities, as follows.

Activity 3(a): Implementation of the information campaign

The aim of this activity was to implement the information campaign according to the plans elaborated during Action 2(d) ‘Planning of the awareness campaign’. This activity was implemented by the two Municipalities under the co-ordination of EPTA. EDSNA also participated in this activity, mostly by undertaking common (for both Municipalities) procurement procedures.

For reporting the progress in each Municipality, all the activities planned and implemented are presented in the following two Tables:

Table 4: Information Campaign implemented in the MoK

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness campaign key message</td>
<td>Design completed as scheduled before the start date of Action 3</td>
<td>See Annex 1.6 (logos, banners)</td>
</tr>
<tr>
<td>Desk office &amp; information hotline</td>
<td>Established as scheduled before the start date of Action 3 and is still in operation after the end of the project</td>
<td>Tel no. 15241</td>
</tr>
<tr>
<td>Website</td>
<td>Launched as scheduled before the start date of Action 3 and is still being updated</td>
<td>Website address: <a href="http://www.biowaste.gr">www.biowaste.gr</a></td>
</tr>
<tr>
<td>Information on the existing municipal website</td>
<td>Website was updated as scheduled before the start date of Action 3. It is still being updated.</td>
<td>Website address: <a href="http://kifissiakathariotita.kifissia.gov.gr/">http://kifissiakathariotita.kifissia.gov.gr/</a></td>
</tr>
<tr>
<td>Facebook page</td>
<td>Launched in October 2012. It is still being updated.</td>
<td><a href="https://www.facebook.com/athensbiowaste">https://www.facebook.com/athensbiowaste</a></td>
</tr>
<tr>
<td>1st Phase (Basic Information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brochure on separate collection system</td>
<td>Design and production completed as scheduled before the start date of Action 3</td>
<td>See Annex 1.15</td>
</tr>
</tbody>
</table>
Distribution in the selected areas in October 2012.

Distribution in additional areas in November-December 2012.

The brochure was distributed door-to-door by municipal employees in October 2012 for the 4 selected areas:
- Ekali, Kastri, Nea Kifissia, Kato Kifissia,

Additional to the planned areas, two more areas:
- Strofyli, Saturday 15 December 2012
- Kefalari, Saturday 12 January 2013

All 5.000 brochures have been distributed.

<table>
<thead>
<tr>
<th>New set of brochures on separate collection system</th>
<th>Reproduction of brochures in May 2014 for citizens and schools.</th>
<th>New brochures were necessary for the continuation of dissemination activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poster (backside of the brochure)</td>
<td>It was incorporated in the brochure</td>
<td>See Annex 1.15 See Annex 2.1 For Vice Mayor’s Letter see Annex 2.1</td>
</tr>
<tr>
<td>Explanatory letter from the vice-mayor</td>
<td>Production completed as scheduled before the start date of Action 3 Distribution together with the brochure</td>
<td></td>
</tr>
<tr>
<td>Discussion with the municipal council and employees</td>
<td>Discussion and information took place during the approval of the tender documents by MoK (May 2012)</td>
<td></td>
</tr>
<tr>
<td>Press conference and release</td>
<td>1st press conference before the start-date of Action 3 (09/11/2011) 2nd press conference took place on 15th of July Continuous press releases (see Dissemination activities)</td>
<td></td>
</tr>
</tbody>
</table>

**2nd PHASE (Engagement)**

Door-to-door information (bins’ distribution) Completed as scheduled Door-to-door discussion of the municipal employees and AthensBiowaste team with citizens during the distribution of the bins

The bins were distributed door-to-door by municipal employees, as following:
- Ekali, Saturday 10 November 2012
- Kastri, Sunday 11 November 2012
- Nea Kifissia, Saturday 17 November 2012
- Kato Kifissia, Sunday 18 November 2012

Additionally to the planned areas:
- Strofyli, Saturday 15 December 2012
- Kefalari, Saturday 12 January 2013

For distribution of bins, see Annex 1.1.

| Separate collection manual | Design and production completed as scheduled before the start date of Action 3 Distribution together with the bins (see above) | See Annex 1.15 |

---

ATHENS-BIOWASTE LIFE10/ENV/GR/000605
Stickers for bins  Design and production completed as scheduled before the start date of Action 3  The stickers were attached to the bins.  

Informational events  Completed as scheduled.  3 Informational events for citizens took place.  

3rd PHASE (Continuous awareness raising)  

Collection vehicle equipped with campaign logo and slogan  Design completed as scheduled before the start date of Action 3  Production and installation in February 2013  

Info point within the pilot areas  This activity will not be implemented by MoK  

Letters (3 sets) & Questionnaires to the participating citizens  Questionnaire template has been developed as scheduled  The 1st set of questionnaires was distributed in January 2013  

Presentations and other activities in schools  Took place in May 2014  

Educational material for schools  The material was produced in May 2014 for all levels of education  

Caps (hats) for school students  They were produced in May 2014 and distributed to students  

Press conferences - releases  Continuous press releases (see Dissemination activities)  

Local events  Disseminated the project in 58th, 59th and 60th Flower Show in Kifissia (2012, 2013 and 2014 respectively). The MoK had a dedicated info-kiosk during the Flower Show.  

Table 5: Information Campaign implemented in the MoA  

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness campaign key message</td>
<td>Design completed as scheduled before the start date of Action 3</td>
<td>See Annex 1.16 (logos, banners)</td>
</tr>
<tr>
<td>Desk office &amp; information hotline</td>
<td>Established as scheduled before the start date of Action 3 and is still in operation</td>
<td>Tel no. 1960 – 210 3402500</td>
</tr>
<tr>
<td>Website</td>
<td>Launched as scheduled before the start date of Action 3 and is still being updated</td>
<td>Website address: <a href="http://www.biowaste.gr">www.biowaste.gr</a></td>
</tr>
</tbody>
</table>

ATHENS-BIOWASTE LIFE10/ENV/GR/000605
| **Information on the existing municipal website** | Website was updated as scheduled before the start date of Action 3. It is still being updated. | Website address: [http://www.cityofathens.gr/kathariotita-periballon](http://www.cityofathens.gr/kathariotita-periballon) |
| **Facebook page** | Launched in October 2012. It is still being updated. | [https://www.facebook.com/athensbiowaste](https://www.facebook.com/athensbiowaste) |
| **1st Phase (Basic Information)** |  |
| **Brochure on the separate collection system** | Design and production completed as scheduled before the start date of Action 3. Distribution completed in the selected areas at the end of June 2013. | See Annex 1.15 |
| **Poster (backside of the brochure)** | It was incorporated in the brochure | See Annex 1.15 |
| **Explanatory letter from the vice-mayor** | The consumables (letters/envelopes) were procured in December 2012. Production completed in June 2013 (1 month before bins' distribution) Distribution completed at the end of June 2013. | For Letters/Envelopes see Annex 1.14.4 For Vice Mayor’s Letter see Annex 2.2 Distribution was delayed due to the delay of bins’ procurement procedures. |
| **Discussion with the municipal council and employees** | Discussion and information took place during the approval of Municipal Plan 2012-2014 in December 2012 |  |
| **Press conference and release** | 1st press conference before the start-date of Action 3 (09/11/2011) 2nd press conference took place on 15th of July 2013 (with the coverage of SKAI TV & all newspapers and news portals). Continuous press releases (see Dissemination activities) |  |
| **2nd PHASE (Engagement)** |  |
| **Door-to-door information (bins’ distribution)** | It took place in the beginning of July 2013. Bins were also provided to Officers’ Club of the Ministry of Defence, the Agricultural University of Athens and the Flower Producer Association of Attica in April/June 2013. Finally, bins were placed at the kitchens of the Air Force and Navy General Staff & the kitchens in two military hospitals. | The bins were distributed door-to-door by municipal employees & volunteers, as following:  - Kypriadou, Saturday – Sunday 6-7 July 2013  - Gazi, Saturday-Sunday 13-14 July 2013 The outdoor bins were placed in November 2013. For distribution of bins to the three additional points, see Annex 1.5, 1.6 and 1.7. |
| **Separate collection manual** | Design and production completed as scheduled before the start date of Action 3 Distribution together with the bins (see above) | See Annex 1.15 |
| **Stickers for bins** | Design and production completed as scheduled before the start date of Action 3 The stickers were attached to the bins. | See Annex 1.16 (bin sticker) & 1.14.1 |
| **Informational events** | They took place in both selected pilot areas in July 2013. | The informational events took place as following:  - Kypriadou, Wednesday 10 |
### 3rd PHASE - (Continuous awareness raising)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection vehicle equipped with campaign logo and slogan</td>
<td>Completed</td>
<td>Design completed as scheduled before the start date of Action 3. Production and installation in April 2013.</td>
</tr>
<tr>
<td>Info point within the pilot areas</td>
<td>The procurement of an info-kiosk has been completed in December 2012. The info-point has been used continuously throughout the project.</td>
<td>For photos of info-kiosk see 1.14.4. The operation of the info-point initially took place as following: Kypriadou: Ep. Kypriadi square, 3-10 July 2013. Gazi, outside Kerameikos Metro station, 11-21 July 2013. It info point also operated on 14, 15 &amp; 16 November 2013.</td>
</tr>
<tr>
<td>Video spots</td>
<td>3 Video spots have been produced (see dissemination activities)</td>
<td>See Annexes 6.32, 6.33 &amp; 6.34.</td>
</tr>
<tr>
<td>Stickers for schools and commercial enterprises</td>
<td>Design and production completed in December 2012. The stickers were distributed in July 2013 to the local enterprises together with the bins.</td>
<td>See Annex 1.14.4.</td>
</tr>
<tr>
<td>Calendars and other small presents for schools</td>
<td>The procurement of consumables (pencils/box) has been completed in December 2012. The consumables were used during school events, taking place from January to June 2014.</td>
<td></td>
</tr>
<tr>
<td>Presentations and other activities in schools</td>
<td>This activity was implemented from January to June 2014 (3 events, 1 in each School). Continuous press releases by June 2013 to all local press (see Dissemination activities).</td>
<td></td>
</tr>
<tr>
<td>Press conferences - releases</td>
<td>Continuous press releases (see Dissemination activities).</td>
<td></td>
</tr>
<tr>
<td>Local events</td>
<td>The MoA participated with the info-kiosk in the Technopolis Recycling Festival in June (03/06/2013 - 06/06/2013). In 2012 it participated in the Athens Half-Marathon. In addition, the ATHENS-BIOWASTE initiative was also implemented at the music festival of the Municipality of Tavros held from 17th to 19th May 2013. Indicative photos are available at: <a href="http://www.biowaste.gr/site/mousiko-festival">http://www.biowaste.gr/site/mousiko-festival</a>. The relevant initiative was promoted through the relevant websites: <a href="http://www.plisskenfestival.gr/info">http://www.plisskenfestival.gr/info</a>, &amp;<a href="http://www.plisskenfestival.gr/greenin2013">http://www.plisskenfestival.gr/greenin2013</a>. The ATHENS-BIOWASTE team participated actively in the ATHENS SCIENCE FESTIVAL with an info kiosk and activities for children held at Technopolis from 30th April until 4th May 2014. On 11th July, the ATHENS BIOWASTE team of the MoA visited the Agricultural Flower Productive Association of Attica since some quantities of flowers delivered to the Mechanical and Biological Treatment Plant were wrapped with plastic material. See Annex 1.11.</td>
<td></td>
</tr>
</tbody>
</table>
The staff of the Flower Association was instructed on the best practices and on the separation of the plastic material. A notice signed by the Director of Sanitation-Recycling of MoA was distributed.

Information letters to local associations

This activity took place in November 2013

The results of this Activity were:

100% accordance of the implemented information campaign with the plans elaborated during Action 2

Taking into account that there was a delay in the beginning of Activity 3(b) – Implementation of the separate collection programme - in the Municipality of Athens a number of activities related to the information campaign have also been delayed. Despite that, all the activities mentioned in the aforementioned tables were implemented in parallel with Activity 3b).

It is considered that the information campaign implemented in this activity reached almost 100% of the local population, taking into account that all available communication means were applied (door-to-door, info kiosks, local events, local press releases, national releases, social media, tv spots, etc.). In addition, the wide dissemination activities (see section 5.2) at national level complemented this activity.

Activity 3(b): Implementation of the Separate collection programme

Aim of this activity was to implement the separate bio-waste collection scheme in the selected areas according to the plans elaborated during Action 2(c) ‘Selection and planning of separate collection method for the case study areas’. This activity was scheduled to start in October 2012 and end in September 2013.

After the tendering procedure and the delivery of the collection equipment (bins and biodegradable bags), a detailed distribution plan was developed for each Municipality. The plan included an informational letter by the Vice-mayors with exact dates and time, the distribution team, map of the area, frequently asked questions for distribution employees, filling forms, vehicles and other consumables to be used. The experience gained from organising distribution activities has been presented in the Guide (see Action 6a).

Municipality of Kifissia (MoK)

MoK started biowaste separate collection scheme, in November 2012 and continued until the end of the project (22 months in total). The collection is still ongoing, while the MoK is planning to expand the system. The areas which participated in the scheme, as well as the timeframe are the following:

November 2012: Nea Kifissia, Kato Kifissia, Ekali and Kastri. - Initial case study areas as elaborated in Activity 2(b)

December 2012: Strofyli (1st Expansion)

January 2013: Kefalari (2nd Expansion)

The collection took place by the Municipality with a frequency of 2-3 times per week in all areas. One existing vehicle was being used and 3 employees (1 driver and 2 collection employees) were occupied on a daily basis in order to cover all areas. The collected biowaste was transferred every day or every second day to the MBT plant of EDSNA for composting. Photos from the collection in the MoK are provided in ANNEX 1.2.

Municipality of Athens (MoA)

MoA had a delay in the procurement of the outdoor bins and the biowaste separate collection in the pilot areas started in October 2013. In the meantime, MoA distributed bins to a) the Ministry of Defence and most specifically the officers club located at Vasilisis Sofias Avenue.
within the center of Athens and b) to the Agricultural University of Athens, located in Votanikos area, near the centre of Athens. The areas which participated in the scheme as well as the timeframe are the following:

April 2013: Officers Club, Agricultural University of Athens
June 2013: Association of Flower Producers of Attica
October 2013: Kypriadoy, Gazi - Initial case study areas as elaborated in Activity 2(b)
February 2014: 1st expansion in Kypriadoy
March 2014: 2nd expansion in Kypriadoy
July 2014: Kitchens of the Air Force and Navy General Staff, Kitchens in two military hospitals. Relevant photos are available in ANNEX 1.23.

In addition, MoA in collaboration with NTUA provided brown bins for the separate collection of biowaste at the music festival of the Municipality of Tavros held from 17th to 19th May 2013. The collection took place by the Municipality with a collection frequency 1-2 times per week depending on the area. One existing vehicle was being used and 3 employees (1 driver and 2 collection employees) were occupied on a daily basis. In addition to that, the bin was escorted each time from the bin washing vehicle (indicative photos are given in ANNEX 1.24) with two additional employees. This was necessary in order to keep the central bins clean and odourless especially during days with high temperature which are quite often in Greece. The collected biowaste was transferred every day or every second day to the MBT plant of EDSNA for composting. Photos from the collection in the MoA are provided in ANNEX 1.8 & ANNEX 1.9.

Quantities of biowaste collected
The quantities that have been delivered to the MBT Plant of EDSNA (are presented in the following table: Table 6: Biowaste Quantities delivered to the EDSNA Composting Unit.

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MoK Quantity (kg)</th>
<th>MoA Quantity (kg)</th>
<th>El. Venizelos Airport Quantity (kg)</th>
<th>Green Waste Quantity (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECEMBER 2012</td>
<td>7.610</td>
<td>-</td>
<td>913</td>
<td></td>
</tr>
<tr>
<td>JANUARY 2013</td>
<td>17.200</td>
<td>-</td>
<td>2.064</td>
<td></td>
</tr>
<tr>
<td>FEBRUARY 13</td>
<td>9.860</td>
<td>-</td>
<td>1.183</td>
<td></td>
</tr>
<tr>
<td>MARCH 2013</td>
<td>16.880</td>
<td>-</td>
<td>3.000</td>
<td>2.386</td>
</tr>
<tr>
<td>APRIL 2013</td>
<td>12.180</td>
<td>2.180</td>
<td>7.000</td>
<td>2.563</td>
</tr>
<tr>
<td>MAY 2013</td>
<td>12.450</td>
<td>1.100</td>
<td>1.626</td>
<td></td>
</tr>
<tr>
<td>JUNE 2013</td>
<td>9.010</td>
<td>4.000</td>
<td>1.561</td>
<td></td>
</tr>
<tr>
<td>JULY 2013</td>
<td>8.190</td>
<td>4.430</td>
<td>1.514</td>
<td></td>
</tr>
<tr>
<td>AUGUST 2013</td>
<td>4.310</td>
<td>1.530</td>
<td>701</td>
<td></td>
</tr>
<tr>
<td>SEPTEMBER 2013</td>
<td>6.270</td>
<td>4.210</td>
<td>1.258</td>
<td></td>
</tr>
<tr>
<td>OCTOBER 2013</td>
<td>7.550</td>
<td>10.460</td>
<td>2.161</td>
<td></td>
</tr>
<tr>
<td>NOVEMBER 2013</td>
<td>8.160</td>
<td>9.510</td>
<td>3.670</td>
<td></td>
</tr>
<tr>
<td>DECEMBER 2013</td>
<td>9.350</td>
<td>11.760</td>
<td>7.480</td>
<td>3.431</td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL (tn)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The data of the previous table are summarized in the diagram below (Figure 9). In both Municipalities the amount of collected bio-waste is provided by the MBT Plant and the data recorded in the weighbridge (Table 6).

![Figure 9: Summary of the collected biowaste quantities during the implementation phase of the ATHENS-BIOWASTE project](image)

The aforementioned data, show that in total 557.5 tonnes of biowaste have been collected throughout ATHENS-BIOWASTE project. It shall be noted that these quantities will increase after the end of the project, as relevant practices will take place.

**Monitoring Plan**

In order to evaluate the performance of the separate collection scheme, a monitoring plan was developed by EPTA and all beneficiaries contributed to its implementation throughout the project. Due to the different collection systems implemented in MoK and MoA a different monitoring plan was applied in each case.

**MoK**
The monitoring actions implemented in the MoK included:

- Creation of maps on a GIS programme for the illustration of the buildings, where bins had been delivered in the six areas. The maps are included in ANNEX 2.4 of the midterm report.
- Recording of the collection routes via a GPS system, as presented in the maps of ANNEX 3.7 of the final report.
- Implementing a one-week onsite monitoring of the collection routes. Each collection vehicle was escorted by a monitoring team (3 persons) which recorded the following items: buildings that had bins set out (ANNEX 3.8 of the final report), the number and type of the bins collected, the address, the time required for collection and emptying and the quality of the material (visual inspection). All data were registered in a form especially developed for the occasion and which is also included as Annex in the Guide (Action 6a) so that it can be used in the future from other Municipalities.
- Evaluation of the results and production of performance indicators for MoK.
- Production of equations and methodology for door-to-door systems, presented in the Guide (see action 6a) and incorporated into the Athens-Biowaste model (see action 5).

MoA

The monitoring actions implemented in the MoA included:

- Recording of the collection routes via the GPS system which was installed in the MoA, as presented in the maps of ANNEX 3.9 of the final report.
- Installation of transceivers in all bins used by the MoA in order to track the position of the outdoor bins and the amount of bio-waste in each bin. Indicative photos from their placement on the bins on 26th September 2013 are available in ANNEX 1.18 of the final report. The transceivers allowed to monitor the time needed for the collection of each bin. The position of the bins in Kypriadou is provided in the map of ANNEX 3.10 of the final report (MoA_Kypriadoy_bins).
- Evaluation of the results and production of performance indicators for MoA.
- Production of equations and methodology for collection systems with central bins, presented in the Guide (see action 6a) and incorporated into the Athens-Biowaste model (see action 5).

Some of the key parameters/indicators which resulted from the implementation of the monitoring plan are given in Table 7.

Table 7: Key parameters/indicators resulting from the implementation of the monitoring plan

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Result</th>
<th>Method of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilograms of bio-waste collected per capita</td>
<td>Based on the total population of the case study areas: 14.51 kg/cap in MoK 26.77 kg/cap in MoA</td>
<td>Based on the recorded quantity of (impurity free) biowaste collected during the pilot scale application and the number of the people participating to the source separation scheme. More information is given in Report 3c.</td>
</tr>
<tr>
<td></td>
<td>Based on the population that received bins: 27.11 kg/cap in MoK 37.39 kg/cap in MoA</td>
<td>Based on the recorded quantity of (impurity free) biowaste collected during the pilot scale application and the number of the people participating to the source separation scheme. More information is given in Report 3c.</td>
</tr>
<tr>
<td></td>
<td>Based on the population that received bins: 27.11 kg/cap in MoK 37.39 kg/cap in MoA</td>
<td>Based on the recorded quantity of (impurity free) biowaste collected during the pilot scale application and the number of the people participating to the source separation scheme. More information is given in Report 3c.</td>
</tr>
</tbody>
</table>
The planned outputs (expected results) compared to the ones implemented and the time schedule of this activity are shown below:

Table 8: Activity outputs (planned and final)

<table>
<thead>
<tr>
<th>Planned outputs</th>
<th>Final project outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% accordance of the implemented separate collection with the plans elaborated during Action 2</td>
<td>All activities planned in Action 2 were successfully implemented by the two Municipalities. Additional activities also took place, including:</td>
</tr>
<tr>
<td></td>
<td>- Two new areas participated in the scheme in the MoK (Kefalari &amp; Strofyli)</td>
</tr>
<tr>
<td></td>
<td>- Two expansions took place by MoA in the area of Kypriadou</td>
</tr>
<tr>
<td></td>
<td>- Large producers in MoA participated (officers club, flower producers, etc.)</td>
</tr>
<tr>
<td>Collection of 720 tn of biowaste$^1$</td>
<td>The total quantity of 557.5 tonnes</td>
</tr>
</tbody>
</table>

$^1$ Regarding the target of the 720 tn it must be highlighted that during the submission of the Athens Biowaste Proposal the following methodology was used:
Volumes of bio-waste collected.
The average waste production per capita in Athens is around 1.37 kg/d.
It is estimated that 40% is organic and 60% of that organic will end up to the bio-waste collection bins.
Thus the annual quantity to be collected in tons amounts to:
3000 Inhabitants x 1.37 kg/d x 40% x 60% x 365 / 1000 = 360 tn
With an average bulk density of 0.4 tn/m3, 900 m3 will be collected in each case study area.
Totally 720 tn or 1.800 m3 of bio-waste will be collected.
Since then and because of the economic crisis the average waste production has decreased to about 1.1 kg/d. So the estimated amount of collected bio-waste corresponds to:
3000 Inhabitants x 1.1 kg/d x 44.4%* x 60% x 365 / 1000 = 320 tn
For both Municipalities the total amount of bio-waste is 320 tn x 2 = 640 tn
*The organics percentage has been updated to 44.4% according to the updated Greek National Solid Waste Management Plan.
Based on that analysis the total quantity of 557.5 tonnes represents 87.1% of the quantity target.
**Activity 3(c): Laboratory analysis of the collected samples**

This activity aimed at analysing bio-waste samples collected during the implementation of the source separation system in order to specify parameters that are crucial for the design of bio-waste treatment facilities, such as **composition, dry substance, organic dry substance etc**. In total 3 batches of bio-waste were analyzed per Municipality in order to assess the differentiations on the composition and the other parameters. This activity has been implemented in parallel with Activity 3b.

The determination of the physicochemical characteristics of source segregated bio-waste (i.e. food & green waste) was an important stage of the evolutionary stages of composting, since the rate at which materials become mature compost as well as the quality of the final composted organic material are largely dependent on the initial properties of the feedstock material. A complete physico-chemical analysis of sorted bio-waste was performed in order to be able to evaluate the composting process and the resulting end product considering that the input material determines a priori the physical, chemical and biological conditions involved in composting.

To this end, a coherent memo was developed aiming to effectively depict (a) the parameters that need to be quantified for the characterization of bio-waste, (b) the collection frequency of representative samples and (c) the selection of appropriate standard methods of analysis for each parameter. The memo was developed through consultation among the ATHENS-BIOWASTE beneficiaries, previous background experience of the NTUA working group on composting and solid waste sampling and analysis (NTUA laboratory is certified under EN ISO 9001 and accredited under **ISO/IEC 17025:2005** on performing chemical analysis on solid waste samples, municipal sludge samples and samples of soil, compost and related materials), networking with other LIFE+ projects, information provided from existing compost quality protocols applied in EU member states (i.e. Germany, RAL – Austria, BKAL, BGBI, KGVÖ - Netherlands BVOR, KIWA – Italy CIC – United Kingdom BSI PAS 100 and EU eco-label) and information from literature review and peer review articles on bio-waste management. The full range of analysis of food and green waste (i.e. bio-waste) is presented in the following table.
### Table 9: Overview of the physicochemical parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bio-waste</th>
<th>Analysis Method</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moisture</strong></td>
<td>√</td>
<td>ISO 11465:1993</td>
<td>% wb</td>
</tr>
<tr>
<td><strong>Dry Matter</strong></td>
<td>√</td>
<td>ISO 11465:1993</td>
<td>% wb</td>
</tr>
<tr>
<td><strong>Density</strong></td>
<td>√</td>
<td>TMECC 03.01</td>
<td>kg m⁻³</td>
</tr>
<tr>
<td><strong>pH/Conductivity</strong></td>
<td>√</td>
<td>EPA 9045D / EPA 9050A/</td>
<td>-</td>
</tr>
<tr>
<td><strong>Ammonium (NH₄⁺)</strong></td>
<td>√</td>
<td>EPA 350. 1-3/</td>
<td>%</td>
</tr>
<tr>
<td><strong>Nitrates (NO₃⁻)</strong></td>
<td>√</td>
<td>ISO 11261:1995 &amp; ISO 11465:1993</td>
<td>%</td>
</tr>
<tr>
<td><strong>Organic Nitrogen (Norg)²</strong></td>
<td>√</td>
<td>Determined by quantifying TN, NH₄⁺, NO₃⁻</td>
<td>% N</td>
</tr>
<tr>
<td><strong>Carbon to Nitrogen ratio (C/N)</strong></td>
<td>√</td>
<td>Determined by quantifying TN &amp; TOC</td>
<td>-</td>
</tr>
<tr>
<td><strong>Ammonium to Nitrates ratio (NH₄⁺/ NO₃⁻)</strong></td>
<td>√</td>
<td>Determined by quantifying NH₄⁺ &amp; NO₃⁻</td>
<td>-</td>
</tr>
<tr>
<td><strong>Heavy Metals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>----</td>
<td>-----</td>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impurities content (glass, plastic metal etc)</td>
<td>√</td>
<td></td>
<td>TMECC Method 03.06 &amp; ASTM D 2217-85</td>
</tr>
<tr>
<td>Bio- waste composition analysis</td>
<td>√</td>
<td></td>
<td>ASTM D 5231 - 92 R03 &amp; Jansen et al. 2004</td>
</tr>
</tbody>
</table>
Overall 6 batches of source segregated food waste were analyzed, whereas 23 parameters were quantified in order to characterize effectively the sorted organic material. In regard to green waste, in total 5 batches were analyzed including 12 parameters in each batch. Although green waste was not foreseen to be examined in the approved proposal, it was considered important to identify the properties of this waste stream, since it constitutes an effective bulking agent for the enhancement of food waste composting, as reported in the majority of industrial composting facilities (indicative photos are available in ANNEX 1.25).

The NTUA working team developed the state of the art methodology for conducting the compositional analysis of segregated municipal biowaste for the two Municipalities. The methodology was based on different technical reports, standards and scientific papers given that an international standard methodology has not been established up until now, while a variety of categorisation systems has been developed due to the different focus and objectives of each study. The analysis considers a single waste route which is associated with waste ending up in the biowaste collection bin or road container provided by the municipality services. The compositional analysis was executed through Waste Analysis Campaigns (WACs) to the MBT prior to composting by appropriately trained personnel for each municipality separately. Due to the fermentable nature of the material it was decided to maintain the interval between biowaste generation, transportation, sampling and sorting between 2 to 4 days, depending mainly on the weather conditions, in order to preserve the freshness of the samples and avoid food spoiling. In total, three (3) WACs were implemented for each municipality in a year period.

The methodology developed included procedures for the collection of a representative sample of unprocessed waste from the waste collection vehicle, manual sorting of the waste into individual waste components, data recording and reporting of the results. Initially, on the day of the WAC, the load of the designated vehicles from each municipality was weighed and recorded. The collected load was discharged from the collection vehicle in a clean surface at the MBT facility. Each time and for each municipality, the working group was selecting a quantity between 300 to 500kg depending on the waste load received. Then, opening of all biowaste collection bags and emptying of the contents to a clear area was implemented. Afterwards, mixing, coning and quartering procedure of the material was executed (Figure 10).

Figure 10: Coning and quartering procedure for selecting representative unprocessed waste samples

Since unprocessed biowaste is a highly heterogeneous material, care was taken to obtain representative samples, eliminating or minimizing sample biasing. After appropriate mixing, about 5kg of representative sample was collected and stored for further extensive laboratory analyses to be performed. The remaining mixture was weighed and transferred to the sorting table where the compositional analysis was conducted (Figure 11).
The methodology employed manual sorting of the mixture into specified biowaste components until the maximum particle size of remaining waste particles was less than 15 mm. The primary waste components are presented in Table 10.

<table>
<thead>
<tr>
<th>No.</th>
<th>Biowaste component category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vegetables and Salads</td>
</tr>
<tr>
<td>2</td>
<td>Fruits</td>
</tr>
<tr>
<td>3</td>
<td>Bread and Bakery</td>
</tr>
<tr>
<td>4</td>
<td>Meals (homemade and pre-prepared)</td>
</tr>
<tr>
<td>5</td>
<td>Spaghetti/Flour/Rice/Cereals</td>
</tr>
<tr>
<td>6</td>
<td>Meat and Fish</td>
</tr>
<tr>
<td>7</td>
<td>Dairy and Eggs</td>
</tr>
<tr>
<td>8</td>
<td>Cake, Desserts, Confectionery and Snacks</td>
</tr>
<tr>
<td>9</td>
<td>Drinks (Coffee and tea bags)</td>
</tr>
<tr>
<td>10</td>
<td>Paper</td>
</tr>
<tr>
<td>11</td>
<td>Garden Waste</td>
</tr>
<tr>
<td>12</td>
<td>Rest biowaste: organic material which does not fit into another category because (a) it is not possible to be integrated in a category and / or (b) has a size less than 15mm</td>
</tr>
<tr>
<td>13</td>
<td>Impurities: i.e. plastics, metals, glass, plastic bags etc.</td>
</tr>
</tbody>
</table>

The selection of the specific waste components considers the effectiveness and practicability of the categorization analysis, the usefulness of the information obtained and the compatibility and transferability of the outputs with data from existing and future related studies.

The extended physicochemical characterisation of the source separated biowaste was performed by measuring a wide variety of parameters, as given below. The water content of the collected biomass was determined after drying the collected samples at 105°C for 24hrs. The pH was measured according to EPA Method 9045D using a pH-meter (Mettler Toledo MPC 227 pH/Conductivity Meter). Total Organic Carbon (TOC) was determined using TOC analyzer TOC-VCSH of Shimadzu coupled with Solid Sample Module - 5000A. Volatile Solids (VS) were measured by weight loss on ignition at 550°C for 4 hrs. Total Nitrogen (TN) was determined through digestion (Gerhard Kjeldaltherm KB / KBL), distillation (Gerhard Vapodest Distillation) and titration, as described in the German Standard Methods for the examination of water, sewage and sludge. The total concentration of heavy metals (Cr, Cu, Ni, Cd, Pb, Zn) was determined using fast sequential atomic absorption spectroscopy (Varian AA240FS). The value of each parameter is presented as an average of a triplicate measurement, whereas analyses of source separated biowaste were carried out for each WAC performed for the two Greek case studies (i.e. three representative samples from each municipality).
After sorting, weighing of the sorted material into categories was employed. Each weighing was executed twice and the resulting values were recorded. Finally, the load discharge area, the sorting site and the sorting table of all waste materials were cleaned. The mass fraction of each component in the sorting sample was calculated from the mass of the corresponding component. In particular, the mass fraction of each component, \( m_{fi} \), and its percentile contribution, \( P_i \), is determined by the following equations:

\[
\frac{m_{fi}}{\sum_{i=1}^{n} w_i} = \frac{w_i}{\sum_{i=1}^{n} w_i}, \quad P_i = m_{fi} \times 100
\]

where \( w_i \) = weight of component \( i \) and \( j = \) number of waste components. An outline of the methodology is illustrated in Figure 12.

**Figure 12:** Outline of the methodology used for conducting compositional analysis in household biowaste

Figure 13 illustrates the biowaste composition from the three WACs in Kifissia Municipality without considering impurities.
The charts clearly show that the largest amount of biowaste in Kifissia is ‘Fruit’ waste (32.96, 47.61 and 41.40% w/w in 1st, 2nd and 3rd WAC respectively) followed by ‘vegetables and salads’ category (28.26, 28.42 and 22.11% w/w and in 1st, 2nd and 3rd WAC respectively). The proportion for ‘Meat and Fish’ and ‘Bread and Bakery’ bio waste categories remained constant between 2 to 3% w/w in all WACs in Kifissia with the exception of the 3rd WAC where no ‘Bread and Bakery’ were recorded. ‘Paper’ and ‘Garden Waste’ varied between 0.5 to 5.5% w/w in Kifissia predominantly because of the seasonal variation of green waste generation. It is worth noticing that ‘Rest biowaste’ category acquires an increased share ranging from 13.16 to 27.72% w/w.

Figure 14 depicts the results derived from the execution of three WACs of biowaste from the Municipality of Athens.
Figure 14: Compositional analysis results from Athens Municipality, Greece (impurities are not considered).

Figure 14 shows variations in composition of biowaste derived from the three different WACs. As exemplified below, this outcome is inextricably linked to the origin of the material each time. Despite that, as in the case of Kifissia, ‘Fruits’, ‘Vegetable and Salads’ and ‘Rest biowaste’ represented the greatest proportions in each WAC for the Municipality of Athens.

A significant variability is observed though between the two municipalities due to seasonal variation and the fact that in the case of Kifissia only residencies were included in the separate biowaste collection scheme. The figures for ‘Meat and Fish’ are higher (4%, 3% and 5% w/w from 1st, 2nd and 3rd WAC respectively) than those recorded for Kifissia. Remarkable differentiations comparing to those of Kifissia were also recorded for the categories of ‘Bread and Bakery’ and ‘Paper’. During the 2nd WAC, a percentage of 15% w/w was also observed for the ‘Paper’ category. This can be attributed to the fact that Gazi is predominantly a commercial region in Athens Municipality where numerous bars, cafeterias and restaurants are located. Finally, low enough is the contribution of ‘Green waste’ to the overall waste composition (1%, 3% and <1% w/w from 1st, 2nd and 3rd WAC respectively), which is in line with the fact that the Municipality of Athens is more urbanised than Kifissia.

Table 11 summarises the output of the composition analyses performed in the examined areas, while it provides an average value for each biowaste category at national level along with corresponding data from case studies in different European countries (i.e. UK, Finland, Portugal and Italy) characterizing samples from the same waste route.

<table>
<thead>
<tr>
<th>Type</th>
<th>Average Kifissia</th>
<th>Average Athens</th>
<th>Greece</th>
<th>Finland</th>
<th>UK</th>
<th>Portugal</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits &amp; Vegetables</td>
<td>70.98</td>
<td>54.00</td>
<td>62.49</td>
<td>44.50</td>
<td>60.90</td>
<td>59.20</td>
<td>69.00</td>
</tr>
<tr>
<td>Bread &amp; Bakery</td>
<td>1.54</td>
<td>8.80</td>
<td>5.17</td>
<td>3.80</td>
<td>9.0</td>
<td>3.10</td>
<td>2.80</td>
</tr>
<tr>
<td>Meals</td>
<td>1.52</td>
<td>0.17</td>
<td>0.84</td>
<td>6.30</td>
<td>12.30</td>
<td>29.00</td>
<td>1.40</td>
</tr>
<tr>
<td>Spaghetti/rice/flour/cereal</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.40</td>
<td>1.50</td>
<td>0.20</td>
<td>12.40</td>
</tr>
<tr>
<td>Meat &amp; Fish</td>
<td>2.42</td>
<td>4.53</td>
<td>3.47</td>
<td>4.30</td>
<td>6.10</td>
<td>7.30</td>
<td>6.20</td>
</tr>
<tr>
<td>Dairy &amp; Eggs</td>
<td>0.32</td>
<td>0.98</td>
<td>0.65</td>
<td>2.00</td>
<td>1.70</td>
<td>0.70</td>
<td>1.40</td>
</tr>
<tr>
<td>Cake, Desserts, Confectionery &amp; Snacks</td>
<td>0.00</td>
<td>1.40</td>
<td>0.70</td>
<td>3.20</td>
<td>0.70</td>
<td>0.30</td>
<td>0.00</td>
</tr>
<tr>
<td>Drinks</td>
<td>0.39</td>
<td>0.34</td>
<td>0.36</td>
<td>27.50</td>
<td>7.10</td>
<td>0.20</td>
<td>0.00</td>
</tr>
</tbody>
</table>
According to Table 11, the percentage of biowaste components differ significantly between the two municipalities studied and when compared to other European case studies. Moreover the ‘Rest biowaste’ category shows considerable differentiation. This can be attributed to the condition of the raw material when sorted at the MBT facility which was in some cases spoiled up to the point in which it was not easy to distinguish the different waste components. The degradation level of the samples in both municipalities examined affected to some degree the ability to unambiguously separate and classify biowaste items. The factor that mostly influenced the level of ‘Rest biowaste’ is related to the degree of samples commingling during transportation using waste collection vehicles. Mixing in waste collection vehicles decreases particle-size and increases contamination of individual waste components. Therefore, the level of ‘Rest biowaste’ remains high irrespectively of the biowaste source separation scheme in place (i.e door to door or road container system). Based on the above, it is suggested that sampling should take place at household level making specific separation and identification much easier, whereas reducing significantly the level of unclassified material. Despite the aforementioned differentiation, the mean value of the compositional data agrees with the general observation of compositional analysis for the case of Greece as well as other European countries. More specifically, in all cases ‘Fruit and vegetable’ wastes constitute consistently the largest proportion of biowaste ranging from 45 to 70% of the total wet weight of the samples. ‘Bread and bakery’ wastes present similarities in Finland, Portugal, Italy and Greece (Kifissia Municipality), while higher proportions are observed only in the UK and Greece (Athens Municipality). The differences might be attributed to the increased capacity of ‘Bread and bakery’ wastes to absorb present or produced leachates in biowaste mixtures in the interval of biowaste generation, collection, transportation and sorting. Differentiation on the proportion in other biowaste categories of the examined sites are mostly related to national food consumption patterns and habits, e.g. increased levels of ‘Spaghetti/rice/flour/cereals’ are observed only in Italy while ‘Drinks' are found in higher percentages in UK and Finland (i.e. tea bags and coffee).

Figure 15 depicts the impurities content in the separated at source food waste in the Municipalities of Athens and Kifissia in the framework of the pilot application of the ATHENS BIOWASTE project.
Figure 15: Impurities content in the separated at source food waste in the Municipalities of Athens and Kifissia in the framework of the pilot application of the ATHENS BIOWASTE project.
Extended physicochemical characterisation of biowaste samples was carried out on samples from each WAC aiming to provide information in support of the compositional analysis. The results are given in Table 12 along with physicochemical data on biowaste from other European case studies.
Table 12: Physicochemical characterization of segregated biowaste in the examined areas in Greece and other EU countries

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Greece</th>
<th>Finland</th>
<th>UK</th>
<th>Portugal</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Kifissia</td>
<td>Athens</td>
<td>Forssa</td>
<td>Luton</td>
<td>Hackney</td>
</tr>
<tr>
<td>pH (1/5)</td>
<td></td>
<td>5.09±0.40</td>
<td>5.31±0.41</td>
<td>5.34</td>
<td>5.12±0.01</td>
<td>5.18±0.01</td>
</tr>
<tr>
<td>Conductivity (1/5)</td>
<td>mS cm⁻¹</td>
<td>4.44±1.42</td>
<td>2.24±0.76</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Water content (w.w.)</td>
<td></td>
<td>76.13±4.10</td>
<td>80.97±4.90</td>
<td>72.98±0.12</td>
<td>76.30±0.06</td>
<td>74.26±0.18</td>
</tr>
<tr>
<td>Total Solids (TS)</td>
<td>% w.w.</td>
<td>23.87±4.10</td>
<td>21.17±4.57</td>
<td>27.02±0.12</td>
<td>23.70±0.06</td>
<td>25.74±0.18</td>
</tr>
<tr>
<td>Density</td>
<td>gr cm⁻³ w.w.</td>
<td>0.53±0.06</td>
<td>0.54±0.02</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Organic Carbon (TOC)</td>
<td>% TS</td>
<td>53.33±5.89</td>
<td>53.36±2.72</td>
<td>N/A</td>
<td>51.2±1.2</td>
<td>51.3±0.2</td>
</tr>
<tr>
<td>Volatile Solids (VS)</td>
<td>% w.w.</td>
<td>20.61±0.31</td>
<td>18.83±0.07</td>
<td>24.91±0.05</td>
<td>21.84±0.10</td>
<td>23.47±0.31</td>
</tr>
<tr>
<td>Volatile Solids (VS)</td>
<td>% TS</td>
<td>86.32±7.47</td>
<td>88.98±1.42</td>
<td>92.26±0.26</td>
<td>91.28±0.20</td>
<td>91.17±0.91</td>
</tr>
<tr>
<td>Total Nitrogen (TN)</td>
<td>% TS</td>
<td>1.88±0.21</td>
<td>2.11±0.17</td>
<td>N/A</td>
<td>3.12±0.01</td>
<td>3.13±0.03</td>
</tr>
<tr>
<td>TOC/TN (ratio)</td>
<td></td>
<td>28.77±5.44</td>
<td>25.39±1.08</td>
<td>N/A</td>
<td>16.41</td>
<td>16.39</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>mg kg⁻¹ TS</td>
<td>1.06±0.38</td>
<td>1.51±0.63</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>mg kg⁻¹ TS</td>
<td>12.85±2.26</td>
<td>12.99±3.97</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>mg kg⁻¹ TS</td>
<td>1.44±0.59</td>
<td>1.14±0.36</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>mg kg⁻¹ TS</td>
<td>0.25±0.08</td>
<td>0.23±0.14</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg kg⁻¹ TS</td>
<td>5.73±0.95</td>
<td>15.67±1.41</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>mg kg⁻¹ TS</td>
<td>35.47±0.39</td>
<td>56.97±6.06</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
The results show a strong degree of similarity in biowaste samples irrespectively of the investigated area and the variation in biowaste composition. More specifically, all samples acquire low TS and similar VS contents. The samples from the Greek municipalities presented lower VS content indicating the presence of more inert materials. Another worth noticing difference is the lower TN in biowaste of the examined areas which can be attributed to the slightly lower proportion of protein rich ‘Meat & Fish’ component in Greek biowaste samples. The differentiation of TN levels should be taken into consideration when biowaste treatment is applied using biological processing methods especially in case where anaerobic digestion is involved. According to Table 12, heavy metals concentration of segregated biowaste decreases in the following order: Zn > Cu > Pb > Ni > Cr > Cd. The values are always much lower than heavy metals concentration in mechanically separated biowaste (i.e. not source separated biowaste). This differentiation of heavy metals concentration is related to the migration of potential toxic elements from non-compostable materials found in MSW (e.g. metals, plastics, batteries) into the fermentable matrix due to size reduction, abrasion, and/or dispersal of pollutants between the disposal of mixed MSW into the bin and its mechanical sorting. Another reason that could add to the difference of heavy metal concentration could be the wearing away of the equipment and machines associated with the mechanical sorting of biowaste. Considering the low impurities level found in the source separated material in the Greek case studies (i.e. less than 8% w/w), it can be inferred that the biologically treated products derived from segregated biowaste would present less contaminants than products obtained from post mechanical separation of biowaste. Therefore, source separation should always be preferred rather than post-collection separation in order to minimize biowaste heavy metal content and facilitate in meeting the quality requirements of the product and market uptake.

Another important factor which is related to the effectiveness of the source separation scheme is the level of impurities found in the source separated material. The analysis performed in March 2013 presented low level of contamination equal to 6.7% w/w, 5.5% w/w of which is plastic bags. An increase of impurities level i.e. 14.7% w/w was identified in May 2013 consisting mainly of plastic bags (10.5% w/w). This can be explained by the fact that the biodegradable bags which have been purchased and distributed by the municipality have already been used and the participants started to use non-biodegradable plastic bags. To this end, the beneficiaries of the ATHENS-BIOWASTE project performed a series of corrective measures in order to reduce the level of plastic bags used by the participants. Considering

(a) the economic problems in Greece over the last years along with the financial issues that all Greek municipalities are confronted,
(b) the limitation of the project’s budget in supporting the procurement of biodegradable bags for the whole duration of the demonstration phase of the project and
(c) the willingness of the project beneficiaries, especially the two municipalities, not only to maintain but also to expand bio-waste source separation services throughout the administrative boundaries of the Athens and Kifissia municipalities well beyond the foreseen end date of the demonstration phase of the project,

the beneficiaries of the ATHENS-BIOWASTE project concluded that the most effective way to reduce the use of plastic bags in the pilot areas is to introduce biodegradable bags into the market and in places near the areas where the source separation services are provided. Therefore, the working group communicated with all the marketplaces within and at the vicinity of the pilot areas in Kifissia municipality aiming to introduce biodegradable bags at a reasonable price. Specific supermarkets in the target areas have been identified and informed about the aims of the project, the importance biodegradable bags and their benefits for introducing and sailing them. Indicatively, Thanopoulos supermarket in Kifissia has launched such products and sells biodegradable bags. However, the price was still very high, that is 2.5 Euros for 10 pieces.

The objective of the deliverable with title «Implementation of the source separation of biowaste program in Attica” (ANNEX 3.11 of the final report) was to present and evaluate the
source separation of biowaste in selected areas of Athens and Kifissia municipalities throughout the duration of the pilot scale application. The audit and characterization of the collected biowaste that formed the organic feed substrate to produce compost was also planned. Specifically, the report was divided into three parts which are described below.

Part A: Initially the following topics were presented (a) the areas and service points of the municipalities of Athens and Kifissia where the source separation of biowaste was applied and (b) the types of source separation schemes set out in the municipalities. This section provided the actual implementation data of the source separation scheme in relation to the initial planning of the project, as it was reflected in previous technical reports of project (namely "Technical report on the selection of pilot areas in Athens and Kifissia municipalities" & "Technical report on the design of biowaste source separation system").

Part B: The second section was related to the characterization of the selected biowaste that resulted from the serviced areas of the two municipalities. Specifically, the physicochemical properties of the collected biowaste were determined and then compared with similar data from other EU countries. The results suggest that the characteristics of biowaste from Greek municipalities are similar to those of other EU countries. Furthermore, it is concluded that biowaste source separation should always be preferred to mechanical post-separation of mixed waste in order to minimize the impurities and pollutants content in biowaste.

Part C: The third section focuses on the monitoring and evaluation of biowaste source separation schemes in Athens and Kifissia municipalities based on specific parameters and indicators such as the quantity of collected biowaste, the level of impurities, the participation rate, the specific collection rate and the diversion level of biowaste. The results from the piloted program are positive since 550 tons of biowaste has been collected in total throughout the duration of the activity (22 months). The rate of biowaste collection is 54.7 and 60.0 kg / (inh yr) in Athens and Kifissia respectively (levels similar to other EU member states), while the impurity content was determined at low levels between 2.0 and 6.7% (not including plastic bags). Finally, given the existing Greek legislation (Law. 4042/2012) which sets a mandatory target of 10% source separation of biowaste by 2020, it is concluded that the application of the project in the two municipalities corresponds to a population equivalent of 15,085.

5.1.4. Action 4: Composting of the collected material and analysis of the final product

Activity 4(a): Planning and implementation of the composting treatment

The objective of Activity 4(a) was to compost the segregated bio-waste resulting from Action 3 and to produce high quality compost material which would have the potential to be marketed. Therefore, the collected bio-waste from the pilot areas in Athens and Kifissia municipalities were transported in the mechanical biological treatment (MBT) facility of EDSNA in Ano Liosia, in order to be effectively treated aerobically. This activity was initiated in November 2012 and lasted until the end of the project. EDSNA working group had initially made all the necessary arrangements to the MBT facility in order to receive and handle the pre-sorted organic material. To this end, the following actions were implemented.

- As it has been stated in previous action, sorted food waste comes from six pilot areas in Kifissia municipality (namely Ekali, Kastri, Strofili, Kefalari, Nea Kifissia and Kato Kifissia), the Club of Officers of the Ministry of Defense, the Agricultural University of Athens, the Association of Flower Producers in Attica Region, the pilot areas in the Municipality of Athens (namely Gazi and Kypriadou), the Eleftherios Venizelos airport. The quantity of segregated food waste that went to the MBT was measured using weighting bridges at the gates of the facility.
- An area had been selected and modified, near the waste reception facility of the MBT, where the operating vehicles, serving the pilot areas, unloaded the segregated bio-waste.
- Green waste from public areas of various municipalities of Attica region were delivered by competent local authorities and temporarily stored near the reception area of
segregated food waste. An amount of this green waste was used as bulking agent during bio-waste composting in order to enhance the aerobic biodegradation process.

- A shredder had been established and used in order to reduce the volume and particle size of green waste.
- A set of conveyor belts had been appropriately positioned in order to transport food waste and shredded green waste to a common conveyor belt. This main conveyor belt bypassed the mechanical sorting stage of the MBT facility and delivered the mixed organic material directly to the composting channel. The quantity of green waste that was mixed with food waste was regulated by the quantity of the collected bio-waste that was fed into the system aiming to achieve a bio-waste to green waste ratio of approximately 5:1 w/w. At this ratio it has been reported that the physical structure and the chemical characteristics of feedstock are improved and, thus, promoted the biodegradation process.
- A composting channel of the MBT’s biological section had been reserved for the treatment of the collected bio-waste. Therefore, a composting channel of the MBT facility was exclusively dedicated to accept pre-sorted organic material that originates from “Athens- Biowaste” project. The composting plant was equipped with an automated turning machine and an aeration system in order to effectively control the aerobic conditions throughout the composting process. Air was supplied by a blower through floor-mounted diffusers, while the ram agitated and pushed the material longitudinally from the inlet end toward the other end. The working teams of EDSNA and NTUA performed all the necessary procedures in order to monitor and evaluate the composting process. Therefore, temperature level, moisture level, oxygen concentration and volatile solids of the substrate were recorded on regular basis in order to depict the composting profile. To this end, three different points lengthwise the channel had been selected in order to regularly perform the necessary measurements (i.e. on a fortnight basis). The set points were located at the front, the middle and the end of the composting channel.

**Activity 4(b): Laboratory analysis of the produced compost**

At the beginning of this activity the physicochemical parameters that need to be analyzed were determined taking into consideration the hazardous substances limits and other parameters needed in order to certify the product according to a compost high quality standard. These standards have been based on existing compost quality protocols applied in EU member states (i.e. Germany, RAL – Austria, BKAL, BGBI, KGVÖ - Netherlands BVOR, KIWA – Italy CIC – United Kingdom BSI PAS 100 and EU eco-label). The list of parameters examined is given in Table 13 along with the analysis methods used. Composting sampling was performed to different batches (approximately once every month), whereas 23 parameters were analyzed in each batch. The data obtained were compared against existing quality standards in order to evaluate and determine the characteristics and the quality of the end product. To this point, the results on compost analysis showed that the end product is of good quality with significant added value. More specifically, the concentration of heavy metals, i.e. Cadmium - Cd, Chromium - Cr, Copper - Cu, Nickel - Ni, Lead – Pb and Zinc – Zn, was relative low and complied with most EU quality standards. The level of impurities in end product was low, whereas the chemical characteristics showed that it can stimulate plant growth.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Compost</th>
<th>Analysis Method</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>√</td>
<td>Thermometer</td>
<td>°C</td>
</tr>
<tr>
<td>Moisture</td>
<td>√</td>
<td>ISO 11465:1993</td>
<td>% wb</td>
</tr>
<tr>
<td>Dry Matter</td>
<td>√</td>
<td>ISO 11465:1993</td>
<td>% wb</td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
<td>Oxygenmeter</td>
<td>% v/v</td>
</tr>
<tr>
<td>pH/Conductivity</td>
<td>√</td>
<td>EPA 9045D / EPA 9050A/</td>
<td>-</td>
</tr>
<tr>
<td>Ammonium (NH₄⁺)</td>
<td>√</td>
<td>EPA 350.1-3</td>
<td>%</td>
</tr>
<tr>
<td>Nitrites (NO₃⁻)</td>
<td></td>
<td>ISO 11261:1995 &amp; ISO 11465:1993</td>
<td>%</td>
</tr>
<tr>
<td>Organic Nitrogen (N₉ₒ%*)</td>
<td></td>
<td>Determined by quantifying TN, NH₄⁺, NO₃⁻</td>
<td>% N</td>
</tr>
<tr>
<td>Carbon to Nitrogen ratio (C/N)</td>
<td>√</td>
<td>Determined by quantifying TN &amp; TOC</td>
<td>-</td>
</tr>
<tr>
<td>Ammonium to Nitrites ratio (NH₄⁺/NO₃⁻)</td>
<td>√</td>
<td>Determined by quantifying NH₄⁺ &amp; NO₃⁻</td>
<td>-</td>
</tr>
<tr>
<td>Total Phosphorous (P)</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Total Potassium (K)</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cd</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Cr</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Pb</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Cu</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Ni</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Zn</td>
<td>√</td>
<td>US EPA 3051A:2007 &amp; APHA-AWWA-WEF Standards Methods:</td>
<td>mg kg⁻¹</td>
</tr>
<tr>
<td>Impurities content (glass, plastic metal etc)</td>
<td>√</td>
<td>TMECC Method 03.06 &amp; ASTM D 2217-85</td>
<td>% w.w.</td>
</tr>
<tr>
<td>Compost particle size</td>
<td>√</td>
<td></td>
<td>% w.w.</td>
</tr>
<tr>
<td>Test Type</td>
<td>Method Number</td>
<td>Method Details</td>
<td>% Δ.B.</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Phytotoxicity test</td>
<td></td>
<td>Zucconi et al. 1981</td>
<td></td>
</tr>
<tr>
<td>Viable weed seeds</td>
<td>√</td>
<td>TMECC Method 05.09</td>
<td>count (4L)⁻¹</td>
</tr>
<tr>
<td>Microbiological tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. <em>Salmonella spp.</em></td>
<td>√</td>
<td>TMECC Method 07.02</td>
<td>MPN (4gr)⁻¹</td>
</tr>
<tr>
<td>ii. <em>Escherichia coli</em></td>
<td>√</td>
<td>TMECC Method 07.01-C</td>
<td>MPN g⁻¹</td>
</tr>
<tr>
<td>iii. <em>Helminth Ova.</em></td>
<td>√</td>
<td>TMECC Method 07.04-A</td>
<td>Viable ova (4gr)⁻¹</td>
</tr>
</tbody>
</table>
The results of the measurements and analyses are in brief summarized in the following tables:

### Table 14: Metal content in the produced compost

<table>
<thead>
<tr>
<th>Compost</th>
<th>Cd</th>
<th>Cr_{tot}</th>
<th>Cu</th>
<th>Hg</th>
<th>Ni</th>
<th>Pb</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATHENS BIOWASTE compost from separated at source biowaste (n=17)</td>
<td>0.23</td>
<td>±0.19</td>
<td>126.15</td>
<td>0.07</td>
<td>20.05</td>
<td>103.99</td>
<td>290.97±83.51</td>
</tr>
<tr>
<td>EDSNA compost from mixed waste (produced in the Mechanical Recycling and Composting Facility)</td>
<td>0.94</td>
<td>33.02</td>
<td>214.36</td>
<td>1.08</td>
<td>47.63</td>
<td>182.90</td>
<td>433.81</td>
</tr>
<tr>
<td>End of Waste Criteria (EoWC)</td>
<td>1.5</td>
<td>100</td>
<td>200</td>
<td>1</td>
<td>50</td>
<td>120</td>
<td>600</td>
</tr>
</tbody>
</table>

### Table 15: Compost Quality Criteria

<table>
<thead>
<tr>
<th>Compost Quality Criteria</th>
<th>Parameter</th>
<th>End of Waste Criteria (EoWC)</th>
<th>European Compost Network (ECN)</th>
<th>ATHENS BIOWASTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Improver</td>
<td>Organic Substance</td>
<td>Min 15% d.m.</td>
<td></td>
<td>67.27±8.77 % d.m.</td>
</tr>
<tr>
<td>Health protection</td>
<td>Salmonella sp.</td>
<td>Not present in 25 g of sample</td>
<td>Not present</td>
<td></td>
</tr>
<tr>
<td>(Pathogens)</td>
<td>E. Coli</td>
<td>Max 1000 CFU per gr fresh mass</td>
<td>No limitation</td>
<td>&lt;50 CFU per gr fresh mass</td>
</tr>
</tbody>
</table>

More relevant information is included in the Deliverable under the title "Composting of collected biowaste & analysis of the finished product" (ANNEX 3.12 of the final report). The deliverable aimed to present the organization and operation of the composting facility in the EDSNA facilities for the treatment of segregated biowaste from the served areas of the Municipalities of Athens and Kifissia, as described in the deliverable of ANNEX 3.11 of the project under the title "Implementation and evaluation of biowaste source separation schemes in the selected areas of Athens and Kifissia Municipalities". More specifically, the report is divided into three parts which are described below.

Part A’: A description of EMAK is presented as well as all the units comprising the treatment 1200 tons / day of mixed MSW from Municipalities of Attica Region. In addition, the configuration of the
arrangements in EMAK is presented which make feasible and smooth the treatment of sorted biowaste from the Municipalities of Athens and Kifissia.

Part B': The biowaste composting protocol in EMAK is presented for the entire duration of the implementation of the pilot scale demonstration. More specifically, the protocol includes (a) the pretreatment and composition process of the feed material to the composting unit consisting of sorted biowaste from the areas served and shredded green waste, (b) the feed to the composting channel and (c) the identification and examination of the control parameters of composting and of the final product produced.

Part C': The third part of the report concerns the control and monitoring of the biowaste and green waste composting throughout the pilot scale application process. The temperature, humidity and oxygen were the main composting control parameters used to determine the aerobic treatment conditions and maintain control parameters within favorable levels. In addition, the third part of the report presents the results of the quality control of the produced compost as tested and evaluated in the specialized laboratories of EDSNA and National Technical University of Athens (Unit of Environmental Science and Technology). The product evaluation was based mainly on the European end of waste criteria for biowaste as have been formulated recently by the EU on the basis of the Waste Framework Directive 2008/98/EC.

It is concluded that the biowaste compost produced within the frame of ATHENS BIOWASTE project presented improved characteristics compared to mixed compost of EMAK derived from mechanical selection of mixed MSW. The results were in agreement with similar applications in other EU Member States. The composting unit at EMAK, which comprises of 48 composting channels in total, can be used gradually to receive only sorted biowaste from the Municipalities of the Attica Region. In this way, it is feasible to gradually replace the production of questionable quality mixed compost with biowaste compost which is in line with the required EU end of waste criteria for biowaste.

Till the end of the project, 130 tonnes of compost have been produced and distributed to the market for further utilization and production of soil improver.

Activity 4(c): Compost quality correlation model
The aim of this Activity was to develop a model where the final product quality is correlated to factors influencing the collection and treatment system. To this end, the characteristics - parameters of the input material that influence composting were identified and were measured and monitored, as mentioned in Activity 3 (c). Additionally, the composting conditions namely temperature, oxygen, moisture and organic matter (volatile solids) of the substrate were recorded in Activity 4 (a). Based on this data, the biodegradation rate of the organic material has been investigated by simulating the composting process based on first-order equation of the organic substrate bioxidation incorporating the environmental parameters (environmental correction factors) that influence composting rate and, thus, composting efficiency. All the above mentioned information was correlated to EU compost quality standards so that corrective actions can be taken in case the produced compost does not meet the necessary criteria for certification in the operation in the after LIFE period. The relevant report for Action 4c is provided in ANNEX 3.13 of the final report.

5.1.5. Action 5: Bio-waste management software tool

Action 5a) Development of a Biowaste Management Software Tool
In the framework of this action, a software (so called Athens Biowaste model) has been developed in order to help municipalities build a separate biowaste collection scheme, estimate the direct
investment and operational costs and identify the areas where substantial GHG savings in CO₂ equiv.
could be achieved.
The model is a decision making tool for Municipalities which seek to establish a separate biowaste
collection scheme. Apart from step-by-step building of the collection scheme, the model provides
estimation of direct investment and operational costs allowing the user to evaluate different scenarios
and varied parameters. It also estimates greenhouse gas emissions from biowaste separate collection
and treatment as well as from the overall MSW management system, allowing the user to primarily
identify the parameters controlling the GHG emissions.

All technical assumptions, indicators and equations used in the model have been based on the work
done in the framework of previous actions and all parameters were carefully selected to suit to local
authorities which plan to set out such a scheme and have been kept simple and comprehensible for
decision makers. Furthermore, all indicators used were based on real data from the pilot separate
biowaste collection scheme implemented in Action 3. The model has been developed in Microsoft
Excel platform in order to be user friendly and is accompanied by a Guidance Manual. Snapshots of
the model are also provided in the manual. The model (available in ANNEX 3.14 of the final report)
and the manual (available in ANNEX 3.15 of the final report) can be downloaded from the Athens-
Biowaste website, www.biowaste.gr. In addition, an online version of the model can be found on the
website model.biowaste.gr.

The model and the manual are developed both in the English language for wide application at
international level and in the Greek for the more convenient use by Greek local authorities.
The first version of the model was produced in June 2014 and was presented in the final Athens
Biowaste conference.. This version was also validated (see action 5b) and the final version was
produced in August 2014.
The model has been widely disseminated through the following means:
- International Athens Biowaste Conference (June 2014). Although the first version was
  presented, during the conference more than 20 international representatives requested for
  using the model. In addition, several Greek Municipalities expressed their interest in using the
  model after its final production.
- National Congress of Waste Management Authorities in Syros (July 2014), presented by
  EPTA.
- National seminar for composting and recycling in Municipalities (November 2014), presented
  by NTUA.
- Paper submitted to International Waste and Biomass Journal and publication is expected.
- AthensBiowaste website (biowaste.gr).
- Greek Municipalities’ and Waste management authorities’ mailing list.
- Existing clients and partners (Municipalities) of EPTA and NTUA.
The software will be further disseminated through the website of all beneficiaries.

The model has been developed by NTUA and EPTA and more specifically:
- NTUA was responsible for coordinating this action and for all carbon footprint modelling and
  analysis
- EPTA was responsible for building separate collection and cost analysis.
- NTUA developed the online version of the model, while EPTA the manual.

**Model Demonstration**

For the purpose of this report, the model has been applied in the Municipality of Patras, the third
largest city in Greece. The report produced automatically by the model, including both input values
and results, is presented in ANNEX 3.16 of the final report.
The Municipality of Patras has a population of 214,000 inhabitants, is recycling at source (packaging
waste) approximately 10% of total municipal solid waste (MSW), while 90% of MSW is landfilled
without any pre-treatment.
The scenario modelled considers a low participation rate, i.e. 15%, a collection frequency of 1 per week and 2 per week for summer months and that the Municipality can provide 2 existing vehicles for the purpose of biowaste separate collection. The results are discussed below.

**Investment and operational cost**

The investment cost for establishing a biowaste separate collection scheme in the entire Municipality is estimated 7,9€ per inhabitant and is analysed in the following table:

<table>
<thead>
<tr>
<th>Investment Cost Estimate for Biowaste Separate Collection</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Kitchen caddies</td>
<td>329,208</td>
</tr>
<tr>
<td>For 41,151 kitchen caddies</td>
<td></td>
</tr>
<tr>
<td>2 Bins</td>
<td>197,227</td>
</tr>
<tr>
<td>For 4,500 bins</td>
<td></td>
</tr>
<tr>
<td>3 Vehicles</td>
<td>460,000</td>
</tr>
<tr>
<td>Only for 4 vehicles (2 existing vehicles will be used)</td>
<td></td>
</tr>
<tr>
<td>4 Biodegradable bags</td>
<td>506,397</td>
</tr>
<tr>
<td>About 3,7mil. Bags</td>
<td></td>
</tr>
<tr>
<td>5 Awareness campaign</td>
<td>200,000</td>
</tr>
<tr>
<td>The awareness campaign has been increased in order to cover also some local TV spots</td>
<td></td>
</tr>
<tr>
<td>6 Other equipment</td>
<td>-</td>
</tr>
<tr>
<td>7 TOTAL</td>
<td>1,692,832</td>
</tr>
<tr>
<td>8 total investment cost per inhabitant</td>
<td>7,9</td>
</tr>
</tbody>
</table>

As shown above, the investment cost depends on several items which are either essential for separate collection (e.g. bins, vehicles and awareness campaign), while others can be avoided, in order to decrease overall cost. Indicatively:
- The cost for kitchen caddies is about 19%, while it is not considered necessary for the municipality. The caddies are provided free of charge to the citizens, as a motivation for initiating separate collection.
- The cost for biodegradable bags is relevantly high and this is something that can be avoided. These bags are usually provided free of charge to the citizens for some months (3 months in the study examined) as a motivation to start separate collection.
- The cost for vehicles is about 27% of the total investment cost, as 2 vehicles out of 6 are provided by the Municipality.

The annual operational cost of biowaste separate collection mostly include personnel cost, covering more than 50% of total cost and secondarily fuel and annual vehicle operating costs.

<table>
<thead>
<tr>
<th>Operational Cost Estimate (annual) for Biowaste Separate Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Collection personnel</td>
</tr>
<tr>
<td>10 Fuels</td>
</tr>
<tr>
<td>11 Vehicle Cost</td>
</tr>
<tr>
<td>12 Bins' replacement</td>
</tr>
<tr>
<td>13 Awareness campaign</td>
</tr>
<tr>
<td>14 Administrative personnel</td>
</tr>
<tr>
<td>15 Biodegradable bags (annual renewal)</td>
</tr>
<tr>
<td>16 TOTAL</td>
</tr>
<tr>
<td>17 total operational cost per tonne of biowaste collected</td>
</tr>
</tbody>
</table>

Cost – benefit analysis
At first sight, it is expected that the total collection cost will increase, as a new collection scheme is established additionally to the existing one for MSW, recyclables and other waste streams. In the case of the Municipality of Patras, a benefit of 613,027 € is achieved, if the national landfill tax is applied (date of enforcement: 1/1/2016) and there is a reduction of the current MSW collection frequency by 10%, as shown below:
### Cost Benefit Estimate of overall municipal waste management

<table>
<thead>
<tr>
<th>Current MSW management cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18</strong> Current MSW collection cost</td>
<td>7.123.120 €</td>
</tr>
<tr>
<td><strong>19</strong> Indicative collection cost for MSW per tonne</td>
<td>80 €</td>
</tr>
<tr>
<td><strong>20</strong> Current MSW treatment/landfilling cost</td>
<td>6.718.315 €</td>
</tr>
<tr>
<td><strong>21</strong> Gate fee for treatment of mixed MSW (per tonne)</td>
<td>45 €</td>
</tr>
<tr>
<td><strong>22</strong> Gate fee for landfilling (per tonne)</td>
<td>45 € - 25 €</td>
</tr>
<tr>
<td><strong>23</strong> Landfill tax (per tonne)</td>
<td>60 €</td>
</tr>
<tr>
<td><strong>24</strong> TOTAL CURRENT MSW MANAGEMENT COST (18+20)</td>
<td>13.841.435 €</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New MSW management cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>25</strong> New MSW &amp; Biowaste collection cost</td>
<td>6.803.922 €</td>
</tr>
<tr>
<td><strong>26</strong> % reduction of current collection frequency</td>
<td>10%</td>
</tr>
<tr>
<td><strong>27</strong> New MSW treatment/landfilling cost</td>
<td>6.218.806 €</td>
</tr>
<tr>
<td><strong>28</strong> Biowaste treatment cost</td>
<td>205.680 €</td>
</tr>
<tr>
<td><strong>29</strong> Gate fee for biowaste treatment per tonne</td>
<td>35 €</td>
</tr>
<tr>
<td><strong>30</strong> TOTAL NEW MSW MANAGEMENT COST</td>
<td>13.228.408 €</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COST – BENEFIT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>31</strong></td>
<td>- 613.027 €</td>
</tr>
</tbody>
</table>

It shall be noted that the Municipality has to reduce MSW collection cost by 1.5% in order to avoid increasing total cost after biowaste separate collection. This reduction can be easily achieved by altering collection frequency. In addition, it is worth mentioning that benefit is achieved although the current gate fee for waste treatment (landfilling) is too low, equals to 25€ per tonne, and the gate fee for biowaste treatment is taken as 35€ per tonne.
Increasing the participation rate from 15% to 25%, the benefit increases to 807.000€, corresponding to a 30% increase. I

**Carbon footprint**

By establishing a new biowaste separate collection scheme, GHGs are emitted by new collection routes and biowaste treatment. Moreover, there are direct savings from diverting waste from landfilling and indirect (downstream) by substituting materials with compost produced. Thus, a comparison of GHG emissions at a system level can provide more consistent results for the Municipality, as shown below:

<table>
<thead>
<tr>
<th>Carbon Footprint Estimate for overall MSW collection, transportation, treatment and landfilling</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO2 eq Current Collection &amp; Treatment System (tn/year)</strong></td>
</tr>
<tr>
<td>1 MSW Collection/Transfer <em>(rough estimation)</em></td>
</tr>
<tr>
<td>2 Recycling of separated collection materials</td>
</tr>
<tr>
<td>3 MSW Treatment</td>
</tr>
<tr>
<td>4 MSW Landfilling <em>(Landfilling (Biogas Incineration)</em></td>
</tr>
<tr>
<td>5 TOTAL</td>
</tr>
<tr>
<td><strong>CO2 eq new Collection &amp; Treatment System (tn/year)</strong></td>
</tr>
<tr>
<td>6 MSW &amp; Biowaste Collection/Transfer <em>(rough estimation)</em></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

The results show that the case modelled can lead to substantial GHG savings, as landfilling is the prevailing waste management method. As discussed in many studies collection and transportation play a minor role in total GHGs emissions, while recycling of separate collected materials has major contribution to savings. In addition waste treatment technologies can contribute more or less in overall savings especially when these are compared with landfilling.
Conclusions
Modelling the case of the Municipality of Patras, the following conclusions can be discussed:
- Even with a low participation rate of 15%, benefit can be achieved in the operational cost of the overall MSW management system after establishing a biowaste separate collection system. The benefit corresponds approximately to 4.4% of the total annual operational cost.
- The Municipality has to alter its existing MSW collection system and reduce by 1.5% the collection frequency in order to achieve the aforementioned benefit.
- The benefit will increase to 6% of the total operational cost, if the participation rate increases from 15% to 25%. This can be achieved through an intensive awareness campaign.
- As landfilling is the prevailing waste management method in the Municipality, establishing a separate biowaste collection, results in substantial GHG savings up to 4,800 t/year. This corresponds to a 11% decrease of the current emissions (in CO₂ eq) produced by the existing MSW management system.

Action 5b) Verification and validation of the software tool in the selected municipalities
The model has been applied in three different Municipalities, representing European urban, suburban and rural areas, varying in population and building characteristics. For all areas, two types of collection schemes were examined, namely door-to-door and road containers collection. All validation process was co-ordinated by EPTA in co-operation with NTUA, the Municipalities of Athens and Kifissia.
More specifically, the areas selected were:
- An area of 17,500 inhabitants (Nea Erythraia) in the Municipality of Kifissia.
- An area of 48,000 inhabitants (3rd Municipal Community) of the City of Athens which consists of the south western districts of Athens: Akropolis, Votanikos, Rouf, Ano & Kato Petralona and part of Elaiona.
- An island with 4,977 inhabitants (Milos Island) which is situated in the southwest of Cyclades islands.
The results of this verification process were discussed with the two Municipalities of Athens and Kifissia and several amendments were made in the model after the first draft. The final validation of the model was taken place for the same areas and the results were presented in a paper submitted to Waste and Biomass Journal showing all results, discussions and conclusions. The paper is attached as dissemination annex in Annex 6.26.

The planned outputs (expected results) compared to the ones implemented and the time schedule of this action are shown below:

**Table 16: Action outputs (planned and final)**

<table>
<thead>
<tr>
<th>Planned outputs</th>
<th>Final project outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of one (1) version of the software tool</td>
<td>Creation of one (1) software tool, the so-called Athens Biowaste model</td>
</tr>
<tr>
<td>Dissemination of the software tool to at least 60 Waste Management Authorities</td>
<td>The software tool is available online for download by any interested body and has been disseminated to all waste management authorities through the International Athens Biowaste Conference (June 2014) and the National Congress of Waste Management Authorities (July 2014). It has also been distributed to a mailing list of Municipalities and Waste Management Authorities. Additional dissemination activities are foreseen in the framework of the After-LIFE Communication plan.</td>
</tr>
<tr>
<td>Application of the software in the two (2) case study areas with the purpose of its verification</td>
<td>Application of the software in three (3) case study areas with the purpose of its verification and publication of results.</td>
</tr>
</tbody>
</table>

**Table 17: Time schedule of Action 5 (planned and implemented)**
As shown in the aforementioned table, this action has been implemented according to schedule. Dissemination activities will continue to take place in the framework of After-LIFE plan. During the site visit in Austria (as described in Action 6), the model was discussed with the Austrian experts and was indicatively applied for Linz municipality. Suggestions were made related to carbon footprint indicators and composting and anaerobic treatment of biowaste.

The indicators that have been used to test the performance of the action are presented below:

**Table 18: Progress Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Values</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of required input values that can be added in the tool by the decision maker</strong></td>
<td>- Municipality Basic Information (6 inputs)</td>
<td>Minimum entries are required, showing the simplicity of the model</td>
</tr>
<tr>
<td></td>
<td>- Area of separate collection (6 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Waste Management in the Municipality (7 inputs)</td>
<td></td>
</tr>
<tr>
<td><strong>Number of optional input values that can be added in the tool by the decision maker</strong></td>
<td>- Area of separate collection (2 inputs)</td>
<td>A significant number of entries can be entered additionally by more advanced users. This allows more advanced users to use the model.</td>
</tr>
<tr>
<td></td>
<td>- Waste Management in the Municipality (7 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Selection of bins &amp; biodegradable bags (13 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Selection of collection &amp; transfer system (10 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Selection of fleet management (7 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Separate collection &amp; management costs (6 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Prices per item (22 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Annual cost per item (13 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Optimization parameters (11 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bulk Nitrous oxide (N(_2)O) and Methane (CH(_4)) emission factors (g/km) for Rigid Heavy Duty</td>
<td></td>
</tr>
</tbody>
</table>
Vehicles (210 inputs)
- GHG emissions from the treatment of waste (14 inputs)

<table>
<thead>
<tr>
<th>Number of default values that user can modify</th>
<th>More than 25 suggested values</th>
<th>All these values can be modified by the user.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of calculated values</td>
<td>73</td>
<td>Most of the values calculated can be modified by the user.</td>
</tr>
</tbody>
</table>

Estimating annual operational cost of separate biowaste collection scheme

Estimating investment cost of separate biowaste collection scheme

Estimating cost – benefit of overall MSW management system

Estimating carbon footprint of overall MSW management system

Optimizing annual operational cost of separate biowaste collection scheme

Optimizing investment cost of separate biowaste collection scheme

Optimizing cost – benefit of overall MSW management system

Optimizing carbon footprint of overall MSW management system

<table>
<thead>
<tr>
<th>Number of graphs automatically produced in the software</th>
<th>6</th>
<th>Cost estimation and carbon footprint graphs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of reports automatically produced in the software</td>
<td>1</td>
<td>A 6-page report is produced with input values, results and graphs</td>
</tr>
<tr>
<td>Number of manuals produced and distributed.</td>
<td>1</td>
<td>A 2nd version will be produced if the software is amended.</td>
</tr>
<tr>
<td>Number of official validation cases</td>
<td>3</td>
<td>The software was validated in 3 case studies: the Municipality of Athens, the Municipality of Kifissia and the Municipality of Milos (island)</td>
</tr>
<tr>
<td>Number of unofficial validation cases</td>
<td>More than 15</td>
<td>The software is continuously being validated and has already been applied to more than 15 cases by project beneficiaries.</td>
</tr>
<tr>
<td>Large-scale dissemination activities of the software</td>
<td>6, including:</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>- International Athens Biowaste Conference (June 2014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- National Congress of Waste Management Authorities (July 2014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Paper submitted to International Waste and Biomass Journal – publication is expected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- AthensBiowaste website.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mailing list of Municipalities &amp; Waste management authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- National seminar for composting and recycling in Municipalities (November 2014)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Further dissemination activities of the software</th>
<th>1. Beneficiaries’ websites</th>
<th>These actions have been scheduled to take place in the framework of the After-LIFE plan and most of them have already been organized.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. All conferences that NTUA and EPTA participates</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The implementation of this action has not raised serious risks or problems. However, a few problems have been identified and are described below:

- **Combing scientific state-of-art and simplicity for decision makers**

A software tool should always be developed with high scientific integrity, which means that data have to be accurate and representative of the case study area. On the other hand, the Athens-Biowaste software was mainly addressed to local authorities that plan to set out a biowaste separate collection scheme and had to be kept simple and comprehensible for decision makers. Combining these issues was of great difficulty and it is believed that both of them have been achieved. Decision makers can easily use the software, while international acceptance has already been acknowledged with the submission and acceptance of a relevant scientific paper to the Journal “Waste and Biomass Valorization”.

- **Dissemination activities**

Although the software has been completed on time, as foreseen in the proposal, dissemination activities could not be completed to a large extent, as planned by the ATHENS-BIOWASTE beneficiaries. However, it has been decided that due to the great application potential of the software, its dissemination and support will take place also after the end of the project by NTUA and EPTA. This has been confirmed by several activities, such as:

a) EPTA applies the software to all clients (Municipalities) that wish to implement a biowaste separate collection system. The software is also applied in local and regional waste management plans, that EPTA implements. In this way, the software is indirectly disseminated to local authorities. It shall be noted that biowaste separate collection will be boosted in most of the 325 Municipalities in Greece as well as in other EU south-eastern countries following EU policies.

b) NTUA applies the software for scientific purposes to Municipalities that co-operate and disseminate it in all conferences. In addition, more scientific papers will be submitted for publication within the next years.

c) Dissemination on all project partners’ website.
All these actions have been incorporated in the After-LIFE Communication Plan. It shall be noted that dissemination and promotion of the software has been and still is of great importance for all ATHENS-BIOWASTE beneficiaries, as it constitutes a strong tool that can be used by a number of local authorities worldwide.

5.1.6. Action 6: National bio-waste plan and recommendations

Status – Completed

Foreseen duration: 01/01/2014 - 30/07/2014
Actual duration: 01/01/2014 - 31/08/2014

Action 6 initiated on 01/01/2014 and was completed at the end of the project implementation. It consisted of two (2) individual activities:

- Activity 6(a): Guide on biowaste management for local authorities
- Activity 6(b): Recommendations for technical specifications and biowaste related legislation.

In order to perform both activities effectively, a 2-day site visit in Austria was planned and took place in April 2014 with the participation of two members of the NTUA working team and three members of the EPTA working team. The ATHENS-BIOWASTE working team had the chance to visit different composting units and discuss with the experienced Austrian experts about suggestions related to carbon footprint indicators and composting and anaerobic treatment of biowaste (Action 5), as well as how local authorities are involved in biowaste management and the provisions of the national legislative framework regarding technical specifications. Indicative photos are given in ANNEX 1.19 of the final report.

Activity 6(a): Guide on biowaste management for local authorities

In the framework of this activity, a Guide for the implementation, monitoring and evaluation of biowaste separate collection schemes and composting has been developed by EPTA with the contribution of NTUA and EDSNA (ANNEX 3.17 of the final report). The Guide incorporates all the experience gained throughout project implementation and is addressed to local authorities that seek to implement separate collection and composting of biowaste. The Guide is divided in five (5) parts, as following:

A. Planning of separate collection scheme (availability of composting plant, initial plan, selection and supply of equipment and consumables, awareness campaign plan, cost estimation)
B. Initiation of separate collection scheme (implementation of the 1st phase of the awareness campaign, distribution of bins, implementation of the 2nd phase of the awareness campaign)
C. Operation, Monitoring and Evaluation of separate collection scheme (monitoring procedures, implementation of the 3rd phase of awareness campaign, operational cost)
D. Minimum requirements - Checklist
E. Annex (Templates of Printed Brochure – Posters, Manual for bins, FAQ, Information Forms, Evaluation Questionnaire, etc.)

The Guide was produced in printed version (500 copies) and electronic version (in pdf) available on project website. All printed versions, apart from some copies kept by the beneficiaries have been distributed to representatives from the Ministry for the Environment, to all 66 Municipalities in the Attika Region (through EDSNA) and to selected Municipalities and Waste management authorities in Greece.

In addition, NTUA has distributed the Guide to all Greek Municipalities and Waste Management Authorities via mailing list. The Guide has been downloaded 597 times till March 2015 (417 in 2014 and 180 in 2015).
Activity 6(b): Recommendations for technical specifications and biowaste related legislation

The Greek legislation related to technical specifications for organic waste management includes provisions concerning facilities of aerobic and anaerobic treatment of mixed waste, especially focusing on the end product (Compost Like Output / CLO). Since the CLO is a material with quite limited uses due to impurities, the technical specifications for biowaste management should be extended so as to include their separate collection which can lead to the production of high quality compost.

The first Joint Ministerial Decision (JMD) establishing the technical specifications for the management of Municipal Solid Waste (MSW) was the CMD 114218/1997. Regarding the organic fraction of waste, the specifications were restricted to the operation of aerobic treatment, in general, and the characteristics of the produced compost from mixed waste. The JMD 56366/4351/2014 (OG B 3339 12/12/2014) was published in the end of December 2014, amending the JMD 114218/1997, introducing new limit values on compost produced from mixed waste, technical specifications for both aerobic and anaerobic treatment process, while, at the same time, setting limit values for secondary fuels.

Minimum quality standards of products from mixed waste processing facilities

The minimum quality standards of the products (compost class A and digestate class A) produced from treatment facilities for mixed waste, in accordance with the aforementioned JMD, are summarized in the following Table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit value</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>≤ 3 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>≤ 250 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>≤ 400 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>≤ 100 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>≤ 300 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>≤ 1.200 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>≤ 10 mg/kg dry matter</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>≤ 2,5 mg/kg dry matter</td>
<td>ISO 16772</td>
</tr>
<tr>
<td>Water content</td>
<td>≤ 40%</td>
<td></td>
</tr>
<tr>
<td>Polychlorinated Biphenyls (PCBs)</td>
<td>≤ 0,4 mg/kg dry matter</td>
<td>ISO 10382:2002</td>
</tr>
<tr>
<td>Polycyclic Aromatic Hydrocarbons (PAHs)</td>
<td>≤ 3 mg/kg dry matter</td>
<td>ISO 18287:2006</td>
</tr>
<tr>
<td>Impurities &gt; 2 mm</td>
<td>≤ 3% on dry matter weight</td>
<td></td>
</tr>
<tr>
<td>Content of viable weeds and plant propagules</td>
<td>3 viable weed seeds per liter of product</td>
<td></td>
</tr>
<tr>
<td>Content of pathogens: Salmonella spp.</td>
<td>No Salmonella sp. in 50 g sample</td>
<td>ISO 6579:2002</td>
</tr>
</tbody>
</table>

Targeted proposals for technical specifications of biowaste management

The ATHENS-BIOWASTE project was the first substantial experience regarding source separation and processing of pre-sorted biowaste. Given that, the suggestions for the preparation of the technical specifications and the provision of recommendations included in the Deliverable are based on the experience gained and the outcomes of the project. Additional elements which were taken into consideration were the National and EU legislation on biowaste, the experience from various other projects concerning the effectiveness of separate collection and European general technical
specifications, such as the End-of-Waste Criteria for biodegradable waste of the European Commission.

Some of the proposals are given in the Table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit value</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>( \leq 1.5 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>( \leq 100 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>( \leq 200 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>( \leq 50 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>( \leq 120 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>( \leq 600 \text{ mg/kg dry matter} )</td>
<td>EN 13650:2001</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>( \leq 1 \text{ mg/kg dry matter} )</td>
<td>ISO 16772</td>
</tr>
<tr>
<td>Water content</td>
<td>( &lt; 40% )</td>
<td></td>
</tr>
<tr>
<td>Impurities ( &gt; 2 \text{ mm} )</td>
<td>( \leq 0.5% ) on dry matter weight</td>
<td></td>
</tr>
<tr>
<td>Content of viable weeds and plant propagules</td>
<td>2 viable weed seeds per liter of product</td>
<td>ISO 6579:2002</td>
</tr>
<tr>
<td>Content of pathogens: <em>Salmonella</em> spp.</td>
<td>No <em>Salmonella</em> sp. in 25 g sample</td>
<td>ISO 6579:2002</td>
</tr>
</tbody>
</table>

Furthermore, the development of an appropriate certification protocol for the quality of compost or digestate produced from source-sorted biowaste should be foreseen. Such protocols establish the necessary conditions for the development of the relevant market for the aforementioned materials.

Finally, regarding the organization of a source separation system, it should be set at the discretion of each municipality in order to examine what is the best solution in relation to the characteristics of the area concerned. This review can be done in accordance with the specifications outlined in the Guide and the Athens Biowaste model.

More information is provided in the Deliverable 6b - Proposals for the technical specifications and legislation of biowaste (ANNEX 3.18 of the final report).

The planned outputs (expected results) and time schedule of this action compared to the ones implemented are shown below:

<table>
<thead>
<tr>
<th>Planned outputs</th>
<th>Final project outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of one (1) guide on biowaste management for local authorities</td>
<td>A guide, so called, ‘Guide for the implementation, monitoring and evaluation of biowaste separate collection schemes and composting’ has been produced.</td>
</tr>
<tr>
<td>At least 5 technical recommendations for the amendment of technical specifications</td>
<td>A proposal with Seven minimum compost quality specifications from separated at source materials.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planned outputs</th>
<th>Final project outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of one (1) guide on biowaste management for local authorities</td>
<td>A guide, so called, ‘Guide for the implementation, monitoring and evaluation of biowaste separate collection schemes and composting’ has been produced.</td>
</tr>
<tr>
<td>At least 5 technical recommendations for the amendment of technical specifications</td>
<td>A proposal with Seven minimum compost quality specifications from separated at source materials.</td>
</tr>
<tr>
<td>Action 6</td>
<td>Start Date</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>Action 6(a): Guide on biowaste management for local authorities</td>
<td>01/01/2014</td>
</tr>
<tr>
<td>Action 6(b): Recommendations for technical specifications and biowaste related legislation.</td>
<td>01/04/2014</td>
</tr>
</tbody>
</table>

**Deliverables**

- Guide on biowaste management for local authorities | 30/05/2014 | 30/06/2014
- Recommendations for technical specifications and biowaste related legislation | 30/07/2014 | 31/08/2014

**Milestones**

- National Biowaste Plan prepared | 30/05/2014 | 10/06/2014 (Presented in the national conference)
- Distribution of the Guide on biowaste for local authorities commenced | 01/06/2014 | 01/08/2014
- Recommendations for technical specifications and biowaste related legislation submitted to the Ministry for the Environment | 30/07/2014 | 31/08/2014

As shown in the aforementioned table, this action has been implemented according to schedule. Dissemination activities will continue to take place in the framework of After-LIFE plan.

### 5.1.7. Action 8: Monitoring & Evaluation

**Status – Completed**

**Foreseen duration: 01/09/2011 - 31/03/2014**

**Actual duration: 01/09/2011 - 31/03/2014**

Action 8 initiated on 01/09/2011 and was implemented throughout the project’s duration. It consisted of two (2) individual activities:

- Activity 8(a): Development of End-of-Action Reports
- Activity 8(b): Evaluation of the performance indicators

The monitoring and evaluation of each Action of the project was undertaken by the respective action leader in collaboration with the Coordination Group by means of the End-of-Action Reports and of the performance indicators. The End-of-Action reports had been elaborated by the respective Action leaders and submitted to the Coordination Group for evaluation together with the indicator checklists. The End-of-Action reports contain information on the progress made during the implementation of the Actions and compare the objectives set in the approved proposal. In turn, the members of the Coordination Group evaluated the reports and provided feedback statement through a performance indicators checklist (included in the End-of-Action reports) based on which the project progress was considered satisfactory.

ATHENS-BIOWASTE LIFE10 ENV/GR/000605
The ATHENS-BIWASTE End-of-Action Reports are summarized in the Table below:

<table>
<thead>
<tr>
<th>End-of-Action Report</th>
<th>Action</th>
<th>Completion Date</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-of-Action Report 1</td>
<td>1</td>
<td>31/08/2014</td>
<td>Annex 3.19 of the final report</td>
</tr>
<tr>
<td>End-of-Action Report 2</td>
<td>2</td>
<td>31/03/2013</td>
<td>Annex 3.6 of the midterm report</td>
</tr>
<tr>
<td>End-of-Action Report 3</td>
<td>3</td>
<td>31/08/2014</td>
<td>Annex 3.20 of the final report</td>
</tr>
<tr>
<td>End-of-Action Report 5</td>
<td>5</td>
<td>31/08/2014</td>
<td>Annex 3.22 of the final report</td>
</tr>
<tr>
<td>End-of-Action Report 6</td>
<td>6</td>
<td>31/08/2014</td>
<td>Annex 3.23 of the final report</td>
</tr>
<tr>
<td>End-of-Action Report 7</td>
<td>7</td>
<td>31/08/2014</td>
<td>Annex 3.24 of the final report</td>
</tr>
</tbody>
</table>

The main parameters used for the evaluation of the performance indicators were:
- Sufficiency of data collected and references used
- Weight of the performance indicators
- Use of accredited reference sources
- Use of the latest available data
- Potential for improvement
- Use of primary data
- Compilation of original work.

The performance indicators of Action 8 are presented in Table 24.

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Target number</th>
<th>Achieved number</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of the initially set performance indicators succeeded by the end of the project</td>
<td>&gt;95%</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>Percentage of the milestones achieved</td>
<td>&gt;95%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Decrease in the appearance of concerns and problems</td>
<td>-</td>
<td>-</td>
<td>No concerns and problems were arisen</td>
</tr>
<tr>
<td>List of the parameters used for the evaluation of the performance indicators</td>
<td>-</td>
<td>-</td>
<td>For a detailed information on the parameters used, see all End-of-Action reports</td>
</tr>
</tbody>
</table>

ATHENS-BIWASTE  LIFE10 ENV/GR/000605
3.1.8. Action 9: After LIFE Communication Plan

Status – Completed

Foreseen duration: 01/07/2014 - 31/08/2014

Actual duration: 01/07/2014 - 31/08/2014

All ATHENS-BIOWASTE beneficiaries are devoted to keep the ATHENS-BIOWASTE alive after the end of the project implementation. The After-LIFE Communication Plan includes the following:

- Update and maintenance of the ATHENS-BIOWASTE website ([www.biowaste.gr](http://www.biowaste.gr)) for at least five (5) years. In addition, all the emails linked to the project will be active for support. This task has been undertaken by NTUA.

- The Athens Biowaste software along with its manual will remain at the disposal of any interested party. Support will be provided for at least 5 years, while new updates or versions will be available in case of identified problems or malfunctions.

- Presentation of the results and outcomes of the ATHENS-BIOWASTE project in future events, networking activities and conferences. Indicatively, the following presentations have been made after the end of the project:

  1. Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “Biowaste Management at municipal level: The ATHENS-BIOWASTE project” in Thessaloniki on 2nd April 2015 making detailed reference to the activities and achievements of the ATHENS-BIOWASTE project ([ANNEX 6.38](#)).

  2. Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “Waste Management: The role of Citizens” in the ATHENS-SCIENCE FESTIVAL at Technopolis in Gazi on 20th March 2015 making special reference to the activities and achievements of the ATHENS-BIOWASTE project ([ANNEX 6.39](#)) of the final report).


6. Dr. Dimitris Malamis represented the ATHENS-BIOWASTE working team by presenting the ATHENS-BIOWASTE project in the networking meeting with projects implementing actions on waste management in the framework of the project “Promoting ZEROWASTE” (MED CAP 2007-2013) on 1st October 2014 (http://www.zerowastepro.eu/events/networking-workshop-in-athens-greece). This was a networking activity (Waste Related Projects that were presented (in Greek) (ANNEX 6.43 of the final report).

7. Dr. Dimitris Malamis represented the ATHENS-BIOWASTE working team by presenting the ATHENS-BIOWASTE project in the LIFE+ WASP-Tool Workshop on 23rd September 2014 (http://www.eedsa.gr/library/downloads/Docs/%CE%A0%CF%81%CE%BF%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%B1%20%CE%97%CE%BC%CE%B5%CF%81%CE%AF%CE%B4%CE%B1%CF%82%CE%A0%CF%81%CF%8C%CE%BB%CE%B7%CF%88%CE%B7%20%CE%91%CF%80%CE%BF%CE%B2%CE%BB%CE%AE%CF%84%CF%89%CE%BD_23-9-2014.pdf). This was a networking activity (ANNEX 6.44 of the final report).

- Presentation of key outcomes of the ATHENS-BIOWASTE project in the national Guide for the operation of small composting plants, issued by the O.P. for the Environment and the Ministry for the Environment in December 2014. The guide was prepared by EPTA and is available online on the ministry’s website http://www.ypeka.gr/LinkClick.aspx?fileticket=0HenuRMoJis%3d&tabid=898&language=el-GR (page 18 & 40 has reference on the project).

- The ATHENS-BIOWASTE working team keeps working hard in order to succeed to influence the future decisions of the competent authorities regarding the waste status in the country and especially in the Attica Region. The authorities want to hear the suggestions of the ATHENS-BIOWASTE team, since this was the first implementation of the separate collection of biowaste of such scale.

- The ATHENS-BIOWASTE working team and especially Prof. Loizidou, the coordinator of the project supports that the EDSNA Mechanical and Composting Facility can gradually accept and treat the separated at source biowaste from the Municipalities of the Attica Region. More specifically, the EDSNA infrastructure can handle 155,000 tonnes of biowaste per year, which actually caters for:
  - 16.3% of the generated biowaste in the Region of Attica.
  - 5.8% of the generated biowaste at national level.

The infrastructure developed in the framework of the project by EDSNA (without being charged) is of high added value, as the plant can accept biowaste from many municipalities in the Region. This is of great importance, considering that no other infrastructure for treating source separated biowaste exists at the moment.

- The two Municipalities continue the implementation of the separate collection of biowaste in the selected areas. In fact, their willingness and planning is not only to continue, but also to expand quickly the relevant implementation in their municipalities. More specifically, the relevant actions are as follows:
  - MoA: The Municipality of Athens received, on behalf of EDSNA, biodegradable bags with capacity of 10 lt and 30lt designed to be used for the separate collection of biowaste and composting within the LIFE+ ATHENS BIOWASTE project. These bags were granted free to EDSNA from the Region of Attica. The notices were placed on building blocks of the areas A, B and C in Kypriadou Area. The kiosk was set up in Papadiamanti square between the streets Markora, Drosini and Kalosgourou and Chalepa-Papalouka square between the streets Chalepas, Markora and Mitsakis in order to
The 10lt -biodegradable bags were given to households, while the 30lt -biodegradable bags were given to local shops which participate in the scheme from 26th September 2014 until 5th October 2014. It is noted that the plan of the Municipality is expand the biowaste separate collection as soon as additional resources are available. The next new point for biowaste separate collection in 2015 is the Helena Venizelou Hospital (where babies are born). That is why the Municipality of Athens assisted by the NTUA working team had also applied for the recent Call for Proposals under the Operational Programme for the Environment addressing Municipalities and Waste Management Authorities. This Call (total available budget: 25 million €.) aimed at promoting separate collection of biowaste over Greece by funding all necessary equipment and dissemination material. Unfortunately, eventually much less resources were available due to the economic crisis and eventually only two Municipalities were approved for getting funded for this reason. Heraklion Municipality in the Attica Region is the first one and the relevant application folder was prepared by the NTUA working team.

MoK: Apart from the continuation of the biowaste separate collection in the selected six areas, the Municipality of Kifissia has already proceeded with the further expansion of the initiative. More specifically, two additional areas of the MoK, namely Adames and Alonia, and stores of the MoK, are served by the ATHENS-BIOWASTE initiative since 29th November 2014. The New Mayor and the New Vice Mayor of the Cleaning Services that took over since 1st September 2014 have also planned the expansion of the biowaste separate collection in the whole municipality very soon. For this reason, a tendering procedure is expected to take place soon for the additional purchase of 500 120-litre bins and 2,000 10-litre bins so that all residents can separate biowaste from the mixed waste on voluntary basis. The relevant budget will be covered by the MoK Budget for 2015. The Municipality of Kifissia also received, on behalf of EDSNA, and distributed biodegradable bags with capacity of 10 lt and 30lt designed to be used for the separate collection of biowaste.

The NTUA and EPTA working teams work hard in order to further promote the use of developed software tool and assist Municipalities in evaluating all relevant parameters and having an overview of how biowaste separate collection can influence the total waste management cost and ensure GHG emission savings.

The ATHENS-BIOWASTE project has been the starting point for the implementation of biowaste separate collection in Greece. All municipalities and the great majority of citizens have been informed by the wide and extremely successful awareness and dissemination strategy and campaign about the ATHENS-BIOWASTE activities in the two municipalities and the benefits for the environment. A number of Municipalities have already been informed at political level by NTUA and EPTA. For example: The implementation of biowaste separate collection is initiating in Naousa. EPTA has implemented Regional Waste Management Plans for the Region of Thessaly and Ipeirus and has directly informed and disseminated project deliverables to all Municipalities. Therefore, it is true to say that the effective implementation of the ATHENS-BIOWASTE project and the relevant successful circulation of that achievement act as a motive for all local authorities to find the initially required means...
and funds in order to proceed with following the example of the Municipalities of Athens and Kifissia.

- The new Head of the Region of Attica has already been informed about the significant value of the ATHENS-BIOWASTE project and the 2015 budget of the Attica Region has already **foreseen resources of 500,000 Euros (budget code: 02.70.04.7135.01)** for the purchase and distribution of brown bins for the initiation of the biowaste separate collection in areas of the Municipalities of Attica. Furthermore, EDSNA and the Region of Attica are devoted to the continuation and expansion of the biowaste separate collection, as proved by **the decision of the EDSNA Committee within March 2015 (ANNEX 2.5 of the final report)**. What is more, the EDSNA has just published (March 2015) the **Guide for the preparation of local plans for the decentralised waste management making clear reference to the ATHENS-BIOWASTE initiative** (see page 5 of the Guide that is available at **ANNEX 2.6 of the final report**). This Guide has been prepared for the Municipalities of the Attica Region and is a clear tool promoting the biowaste separate collection in practice.

- Finally, it is also important to note that the ATHENS-BIOWASTE working team has contributed to developing a market for high quality compost. It is estimated that if the channels of the Mechanical Recycling and Composting Facility of EDSNA at Ano Liosia received separated at source biowaste, then the relevant high quality compost would have been totally absorbed in the Greek market seeing that there is lack for organic matter in Greece and thousands of tons of such products are imported every year in Greece. Therefore, in this way the ATHENS-BIOWASTE project is also expected to contribute to create more jobs in the near future and strengthen the Greek economy. Indicatively, EU companies have just started operating in Greece in this field feeling that the relevant market is promising. For instance, Compost Systems from Austria has developed a Greek company in order to train Greek interested parties how to produce high quality compost and introduce their composting systems in the promising Greek market. That is also the reason why the NTUA laboratory has decided to invest money and become and remain certified with ISO 17025, since a new market is being created in Greece and the ATHENS-BIOWASTE project has played a key role towards this direction.

5.1.8. Action 10: Networking with other projects

**Status – Completed**

**Foreseen duration:** 01/09/2011 - 31/08/2014

**Actual duration:** 01/09/2011 - 31/08/2014

Action 10 initiated on 01/09/2011 and was implemented throughout the project’s duration. Overall, at least 15 other projects sharing some of their goals with ATHENS-BIOWASTE were identified and networking activities were implemented in the framework of the ATHENS-BIOWASTE project. At first, the ATHENS-BIOWASTE team shared experiences with the other waste related projects that the personnel of the Unit of Environmental Science & Technology participates, namely the DRYWASTE project, the WASTE2BIO project, the ISWM-TINOS project, the RECYCLING@HOME project, the BALKWASTE project.

It is also noted that members of the working teams of other relevant LIFE+ projects participate in the ATHENS-BIOWASTE Steering Committee and provide relevant feedback for networking (e.g. Associate Prof. Katia Lazaridi (WASP Tool Project: [http://wasptool.hua.gr](http://wasptool.hua.gr)) and Dimitris Homatidis (Pay As You Throw Project).

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Furthermore, representatives of several waste related projects participated in the final Conference of the ATHENS-BIOWASTE project in June 2014 and shared experiences with the ATHENS-BIOWASTE working team. Such indicative papers and presentations in the ATHENS-BIOWASTE conference agenda included:

   This paper was also submitted in the Special Issue of the Journal WASTE & BIOMASS VALORIZATION for the ATHENS-BIOWASTE Conference.
2. Z. Gaitanarou, G. Tentes, Y. Katselis, Landfill Mining: An empirical review on past and state-of-the-art applications. (Networking with the LIFE+ RECLAIM Project (LIFE12 ENV/GR/000427) available at: www.reclaim.gr)
4. I. V. Skiadas, H. N. Gavala, AMMONOX research project: Use of ammonia for enhancing biogas production from waste lignocellulosic biomass & reducing NOx emissions from biogas engines

In addition, the ATHENS-BIOWASTE project was presented by Dr. D. Malamis during the LIFE+ WASTE-C-CONTROL Closing event which took place on Wednesday 25th September 2013 at Divani Caravel Hotel.

The ATHENS-BIOWASTE team had also networking contacts with other waste related LIFE+ projects in the Green Week (LIFE Waste Platform Meeting on 3rd June 2014) in Brussels. Additional projects that the ATHENS-BIOWASTE team has made networking activities are mentioned in the AFTER-LIFE Activities.
5.2 Dissemination actions

The ATHENS-BIOWASTE working team gave extremely high emphasis on this Action, since the high dissemination impact has been a necessary precondition for the success of the ATHENS-BIOWASTE activities. Therefore, the ATHENS-BIOWASTE team intended and actually planned to do much more than those foreseen in the ATHENS-BIOWASTE contract being able to make thousands simple citizens get aware of the ATHENS-BIOWASTE project and the impact of the LIFE Programme of the European Commission to the everyday life of citizens.

More specifically, the relevant dissemination activities during the 36-month project implementation included the following:

As soon as the ATHENS-BIOWASTE banner was designed and was available and the ATHENS-BIOWASTE website was active, a press conference (although not foreseen within the contract) took place at the Administration Building of the National Technical University of Athens on Wednesday 9th November 2011. Representatives from all mass media at national level, the local media working within the two Municipalities (Athens & Kifissia) and all Municipalities from the Attica Region were invited to attend. The whole way that the press conference was organised was very careful and all beneficiaries were active in order to make it successful. EDSNA was responsible for notifying the Representatives of the Municipalities, NTUA for inviting the national mass media and Academic Staff, the two Municipalities for forwarding the relevant information to the local media. Five main speakers took part in the first ATHENS-BIOWASTE press conference, namely Prof. Maria Loizidou representing NTUA, Mr. Nikolaos Chiotakis, Mayor of Kifisia and President of EDSNA, Mr. Andreas Varelas, Vice Mayor of the Athens Municipality for Cleaning - Recycling, Mr. Vasilis Xipolitas, Vice Mayor of the Athens Municipality for Cleaning-Recycling, Mr. Dimopoulos from EDSNA, Mr. George Iliopoulos, General Director of EPTA SA and Vice President of the Technical Chamber of Greece. The Text distributed to the media representatives, the Invitation, the Participant List as well as the Minutes of the press conference are available in the project website (www.biowaste.gr) (ANNEX 8 of the Inception Report). At this point, it should also be noted that the name of the ATHENS-BIOWASTE website has been carefully selected in order to be easily accessible by the public.

The press conference was covered by two national TV channels, despite the fact that there was change of the national government composition on the same day. More specifically, the press conference received coverage from the State Television (New Greek Television, NET) in the News, as well as the SKAI TV Channel, ECONews on Wednesday 9th November 2011, at 21.45: http://www.skai.gr/player/TV/?MMID=220875 (ANNEX 9 of the Inception Report).

Furthermore, a radio Interview of Prof. Maria Loizidou to the Journalist Mr. Apostolides to the Radio Station 9.84 that was broadcasted on Sunday 13th November 2011 at 6.45 in the morning – MP3. Ms. Athena Bourka also had an interview that was transmitted by the same Radio Station.

There is a considerable number of references to the ATHENS-BIOWASTE project in the press prior to the initiation of the separation at source of biowaste (all national newspapers circulated at national level and internet (ANNEX 10 of the Inception Report). Indicatively, the list is available in ANNEX 6.9 of the final report.

All 87 references are different and constitute big achievement of the ATHENS-BIOWASTE project, since it was positively disseminated in almost all national and local (in Athens) daily newspapers, Greek news and environmental websites and generally media in Greece. The relevant PDF files have been saved in order to avoid losing references that will be removed from websites in the future. This has already happened to the 81st reference, but the relevant pdf file is still available.

The beneficiaries of the ATHENS-BIOWASTE project also participated in the kick-off meeting of the Greek and Cypriot LIFE10 projects on the 15th November 2011 and briefly presented the ATHENS-BIOWASTE project.

Another internet reference about the kick-off of the ATHENS-BIOWASTE project is the following: http://www.kifissia24.gr/ - PDF (ANNEX 11 of the inception report).

Furthermore, the ATHENS-BIOWASTE project has been presented in the Compost Newsletter #3 – December 2011 - PDF (ANNEX 12 of the inception report). The first subject of the Compost
Recycling Newsletter #7 - February 2013 refers to the ATHENS-BIOWASTE project (http://www.ecorec.gr/econew/index.php?option=com_content&view=article&id=478&Itemid=130), while reference to the ATHENS-BIOWASTE project was also made in the Compost & Recycling Newsletter #8 – April 2013 (http://www.ecorec.gr/econew/index.php?option=com_jnews&act=mailing&task=view&listid=0&mailingid=4&listtype=1&Itemid=596&lang=en & http://www.ecorec.gr/econew/index.php?option=com_content&view=article&id=442&catid=11&Itemid=485&lang=en). Regarding the presentations of the representatives of the ATHENS-BIOWASTE team, Ms. Bourka made a presentation about the ATHENS-BIOWASTE project in the two-day seminar on the Waste Workshop, jointly organized by the European Environment Bureau (EEB) and its members: ELLINIKI ETAIRIA for the Environment & Cultural Heritage (ELET), MEDITERRANEAN SOS Network (MEDSOS) and ECOLOGICAL RECYCLING SOCIETY (ECOREC). The event took place at the Offices of the Greek Company for Environment and Civilization, 28, Triponon Street, Plaka on Thursday 3rd & Friday 4th November 2011 (ANNEX 13 of the inception report). Furthermore, Ms. Athena Bourka made the presentation entitled: “Separation at source and composting of biological waste – Pilot Implementation in the Municipality of Athens and Municipality of Kifissia” at the Workshop organized by the Technical Chamber of Greece with title “Integrated Management of Municipal Solid Waste and its contribution to social development”, which took place at ELECTRA PALACE Hotel (18-20 Nauarchou Nikodimou Street) in Athens on 1st February 2012 (ANNEX 14 of the inception report). Prof. M. Loizidou made a reference to the ATHENS-BIOWASTE project at the Corporate Waste & Recycling Conference which was held in Athens on 26th June 2012 (http://www.wasteandrecycling.gr/default.asp?pid=1&la=1). The relevant presentation is attached (ANNEX 15 of the inception report, see slide No 12). The ATHENS-BIOWASTE project was presented in the Networking Meeting for Regions for Recycling (R4R) on Wednesday 12th December 2012 by Ms. Sofia Giannaki, representative of the Municipality of Athens. The aim of the networking meeting was the exchange of experiences and opinions between Regions and Municipalities in Greece and the share of thoughts and experiences on waste management and good practices with other European Regions (ANNEX 6.1 of the midterm report).

The ATHENS-BIOWASTE working team also organized two LIFE 20-year Anniversary Events, the first in Kifissia and the second in Athens. The working team of MoK developed a kiosk in order to promote and inform about the ATHENS-BIOWASTE project and LIFE in general during the Kifissia Flower Show, 26th April – 13th May 2012. According to the agenda of the Kifissia Flower Show (Agenda (in Greek) (ANNEX 18 of the Inception Report), the date 7th May 2012 was especially devoted to LIFE (Photos – Monday 7th May 2012) (ANNEX 19 of the Inception Report). During the 18 days of the Kifissia Flower Show, more than 10,000 people visited the Flower Show and around 2,000 copies of the 1st ATHENS-BIOWASTE Newsletter with the Kifissia contact details together with LIFE informative material sent from Brussels were distributed (Newsletter distributed to the visitors of the flower show in Greek) (ANNEX 20 of the Inception Report).

The Acropolis Half Marathon 2012 – Athens Run 2012, LIFE 20-year Anniversary Event, Athens, Sunday 20th May 2012 was organized by the working team of MoA. The event took place with the cooperation of the Organization of Culture Sports and Youth of the City of Athens and the Athletics Federation. The race, with free membership runners started at the Panathenaic Stadium and ended at Zappeion, where the kiosk of the ATHENS-BIOWASTE team was located distributing the 1st ATHENS-BIOWASTE Newsletter with the contact details of the MoA together with LIFE informative material sent from Brussels. The ATHENS-BIOWASTE team provided information on the implementation of the project in Gazi and Kypriadou (Photos (ANNEX 21 of the Inception Report). Newsletter that was distributed to the public (ANNEX 22 of the Inception Report). Two different posters (ANNEX 23 of the inception report), as well as maps of the selected pilot areas (ANNEX 24 of the Inception Report) for the implementation of the separation at source of biowaste were also used in both ATHENS-BIOWASTE LIFE 20-Year Anniversary Events as well as the ATHENS 2012 International Conference on Sustainable Solid Waste Management, in the Exhibition Section (http://uest.ntua.gr/athens2012). Six photos from the two LIFE 20-year Anniversary events in Athens and Kifissia respectively are available at: https://www.facebook.com/media/set/?set=a.10151224087349395.474942.302437314394&type=3. Th
e version of the Newsletter that was distributed in this Conference is provided in ANNEX 25 of the Inception Report. The 2nd ATHENS-BIOWASTE Newsletter (attached in ANNEX 6.2 of the midterm report) was distributed to citizens in Kifissia and Athens (mainly in electronic form). The ATHENS-BIOWASTE team delayed the reproduction of the 3rd Newsletter and decided to produce it when the biowaste separation at source scheme initiated in the neighborhoods of Athens (November 2013) (ANNEX 6.10 of the final report). It was decided not to proceed with the rest Newsletters and alternatively to develop material for pupils seeing that all news related to the ATHENS-BIOWASTE project had a lot of alternative dissemination ways in order to get known (special leaflets for the citizens of Kifissia (Kifissia-Biowaste), biowaste website, athens-biowaste facebook account, the communication channels of EDSNA and the two participating municipalities, press releases in all mass media, etc).

At least 18 presentations of the ATHENS-BIOWASTE working team were made, namely the following:


5. “ATHENS-BIOWASTE: Integrated biowaste management in Greece: The case of Athens” by Dr. Dimitris Malamis at the final workshop of the WASTE-C-CONTROL LIFE+ Project which was held at Divani Caravel Hotel at Wednesday 25th September 2013 (agenda, presentation) (http://www.biowaste.gr/site/news/%CF%80%CE%B1%CF%81%CE%BF%CF%85%CF%83%CE%AF%CE%B1%CF%83%CE%B7-%CF%84%CE%B7%CF%82-%CE%BF%CE%BC%CE%AC%CE%B4%CE%B1%CF%82-%CE%B5%CF%81%CE%B3%CE%B1%CF%83%CE%AF%CE%B1%CF%82-%CF%84%CE%BF%CF%85-%CE%AD%CF%81/?lang=en) (ANNEX 6.11 of the final report).

6. “Separation of organic waste at source, factor of orthodological daily life: The results of the LIFE+ project ATHENS-BIOWASTE” by Dr. Konstantinos Moustakas in the Conference of the Hellenic Plant Material Exporters Association with subject “Management of urban ecosystems” that was held on Saturday 5th October 2013 at MEC Paiania, in the framework of the Exhibition Building Green Expo 2013 (agenda, presentation) (http://www.biowaste.gr/site/news/%CF%80%CE%B1%CF%81%CE%BF%CF%85%CF%83)
7. “Communicating your project and working with local authorities– the case of LIFE ENV / ATHENS BIOWASTE project” by Dr. Konstantinos Moustakas at the LIFE12 Kick-off Meeting which was held at Gaia Centre on 9th October 2013 (ANNEX 6.13 of the final report)


17. “The life cycle of food waste” by Konstantinos Moustakas on Saturday 3rd May 2014 at Technopolis at Gazi Area in the framework of the Athens Science Festival (http://www.biowaste.gr/site/news/athens-biowaste-athens-science-festival-2014/?lang=en) (ANNEX 6.23 of the final report). Apart from the presentation, an ATHENS-BIOWASTE kiosk was placed in the Athens Science Festival for five days and activities with children were organised in order to learn how to separate the waste materials. Indicative photos are available in ANNEX 1.20.


The ATHENS-BIOWASTE publications in journals include:

1. D. Malamis, K. Moustakas, A. Bourka, K. Valta, O. Skiadi, A. Sotiropoulos, V. Panaretou, C. Papadaskalopoulou, Compositional analysis of biowaste from study sites in Greek municipalities (Waste & Biomass Valorisation, accepted under minor revision) (ANNEX 6.25 of the final report)


One more publication will be submitted in the future months.

The ATHENS-BIOWASTE team developed a Facebook account in order to support the ATHENS-BIOWASTE activities (http://www.facebook.com/athensbiowaste). The ATHENS-BIOWASTE team kept updating the Facebook account in order to support the ATHENS-BIOWASTE activities. The number of visitors of the biowaste website (more than 26,700 visitors in total and high number of monthly visitors during the implementation phase, e.g. more than 1,000 visitors within January 2013 and more than 1,700 ones within July 2013) and the facebook website (exceeding in total the number of 50,000 and more than 800 LIKES) is significantly high, proving the effectiveness of both the campaign, as well as the dissemination activities. The mass media (SKAI Channel, SKAI radio, ATHENS 9.84 radio & newspapers (KATHIMERINI, TA NEA & ESTIA), environmental magazines (e.g. ECOTEC, issue May 2013) & news portals (e.g. www.econews.gr) were also involved in order to succeed in the initiation of the separation of biowaste at source in Kifissia and Athens respectively, thus promoting the ATHENS-BIOWASTE project at national level. Indicative ATHENS-BIOWASTE web references for the initiation in Kifissia in November 2012 are available in ANNEX 6.5 of the midterm report and for the initiation in Athens in 2013 (mainly April 2013) are available in ANNEX 6.6 of the midterm report:

The Kifissia Vice Mayor, Mr. Vassilis Xipolitas made an interview at SKAI Channel regarding the ATHENS-BIOWASTE initiative (http://www.youtube.com/watch?v=N1SmxL18t_Q&feature=youtu.be).

Leaflets of the ATHENS-BIOWASTE project were distributed in the CARBONTOUR final Conference held at DIVANI CARAVEL Hotel on Monday 10th December 2012 (http://www.ecotourism2012.uest.gr/).

The flash application about the ATHENS-BIOWASTE project in Kifissia was available at http://www.skai.gr/news/environment and other news portals (ANNEX 6.27 of the final report) leading to significantly high number of visitors for the ATHENS-BIOWASTE website.
The ATHENS-BIOWASTE was happy to receive supporting hundreds of messages and questions from all the country and especially Athens, including teachers and pupils with emphasis on young people.

The new site of EDSNA is on air with AthensBiowaste banner at home page and reference and the project (http://www.edsna.gr/index.php/design-and-features/life-biowastea). EPTA participated in the conference Biowaste - Sofia 2013 in April 2013 – Implementation of Biowaste Management in Southern and Eastern European Countries, organized by the Bulgarian Ministry of Environment, the European Compost Network (ECN) and ISWA. EPTA held a brief presentation about the current situation on biowaste management in Greece, the Athens-Biowaste project and its added value for Greece. This issue was also discussed with the representative of the European Commission, DG Environment, Mr. B. Zambrzycki who also participated in the seminar (ANNEX 6.7 of the midterm report).

The ATHENS-BIOWASTE project was also disseminated during the Kifissia Flower Show, 7-26 May 2013. More than 60,000 people visited the Flower Show and had a contact with the kiosk of the Sanitation Department, where the Athens Bio-waste collection bins were exhibited and brochures were distributed. Relevant photos are available in ANNEX 1.10 of the midterm report. Indicative photos are available at: http://www.biowaste.gr/site/mousiko-festival. The ATHENS-BIOWASTE initiative was also implemented. More specifically, the relevant initiative was promoted through the relevant websites: http://www.plisskenfestival.gr/infogr & http://www.plisskenfestival.gr/greenin2013.

In addition, the ATHENS-BIOWASTE initiative was also implemented at the music festival of the Municipality of Tavros held from 17th to 19th May 2013. More specifically, the MoA in collaboration with NTUA provided brown bins for the separate collection of biowaste. Indicative photos are available at: http://www.biowaste.gr/site/mousiko-festival. The relevant initiative was promoted through the relevant websites: http://www.plisskenfestival.gr/infogr & http://www.plisskenfestival.gr/greenin2013.

The ATHENS-BIOWASTE has participated in the Recycling Festival, from 3rd to 6th June 2013, at Technopolis of the Athens Municipality. The Technopolis cultural & recreation site lies inside the Ghazi pilot area. Relevant photos are available at ANNEX 1.11.1.

In addition, the Athens-Biowaste project was presented in the 7th National Congress of Waste Management Authorities on the 21st June 2013 in Chios. A new stand/banner was produced by EPTA and was placed in the area of the conference, as EPTA was a sponsor in the Congress. In addition, 100 leaflets were distributed to the participants. It must be noted that all waste management authorities from Greece were represented. Photos of the Congress are available at ANNEX 6.8 of the midterm report. In addition, relevant dissemination took place by EPTA in the 8th National Congress of Waste Management Authorities on the 4th & 5th of July 2014 in Syros.

The Media coverage for the ATHENS-BIOWASTE was very effective in July 2013 when the initiation actions for the implementation of the biowaste separate collection in the Municipality of Athens started including:

Initiation actions in Athens:

Kyriadiou pilot area
- July 2nd: Door-to-door distribution of envelope with Vice-Mayor’s letter and informative leaflet to all participating biowaste producers (households, restaurants, cafeterias, bars)
- July 3rd – 10th: All day presence of informative kiosk in Kyriadi Square (inside pilot area): Information, sensitization, communication regarding the bins’ distribution, distribution of bins to participants who missed the distribution date
- July 6th: Door-to-door distribution of kitchen bins for the separation at source of food waste to all participating biowaste producers
- July 10th: Informative evening event for participants in Italian School (inside pilot area)
Gazi pilot area
- July 8th: Door-to-door distribution of envelope with Vice-Mayor’s letter and informative leaflet to all participating biowaste producers (households, restaurants, cafeterias, bars)
- July 11th – 21st: Afternoon-evening of informative kiosk in Persefonis Square (near metro station “Kerameikos”, inside pilot area): Information, sensitization, communication regarding the bins’ distribution, distribution of bins to participants who missed the distribution date
- July 13th: Door-to-door distribution of kitchen bins for the separation at source of food waste to all participating biowaste producers
- July 17th: Informative evening event for participants in auditorium of the municipal radio station “Athina 9.84 FM” (Technopolis, inside pilot area)

Relevant photos are available at: http://www.biowaste.gr/site/news/%CE%BE%CE%B5%CE%BA%CE%B9%CE%BD%CE%AC-%CE%BA%CE%B1%CE%B9-%CF%83%CF%84%CE%B7%CE%BD-%CE%B1%CE%B8%CE%AE%CE%BD%CE%B1-%CF%84%CE%BF-%CF%80%CE%B9%CE%BB%CE%BF%CF%84%CE%B9%CE%BA%CF%8C-%CF%80%CF%81%CF%8C%CE%B3/

More specifically, a large number of press releases were made, there was TV coverage (ECO NEWS, ΣΚΑΙ Channel) of the press conference on 15th July 2013, radio coverage (Athina 9.84) and a significant promotion webpage by Xrusi Eukairia with thousands of recipients all around the country. Indicative photos are available at: http://www.biowaste.gr/site/photos-press-15-7-13, while the invitation is available at: http://www.biowaste.gr/site/wp-content/uploads/2013/07/prosklisi-15-7-2013.pdf. Indicative photos from the press conference are available in ANNEX 1.17.

The www.biowaste.gr had more than 1,650 visitors in July 2013, while more than 1,500 visited the facebook webpage and we had more than 110 new LIKES. A large number of citizens communicated with the project team through the biowaste website, the facebook website, personal contact (e.g. at the kiosk in Kypriadou or Gazi) or telephone contact.

Indicative relevant webpages are available below:

http://sendy.xe.gr/w/a3Yc892R1a3L9LeLK7AzMvI/Q/s9892892OrfLnN8kt27l2WPDXw/VhhpAyoaAUC71sF27637EBVSA

http://www.youtube.com/watch?v=txY-T-YfidWs
http://www.econews.gr/ , (Pdf)
http://www.biomassenergy.gr/ , (Pdf)
http://www.athensvoice.gr/ , (Pdf)
http://www.energypress.gr/ , (Pdf)
http://www.cityofathens.gr/ , (Pdf)
http://www.iefimerida.gr/ , (Pdf)
http://www.dete.gr/ , (Pdf)
http://www.inews.gr/ , (Pdf)
http://www.imerisia.gr/ , (Pdf)
http://www.zougla.gr/ , (Pdf)
http://athinatora.blogspot.gr/ , (Pdf)
http://biotevma.blogspot.gr/ , (Pdf)
http://www.michanikos-online.gr/ , (Pdf)
http://www.athina984.gr/node/250245

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November 2013 was the starting point for the implementation of biowaste separate collection from the households within the pilot areas in the Municipality of Athens. The www.biowaste.gr had more than 1,390 visitors during November 2013. A press release about the project initiation in Gazi was sent to the media, it appeared in a huge number of websites and was announced from the municipal radio station ATHINA 9.84 (http://www.athina984.gr/node/266646: one can hear it during the last five minutes).

Indicative references are provided in ANNEX 6.28 of the final report.

The ATHENS-BIOWASTE team produced a video with duration 6 minutes and 46 seconds about the project implementation in the Municipality of Athens. The video is available at www.biowaste.gr (http://www.biowaste.gr/site/news/%CE%B5%CF%86%CE%B1%CF%81%CE%BC%CE%BF%CE%B3%CE%AE-%CE%B4%CE%B9%CE%B1%CE%BB%CE%BF%CE%B3%CE%AE%CF%82-%CF%83%CF%84%CE%B7%CE%BD-%CF%80%CE%B7%CE%B3%CE%AE-%CE%B2%CE%B9%CE%BF%CE%B1%CF%80%CE%BF%CE%B2%CE%BB/?lang=en, www.facebook.com/athensbiowaste and http://www.youtube.com/watch?v=dbjNq5wQ1iU&feature=youtu.be (ANNEX 6.29 of the final report).

New indicative later ATHENS-BIOWASTE website references in February 2014 included the following:

http://www.imerisia.gr/article.asp?catid=26515&subid=2&pubid=113224594
http://www.econews.gr/2014/02/19/athens-biowaste-apovlita-112079/?fb_action_ids=703020006387830&fb_action_types=og.likes&fb_source=other_multiline&action_object_map=[295107173969732]&action_type_map=[%22og.likes%22]&action_ref_map
http://www.vpodomes.com/index.php/astiki-anaptixi/perivallontika-erga/item/23824-%CE%B1%CF%84%CF%84%CE%B9%CE%BA%CE%AE-%CF%80%CF%81%CF%8C%CE%BF%CE%B4%CF%82-%CF%83%CF%84%CE%BF%CE%B1%CF%80%CF%81%CF%8C%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%B1-athens-biowaste
http://www.econews.gr/2014/02/27/programma-kompostopoiisis-athina-112534/
http://agroselida.blogspot.gr/2014/02/blog-post_7159.html
http://teknologosgeoponos.blogspot.gr/2014/02/225000-athens-biowaste.html
http://cebil.gr/a/2866592/me_epityxia_exelixsetai_to_pilotiko_programma_dialogis_stin_pigi_bioapobilon_athens_biowaste
http://www.livecity.gr/234382/epitekiniteia-to-athens-biowaste
http://paraponofylis.blogspot.gr/2014/02/blog-post_5580.html
http://gr.limegator.com/826294/225000-athens-biowaste.html,

Representatives from the Department of Cleaning of the Municipality of Athens gave a thorough presentation of the biowaste separate collection and composting project in the auditorium of 9,84 at Technopolis, Gazi, on April 28, 2014. The attendees -the students and the Environmental Education Group of the Music School of Bartholomio, Ilia- were informed about waste management in general and more specifically about the new waste management techniques implemented in the Municipality of Athens.

The Athens-Biowaste Conference (ATHENS 2014, 2nd International Conference on Sustainable Solid Waste Management) was held at the Royal Olympic Hotel in Athens from 12th to 14th June 2014 and was indeed very successful and fruitful.

Indicatively, in total 800 participants from 40 countries attended the conference, 129 presentations were made, while 100 participants also participated in the study tour at the MBT facility of EDSNA at Ano Liosia in order to see how the MSW waste is managed in Athens and the separate channel for the biowaste collected from the City of Athens and the Municipality of Kifissia within the ATHENS-BIOWASTE project. The majority of the participants in site visit were participants from abroad, as well as representatives of Municipalities and Regions from all over Greece.

Only some of the dozens of the website references for the conference are available in ANNEX 6.30 of the final report, while the national TV channel ALPHA TV also had reportage about the ATHENS2014 Conference in the news on 12th June 2014. The relevant video is available at: https://www.youtube.com/watch?v=gsfyjduVazA.


A relevant post about the summary of the event is also available in the LIFE webpage (http://ec.europa.eu/environment/life/news/events/events2014/june.htm).

The best papers of the Conference were sent to the two Collaborating Journals (Waste Management & Research, Waste and Biomass Valorization) (ANNEX 6.31 of the final report). The review process is in progress. The Special Issue of the Journal WASTE & BIOMASS Valorization (Springer Edition) will have the title: “BIOWASTE VALORIZATION AND WASTE MANAGEMENT” and Prof. Maria Loizidou is the Guest Editor. The two aforementioned ATHENS-BIOWASTE journal papers will be included in this Special Issue and the relevant Editorial will make special reference to the LIFE+ Programme of the European Commission and the ATHENS-BIOWASTE project.

Finally, special attention should be drawn to the videos developed for the students of the Schools of the Pilot Areas of the Municipality of Athens, which was an Outside LIFE activity:

The Directorate of Waste Management and Recycling of the Municipality of Athens first conducted a workshop on cartoon and animation. The workshop took place at the 139th Primary School of Athens in Kypriadou Pilot Area on 31st January 2014. Pupils of the 5th and 6th class of Primary School as well as the educational staff of the school attended the workshop. The relevant video is available at: http://www.biowaste.gr/site/news/enimerosi-sxoleio/?lang=en & www.facebook.com/athensbiowaste & https://www.youtube.com/watch?v=dtY1iwVsh8c (ANNEX 6.32 of the final report).

In context with the dissemination actions of the LIFE+ Project ATHENS-BIOWASTE, the Directorate of Waste Management and Recycling of the Municipality of Athens then conducted a workshop on cartoon and animation. The workshop took place at the 87th Primary School of Athens in Gazi Pilot Area on 9th April 2014. Pupils of the 4th, 5th and 6th class of Primary School as well as the educational staff of the school attended the workshop. The video is available at: http://www.biowaste.gr/site/news/%CE%B5%CE%BD%CE%B7%CE%BC%CE%AD%CF%81%CF%89%CF%83%CE%B7-%CF%83%CF%84%CE%BF-87o-
Finally, the Directorate of Waste Management and Recycling of the Municipality of Athens organised another workshop on cartoon and animation at the 142th Primary School of Athens in Kyriadou Pilot Area on 3rd June 2014. Pupils of the 5th and 6th class of Primary School as well as the educational staff of the school attended the workshop: [http://www.biowaste.gr/site/news/%CE%B5%CE%BD%CE%BC%CE%AD%CF%89%CF%83%CE%B7-%CF%83%CF%84%CE%BF-142o-%CE%B4%CE%B7%CE%BC%CE%BF%CF%84%CE%B9%CE%BA%CF%8C-%CF%83%CF%87%CE%BF%CE%BB%CE%B5%CE%AF%CE%BF-%CE%B1%CE%B8%CE%B7%CE%BD/] & [https://www.youtube.com/watch?v=seCQ2qIb6ZA](https://www.youtube.com/watch?v=seCQ2qIb6ZA) (ANNEX 6.33 of the final report).

Indicative photos from the three events in the three Schools are available in ANNEX 1.22.

Finally, exercises were prepared for the pupils of the Schools of MoK (ANNEX 6.35) that were distributed at the last week of May 2015 and the first week of June 2015. Two additional leaflets were also distributed to the households in Kifissia in June, July and August 2015 (ANNEX 6.36 of the final report). An additional leaflet was also distributed to the participating households in the MoA making reference to the animation workshops in the primary schools of the pilot areas and the areas and points where biowaste separate collection is applied in MoA (ANNEX 6.37 of the final report).

Additional dissemination deliverables after the end of the project have been referred in the section of AFTER-LIFE (ANNEXES 6.38-6.44 of the final report).

The Layman’s Report is available in ANNEX 6.48 of the Final Report.

### 5.3 Evaluation of Project Implementation

The ATHENS-BIOWASTE working team considers that all foreseen activities have been implemented effectively and successfully following the most suitable methodology at all stages.

All milestones of the ATHENS-BIOWASTE project were fully achieved, as summarized in the Table 25.

<table>
<thead>
<tr>
<th>Task</th>
<th>Foreseen in the proposal</th>
<th>Achieved</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kick of meeting in Athens</td>
<td>N</td>
<td>Held as foreseen with the active participation of all ATHENS-BIOWASTE beneficiaries</td>
</tr>
<tr>
<td></td>
<td>Nomination of the Project Manager, Coordination Group and Action Co-ordinators</td>
<td>N</td>
<td>The distribution of roles took place as foreseen. All beneficiaries had personnel with high qualifications and experience in the field of biowaste management</td>
</tr>
<tr>
<td>10</td>
<td>Networking with other projects commenced</td>
<td>N</td>
<td>The networking activities of the ATHENS-BIOWASTE projects were rich, as the working team was present in a huge number of waste related events</td>
</tr>
<tr>
<td>7</td>
<td>Project website</td>
<td>N</td>
<td>The impact of the ATHENS-BIOWASTE website was high with much more visitors than anticipated. Indicative reasons for that: Continuous update with news, effective</td>
</tr>
<tr>
<td></td>
<td>2nd Project Meeting in Athens</td>
<td>N</td>
<td>The case study areas were identified early using specific methodology so that the biowaste separate collection initiative was applied in areas with different characteristics and background.</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------</td>
<td>----</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>3rd Project Meeting in Athens</td>
<td>N</td>
<td>All project meetings were organised and held with the active participation of all ATHENS-BIOWASTE beneficiaries.</td>
</tr>
<tr>
<td>3</td>
<td>Implementation of the bio-waste separate collection program</td>
<td>N</td>
<td>The implementation of the biowaste separate collection program was successful in both Municipalities with 22 months of implementation for the case of Kifissia and 11 months for the case of Athens (the duration was longer, about 16 months, for the certain points from where the initiative started in MoA).</td>
</tr>
<tr>
<td>1</td>
<td>4th Project Meeting in Athens</td>
<td>N</td>
<td>All project meetings were organised and held with the active participation of all ATHENS</td>
</tr>
<tr>
<td>4</td>
<td>Assessment of the produced compost quality</td>
<td>v</td>
<td>All measurements and analyses proved and revealed that the product of the composting process is of high quality. The fact that the NTUA laboratory is certified by ISO 9000 and 17025 verifies the accuracy and reliability of the relevant results. The quality results are much better than those referring to the compost produced from mixed waste.</td>
</tr>
<tr>
<td>6</td>
<td>National Biowaste Plan prepared</td>
<td>N</td>
<td>The proposed national biowaste plan had been agreed among project beneficiaries and was presented in ATHENS-BIOWASTE Conference in June 2014.</td>
</tr>
<tr>
<td>6</td>
<td>Distribution of the Guide on bio-waste management for local authorities commenced</td>
<td>N</td>
<td>All Municipalities have been notified about the Guide for local authorities developed on biowaste. The role of EDSNA was crucial so that all Municipalities have access to that. Furthermore, NTUA and EPTA have promoted the Guide to all collaborating municipalities and competent authorities.</td>
</tr>
<tr>
<td>6</td>
<td>Recommendations for technical specifications and bio-waste related legislation submitted to the Ministry of Environment</td>
<td>N</td>
<td>The Recommendations have been forwarded to the Ministry of Environment and especially to the recently appointed General Secretary for Waste. It is noted that the ATHENS-BIOWASTE Conference was organised under the auspices of the Ministry of Environment and high officials of the Ministry attended the Conference.</td>
</tr>
<tr>
<td>5</td>
<td>Bio-waste management software tool</td>
<td>N</td>
<td>The model is a useful tool that can assist Municipalities in evaluating all relevant parameters and having an overview of</td>
</tr>
<tr>
<td></td>
<td>design of the website &amp; easy name: <a href="http://www.biowaste.gr">www.biowaste.gr</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>how biowaste separate collection can influence the total waste management cost and ensure GHG emission savings.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5th Project Meeting in Athens</td>
<td>N</td>
<td>All project meetings were organised and held with the active participation of all ATHENS-BIOWASTE beneficiaries.</td>
</tr>
<tr>
<td>7</td>
<td>Final Conference</td>
<td>N</td>
<td>The ATHENS-BIOWASTE Conference was held from 12-14 June 2014 at Royal Olympic Hotel. It was a big waste event with the participation of 800 participants of all around the world. Apart from the high academic level, the participants of the conference had the chance to visit the EDSNA facilities and see how the ATHENS-BIOWASTE initiative was applied in practice producing compost of high added value.</td>
</tr>
<tr>
<td>9</td>
<td>After-LIFE Communication plan drafted</td>
<td>N</td>
<td>The ATHENS-BIOWASTE working team gave emphasis on this plan, not in theory, but in practice. Both Municipalities continue to apply the separate collection of biowaste and look for financial tools in order to further expand the relevant scheme. The MoK has already expanded the pilot areas and is ready to implement it full scale in the near future. More Municipalities (e.g. Naousa and others with the help of EDSNA) are planning to do so very soon.</td>
</tr>
</tbody>
</table>

It is noted that the only modification request and subsequent amendment required referred to the modification of the name of one beneficiary and, therefore, it was minor. There was not need to proceed with prolongation request. The only thing that created major delay was related to the delay of the tendering procedure of the Municipality of Athens regarding the big brown bins. This delay led to the actual implementation of the biowaste separate collection for the pilot areas in Athens for about a year. This delay was dealt with the extension of the implementation until the end of the project. In fact, the implementation in both municipalities is still in progress after the end of the project. In this way, no actual negative impact was caused by the delay of the finalisation of the tendering procedure and the difficulties of the company to deliver the bins on time due to specific circumstances.

Regarding the effectiveness of the dissemination activities, the ATHENS-BIOWASTE working team did its best in order to disseminate its activities not only to local authorities and competent authorities, but to citizens, too. **It is certainly the first time in Greece that a LIFE+ project got such publicity at national level. The dissemination campaign was indeed really enormous with great achievements without any payment to mass media.** All types of disseminations means were used in many ways. Indicative special characteristics included:

1. A dynamic website with huge number of news and updates and thousands of visitors
2. A facebook account with a large number of posts and lots of followers.
3. Three very interesting videos with activities with students ([https://www.youtube.com/watch?v=F90ErehscN0](https://www.youtube.com/watch?v=F90ErehscN0), [https://www.youtube.com/watch?v=seCQ2qIb6ZA](https://www.youtube.com/watch?v=seCQ2qIb6ZA) & [https://www.youtube.com/watch?v=dtY1iwVsh8c](https://www.youtube.com/watch?v=dtY1iwVsh8c)).
4. Information material tailored to pupils
5. Development of videos presenting the ATHENS-BIOWASTE activities (e.g.: https://www.youtube.com/watch?v=dbiNq5wQliU & https://www.youtube.com/watch?v=nwrLAhcBA9f).


7. Promotion release by Xrusi Eukairia with thousands of recipients all around the country: http://sendy.xe.gr/w/a3Yc892Ria3L9LeL7AzMvIQ/s9892892OrfLnN8kt27l2WPDXw/VhhpAYoAUC71sF27637EBVSA (ANNEX 6.47 of the final report)

8. A large number of information events
9. A large number of speeches and presentations in a lot of events (conferences, exhibitions, festivals, etc)
10. A huge conference events with more than 800 participants all over the world
11. Presence of the ATHENS-BIOWASTE representatives in many massive events
12. Information kiosk in all pilot areas for several days
13. Distribution of suitable information material
14. Hundreds of press releases and articles in all mass media (all newspapers, all internet portals, blogs, magazines, etc).
15. Press Conferences
16. Flash application about the ATHENS-BIOWASTE in several news portals
17. Interviews in radio broadcasts.

5.4 Analysis of long-term benefits

1. Environmental benefits

a. Direct / quantitative environmental benefits

The Athens Biowaste project had direct environmental benefits through the separate collection of biowaste in the Municipalities of Athens and Kifissia and biowaste treatment in the composting plant of EDSNA. More specifically, till 31-08-2014:

- 522 tonnes of biowaste were separate collected in the two Municipalities. These quantities were composted and were diverted from landfilling.
- 150 tonnes of CO₂ equiv. have been saved, as landfilling was replaced by composting. This value is automatically calculated in the Athens Biowaste model. CO₂ equiv. produced by the new collection system are not taken into account as they have a minor contribution to overall emissions.
- 130 tonnes of compost have been produced and distributed to the market for further utilization and production of soil improver.

It shall be noted that the environmental benefits have been estimated till the end of the project, while separate collection of biowaste and composting is still in operation. In addition, further expansion of the collection schemes in the two Municipalities (which is under planning), as well as the commitment of EDSNA to accept source separated biowaste from all Municipalities in the Region of Attika, provides additional and long-term environmental benefits, as described in the next section.

b. Relevance for environmentally significant issues or policy areas

ATHENS-BIOWASTE LIFE10 ENV/GR/000605
The Athens Biowaste project is in line with the provisions of the Directive 2008/98/EC which requires that Member States shall take measures as appropriate, to encourage the separate collection of biowaste with a view to the composting and digestion of bio-waste. In addition, Greek Law 4042/2012 stipulates separate collection of biowaste and sets specific targets. Through Athens Biowaste project, biowaste collection has been demonstrated for the first time in Greece in two pilot areas in the region of Attika in order to assess the recovery rates and the potential of producing high quality compost. The project has also demonstrated that separate collection of biowaste, if planned correctly, can ensure that:

- Greece, as well as other countries, can take measures to encourage separate collection of biowaste in line with EU Directive 2008/98/EC and can also achieve national targets,
- Biowaste source separation can lead to a reduction of biodegradable waste sent to landfill in line with the Directive 1999/31/EC on the landfill of waste.
- A high quality compost can be produced from source separated biowaste promoting soil improvement in line with EU policy for soil.

The project is also in line with the ‘Proposal for a Directive of the European Parliament and of the Council amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment (COM/2014/0397)’. According to this proposal, Member States shall ensure separate collection of bio-waste by 2025 and the EC shall carry out an assessment on the management of bio-waste with a view to submitting a proposal if appropriate. The assessment shall examine the opportunity of setting minimum requirements for bio-waste management and quality criteria for compost and digestate from bio-waste, in order to guarantee a high level of protection for human health and the environment.

The project is also in line with the objectives of the Resource Efficiency Roadmap and the 7th Environment Action Programme, as it promotes high quality recycling and the use of recycled waste as a major. The second action area of the 7th Environment Action Programme refers to the conditions that will help transform the EU into a resource-efficient, low carbon economy, with special focus on turning waste into a resource. In addition, it stipulates that the EC should present a comprehensive strategy to combat unnecessary food waste and work with Member States in the fight against excessive food waste generation. Measures to increase composting and anaerobic digestion of discarded food, as appropriate, would be helpful in this regard.

2. Long-term benefits and sustainability

   a. Long-term / qualitative environmental benefits

In conformance with EU Directive 2008/98, Greek Law 4042/2012 stipulates separate collection of biowaste and sets specific targets. In Greece, Athens Biowaste was the first pilot project for separate collection in Municipalities and has already been established as the reference point for any new collection system which is under planning within the country. All project deliverables (Guide, software, national recommendations, laboratory results, etc.) are publicly available allowing transferability and replicability to all Greek Municipalities. The environmental benefits of biowaste separate collection are well known, as biodegradable waste is diverted from landfilling and new products can be produced (compost, energy). It shall be noted that these benefits are quantified in terms of carbon footprint in the framework of Athens Biowaste model. Thus, it is considered that the long-term environmental benefits of the project are significant for Greece, as separate collection and treatment of biowaste will be replicated to other Municipalities and these will be visible within the next years.

   b. Long-term / qualitative economic benefits (e.g. long-term cost savings and/or business opportunities with new technology etc., regional development, cost reductions or revenues in other sectors)
Biowaste separate collection and treatment mainly results in environmental benefits through waste diversion from landfilling. However, this can also produce direct and long-term cost savings for municipalities and as a result for citizens. These savings are analysed and calculated in Athens Biowaste software which demonstrates how different parameters can play a significant role in investment and operation cost of overall waste management. It is acknowledged that landfill tax which will be applied by 2016 in Greece will impose high fees for waste landfilled and not separated at source. In addition, separate collection of biowaste boosts the development of new business opportunities, including the collection, treatment of biowaste (composting or anaerobic digestion plants) and markets for the final product (e.g. compost). It shall be noted that compost market as a soil improver is almost inexistent.

As described in Action 5b) Verification and validation of the software tool in the selected municipalities, the model has been applied in three different Municipalities, demonstrating the outcomes through its application in three case study areas and identifying the key parameters that contribute to cost-efficient and GHG saving measures when establishing separate collection systems for biowaste. It is worth mentioning, that in most of the scenarios modelled, the total MSW management cost of the Municipality decreases between 5 to 7%, after establishing biowaste separate collection, while this benefit increases in accordance with the size of the case study area.

c. Long-term / qualitative social benefits (e.g. positive effects on employment, health, ethnic integration, equality and other socio-economic impact etc.)

As already described, new business opportunities will arise in Greece like in most northern European countries. New collection schemes, new treatment plants, new markets (compost market) will be developed resulting in the creation of new job opportunities. It is thus expected that this sector will have a great long-term positive effect on employment. In addition, environmental campaigns for promoting separate collection of biowaste at schools, public, businesses will positively affect public opinion and awareness on general environmental issues.

d. Continuation of the project actions by the beneficiary or by other stakeholders

Athens Biowaste project has a great continuation potential for two main reasons: a. it is part of the national strategy for the promotion of biowaste source separation and is considered as the first and up to now the sole national initiative with practical results. b. its deliverables can be considered of high quality and applicability to most of the interested bodies, such as Municipalities. The actions that are expected to be continued by all project partners, as also described in Action 9, include:

- The website will be active for at least 5 years after the end of the project and all materials produced (guide, model, leaflets, etc.) will be available online. In addition, all the emails linked to the project will be active for support.
- The Athens Biowaste software along with its manual will remain at the disposal of any interested party. Support will be provided for at least 5 years, while new updates or versions will be available in case of identified problems or malfunctions.
- There will be continuous participation in conferences, international journals and workshops and indicatively within 2015, more than 6 relevant participations have already taken place.
- In addition, each partner will further promote Athens Biowaste through its own activities:
  o NTUA and EPTA support Municipalities to build biowaste separate collection systems and promote all Athens Biowaste material including application of the software/model.
  o EDSNA as the waste management authority of Attika Region has adopted all Athens-Biowaste material and promotes them to Municipalities-members.
  o Municipality of Athens & Kifissia utilise all material for further expansion of the system in their whole Municipality.
3. Replicability, demonstration, transferability, cooperation:

Athens Biowaste project had a significant demonstration character, as it was the first initiative in Greece combining separate collection and composting of biowaste. All project results can be directly transferred and reproduced to Municipalities in Greece and other EU south-eastern countries. More specifically:

- The ‘guide for establishing, monitoring and evaluating biowaste separate collection systems’ has already been distributed to more than 150 Municipalities (out of 325) and can be used as a reference point and a step-by-step guide by any interested body which seek to establish such a system.
- The Athens Biowaste model helps municipalities build a separate biowaste collection scheme, estimate the direct investment and operational costs and identify the areas where substantial GHG savings in CO2 equiv. could be achieved. The model is user friendly and can be downloaded from the Athens-Biowaste website, by any interested body worldwide.
- Compost quality analysis demonstrated the high quality of compost produced by source-separated biowaste in Greece. The results are of great importance for the design of composting or anaerobic digestion plants and they have already been referenced in the national guide for the operation of composting plants, produced by the Ministry for the Environment.
- Biowaste content analysis is taken place for the first time in Greece and is useful for evaluating food habits of people.

Each project beneficiary can transfer and replicate the project results to other interested body, taking into account that:

- ESDNA is the competent authority for formulating the waste management policy in the Region of Attika and provides Municipalities with guidelines for separate collection of biowaste. It is also considered that EDSNA’ Mechanical and Composting Facility can gradually accept and treat the separated at source biowaste from the Municipalities of the Attica Region. More specifically, this infrastructure can handle 155,000 tones of biowaste per year, which actually caters for:
  - 16.3% of the generated biowaste in the Region of Attica.
  - 5.8% of the generated biowaste at national level.
- NTUA and EPTA co-operate with Municipalities all over Greece and abroad transferring and applying the results of Athens Biowaste.
- City of Athens and Municipality of Kifissia transfer project results especially within their administrative area through the expansion of separate collection to the whole municipality.

4. Best Practice lessons

Athens Biowaste project aimed, among others, at evaluating EU best practices in biowaste separate collection and treatment and apply them in Greece. In this context, best practices have been assessed in the beginning of the project (see action 2.2 Review and evaluation of the bio-waste source separation methods and programs in the EU and especially in the Mediterranean EU countries) and throughout the implementation of other actions. More specifically, the best practice measures used focused on:

- Collection schemes (door-to-door or central bins), collection equipment (bins, vehicles), collection monitoring techniques (fleet management, monitoring participation, etc.), composting techniques and monitoring processes.
- Other models developed relevant to the project, such as Life Cycle Assessment (LCA) tools or dedicated waste LCA tools (e.g. EASEWASTE, WRATE, LCA-IWM) or cost models Kerbside Analysis Tool (KAT) developed by WRAP, etc.

All best practices have been adjusted to fit to south-eastern countries, taking into account the climate conditions, the current collection practices and public environmental awareness.
5. Innovation and demonstration value

Athens Biowaste project had a high innovation and demonstration value at national level since:

- The first pilot and up to now the sole biowaste separate collection system was planned and implemented by two Municipalities.
- EDSNA, the waste management authority of the Region of Attika, accepted for the first time, source separated biowaste. For this reason, EDSNA adjusted its composting plant so as to further accept biowaste from different Municipalities in Attika Region.
- Compost quality analysis (from source separated biowaste) took place for the first time in Greece, allowing better planning and design of future composting plants.
- Awareness on biowaste source separation took place for the first time in Greece disseminating new terms to public such as biowaste, composting, etc.
- All project results and deliverables have been widely disseminated throughout the project via the website, social media, conferences, etc. and have approached a large number of stakeholders.
- Above all, it boosted separate collection of biowaste, as it provided the reference point for Greek stakeholders, including the Ministry for the Environment. It shall be noted that separate collection and composting of biowaste will be one of the core priorities for funding under the national structural funds.

At international level, Athens Biowaste has already been acknowledged in the framework of the international conference taken place in June 2014 with more than 800 participants worldwide. The Athens Biowaste model is its main innovation and demonstration value as it can be applied worldwide, allowing local authorities to evaluate biowaste separate collection and treatment schemes starting from scratch. The model, as well as its manual, have been produced in the English and Greek language and are available upon request. It shall be noted that publications to international journals have already been made.

6. Long term indicators of the project success

It is considered that the long-term benefits of the project will be visible at least in Greece within the next 5 years. A list of quantifiable indicators that can be used for future assessments is presented below:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of separate biowaste collection schemes to be developed in Greece within the next 5 years</td>
<td>More than 150</td>
<td>it is assumed that all these initiatives will take into account Athens Biowaste, as it is the only reference point</td>
</tr>
<tr>
<td>Number of new composting plants to be developed in Greece within the next 5 years</td>
<td>More than 30</td>
<td></td>
</tr>
<tr>
<td>Overall EU fund to be allocated to biowaste collection and treatment</td>
<td>More than 100 million €</td>
<td></td>
</tr>
<tr>
<td>Number of users to apply Athens Biowaste model within the next 5 years</td>
<td>More than 500 at international level</td>
<td></td>
</tr>
<tr>
<td>Number of Municipalities to</td>
<td>More than 100</td>
<td>it is assumed that all these</td>
</tr>
</tbody>
</table>

Table 26: Long term indicators
initiatives will take into account Athens Biowaste, as it is the only reference point

| Review Athens Biowaste Guide |
|---|---|
| Number of presentations – publications in international conference or journals | More than 20 |

6. Annexes

ANNEX 1: Photos in electronic Form

- ANNEX 1.1 of the midterm report: Distribution of bins in MoK
- ANNEX 1.2 of the midterm report: Informational events in MoK
- ANNEX 1.3 of the midterm report: Biowaste Collection in MoK
- ANNEX 1.4 of the midterm report: 1st Delivery of biowaste to EMAK (Composting Unit)
- ANNEX 1.5 of the midterm report: Distribution of bins to the Agricultural University of Athens – MoA
- ANNEX 1.6 of the midterm report: Distribution of bins to the Club of Officers, Ministry of Defence - MoA
- ANNEX 1.7 of the midterm report: Distribution of bins to the Flower Producers Association of Attica - MoA
- ANNEX 1.8 of the midterm report: Collection of biowaste in the Agricultural University of Athens - MoA
- ANNEX 1.9 of the midterm report: Collection of biowaste in the Club of Officers, Ministry of Defence - MoA
- ANNEX 1.10 of the midterm report: Local Events - MoK
- ANNEX 1.11 of the midterm report: Local Events - MoA
- ANNEX 1.12 of the midterm report: Biowaste sampling by NTUA
- ANNEX 1.13 of the midterm report: Procurement - MoK
- ANNEX 1.14 of the midterm report: Procurement - MoA
- ANNEX 1.15 of the midterm report: Procurement - EDSNA
- ANNEX 1.16 of the midterm report: Procurement - EPTA
- ANNEX 1.17 of the final report: Photos from the press conference on 15th July 2013
- ANNEX 1.18 of the final report: ATHENS-BIOWASTE photos on 26th September 2013
- ANNEX 1.19 of the final report: Photos from the site visit in Austria in April 2014
- ANNEX 1.20 of the final report: Photos from the ATHENS SCIENCE FESTIVAL on 1st May 2014
- ANNEX 1.21 of the final report: Photos from the Athens-Biowaste Conference from 12th to 14th June 2014
- ANNEX 1.22 of the final report: Photos from the events in primary schools in MoA
- **ANNEX 1.23 of the final report**: Photos from the expansion of the biowaste separate collection in Hospitals and Facilities of the Armed Forces in July 2014
- **ANNEX 1.24 of the final report**: Photos from the process of washing the brown bins with the use of a specific vehicle in MoA
- **ANNEX 1.25 of the final report**: Photos from the pre-treatment of green waste for being used in the composting process

**ANNEX 2: Supporting Material**
- **ANNEX 2.1 of the midterm report**: Vice Mayor Letter, MoK
- **ANNEX 2.2 of the midterm report**: Vice Mayor Letter, MoA
- **ANNEX 2.3 of the midterm report**: Questionnaire MoK & Feedback from citizens
- **ANNEX 2.4 of the midterm report**: Maps of Kifissia with bind delivered
- **ANNEX 2.5 of the final report**: Decision of the EDSNA Committee within March 2015
- **ANNEX 2.6 of the final report**: EDSNA Guide for the preparation of local plans for the decentralised waste management making clear reference to the ATHENS-BIOWASTE initiative

**ANNEX 3: Deliverables - Reports**
- **ANNEX 3.1 of the midterm report**: Report for the site visit to Milan (12th – 13th December 2011), revised version
- **ANNEX 3.2 of the midterm report**: Review and evaluation of the existing bio-waste management practices in the EU, revised version
- **ANNEX 3.3 of the midterm report**: Technical Report for the selection of the pilot areas in the Municipality of Athens and the Municipality of Kifissia
- **ANNEX 3.4 of the midterm report**: Technical Report for the planning of the separation at source system, revised version
- **ANNEX 3.5 of the midterm report**: Technical Report for the planning of the awareness campaign, revised version
- **ANNEX 3.6 of the midterm report**: End-of-Action Report for Action 2
- **ANNEX 3.7 of the final report**: Collection pattern maps in MoK
- **ANNEX 3.8 of the final report**: Maps with the position of bins in MoK
- **ANNEX 3.9 of the final report**: Collection pattern map in MoA
- **ANNEX 3.10 of the final report**: Map with the position of bins in Kypriadou in MoA
- **ANNEX 3.11 of the final report**: Report on Activity 3c
- **ANNEX 3.12 of the final report**: Report on Activity 4b
- **ANNEX 3.13 of the final report**: Report on Activity 4c
- **ANNEX 3.14 of the final report**: Model in .xls form in Greek and English
- **ANNEX 3.15 of the final report**: Manual in Greek and English
- **ANNEX 3.16 of the final report**: Report produced by the model for Patra
- **ANNEX 3.17 of the final report**: Guide for the implementation, monitoring and evaluation of biowaste separate collection schemes and composting
- **ANNEX 3.18 of the final report**: Proposals for the technical specifications and legislation of biowaste
- **ANNEX 3.19 of the final report**: End-of-Action Report for Action 1
- **ANNEX 3.20 of the final report**: End-of-Action Report for Action 3
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- **ANNEX 3.22 of the final report**: End-of-Action Report for Action 5
- **ANNEX 3.23 of the final report**: End-of-Action Report for Action 6
- **ANNEX 3.24 of the final report**: End-of-Action Report for Action 7

**ANNEX 4: Tender Documents**
- **ANNEX 4.1 of the midterm report**: MoK Tender Documents
- **ANNEX 4.2 of the midterm report**: MoA Tender Documents
- **ANNEX 4.3 of the midterm report**: EDSNA Tender Documents

**ANNEX 5: Management**
- **ANNEX 5.1 of the midterm report**: Agenda, Participant List & Minutes of the Steering Committee meeting in Athens (20th July 2012)
- **ANNEX 5.2 of the midterm report**: Agenda & Minutes of the 3rd Project Meeting at Ano Liosia (26th February 2013)
- **ANNEX 5.3 of the final report**: Photos of the meeting held at MoA (24th October 2013)
- **ANNEX 5.4 of the final report**: Photos of the 4th Project Meeting at EPTA SA premises (30th October 2013)
- **ANNEX 5.5 of the final report**: Photos of the monitoring visit held at MoA (19th February 2014)

**ANNEX 6: Dissemination**
- **ANNEX 6.1 of the midterm report**: Presentation and agenda of the ATHENS-BIOWASTE project at the Networking Meeting for Regions for Recycling (R4R) on Wednesday 12th December 2012 (including photos)
- **ANNEX 6.2 of the midterm report**: 2nd ATHENS-BIOWASTE Newsletter
- **ANNEX 6.5 of the midterm report**: Indicative press releases and internet references for the initiation of the biowaste separation at source in Kifissia
- **ANNEX 6.6 of the midterm report**: Indicative press releases and internet references for the initiation of the biowaste separation at source in Athens
- **ANNEX 6.7 of the midterm report**: Presentation of the Athens-Biowaste team in Sofia, Bulgaria, April 2013
- **ANNEX 6.8 of the midterm report**: Photos from the FODSA Conference in Chios (June 2013)
- **ANNEX 6.9 of the final report**: Indicative list of references to the ATHENS-BIOWASTE project in the press prior to the initiation of the separation at source of biowaste
- **ANNEX 6.10 of the final report**: 3rd Athens-Biowaste Newsletter
• ANNEX 6.11 of the final report: “ATHENS-BIOWASTE: Integrated biowaste management in Greece: The case of Athens” by Dr. Dimitris Malamis at the final workshop of the WASTE-C-CONTROL LIFE+ Project which was held at Divani Caravel Hotel at Wednesday 25th September 2013

• ANNEX 6.12 of the final report: “Separation of organic waste at source, factor of orthodological daily life: The results of the LIFE+ project ATHENS-BIOWASTE” by Dr. Konstantinos Moustakas in the Conference of the Hellenic Plant Material Exporters Association with subject “Management of urban ecosystems” that was held on Saturday 5th October 2013 at MEC Paania, in the framework of the Exhibition Building Green Expo 2013

• ANNEX 6.13 of the final report: “Communicating your project and working with local authorities– the case of LIFE ENV / ATHENS BIOWASTE project” by Dr. Konstantinos Moustakas at the LIFE12 Kick-off Meeting which was held at Gaia Centre on 9th October 2013


• ANNEX 6.22 of the final report: “Composting of source separated biowaste in the MBT plant of EDSNA” by O. Skiadi, Th. Zarmpoutis. Ms. Olga Skiadi from EDSNA was the presenting author (http://www.athens2014.biowaste.gr/pdf/skiadi.pdf)


• ANNEX 6.25 of the final report: D. Malamis, K. Moustakas, A. Bourka, K. Valta, O. Skiadi, A. Sotiropoulos, V. Panaretou, C. Papadaskalopoulou, Compositional analysis of biowaste from study sites in Greek municipalities (Waste & Biomass Valorisation, accepted under minor revision)

• ANNEX 6.26 of the final report: A. Bourka, D. Malamis, C. Venetis, K. Moustakas, G. Konstantzos, O. Skiadi, M. Loizidou, Carbon footprint calculation of the collection at source and treatment of biowaste (Waste & Biomass Valorisation, accepted under minor revision)

• ANNEX 6.27 of the final report: Indicative list of news portals playing the Kifissia-Biowaste flash application

• ANNEX 6.28 of the final report: Indicative list of press releases regarding the initiation of the biowaste separate collection in Gazi area in MoA (November 2013)

• ANNEX 6.29 of the final report: video with duration 6 minutes and 46 seconds about the project implementation in the Municipality of Athens

• ANNEX 6.30 of the final report: Indicative press releases regarding the ATHENS-BIOWASTE conference event from 12th to 14th June 2014

• ANNEX 6.31 of the final report: Selected papers for potential publication in the two Collaborating Journals of the ATHENS-BIOWASTE Conference (Waste Management & Research, Waste and Biomass Valorization)

• ANNEX 6.32 of the final report: 1st Animation Video from the event in the primary school of the MoA on 31st January 2014

• ANNEX 6.33 of the final report: 2nd Animation Video from the event in the primary school of the MoA on 9th April 2014

• ANNEX 6.34 of the final report: 3rd Animation Video from the event in the primary school of the MoA on 3rd June 2014
• ANNEX 6.35 of the final report: exercises prepared for the pupils of the Schools of MoK that were distributed at the last week of May 2015 and the first week of June 2015
• ANNEX 6.36 of the final report: Two additional leaflets distributed to the households in Kifissia in June, July and August 2015.
• ANNEX 6.37 of the final report: Additional leaflet distributed to the households in MoA in July and August 2015.
• ANNEX 6.38 of the final report: Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “Biowaste Management at municipal level: The ATHENS-BIOWASTE project” in Thessaloniki on 2nd April 2015 making detailed reference to the activities and achievements of the ATHENS-BIOWASTE project
• ANNEX 6.39 of the final report: Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “Waste Management: The role of Citizens” in the ATHENS-SCIENCE FESTIVAL at Technopolis in Gazi on 20th March 2015 making special reference to the activities and achievements of the ATHENS-BIOWASTE project
• ANNEX 6.40 of the final report: Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “Biowaste Management: The ATHENS-BIOWASTE Initiative” in the WASTE & RECYCLING Conference at the Maroussi Plaza Amphitheatre on 29th January 2015 making special reference to the activities and achievements of the ATHENS-BIOWASTE project (http://www.wasteandrecycling.gr/default.asp?pid=4&la=1)
• ANNEX 6.41 of the final report: Dr. Dimitris Malamis represented the ATHENS-BIOWASTE working team with the speech with title “Biowaste Management – Pilot applications and decision tools” in the Transnational Conference & Transnational Workshop with Subject: “Municipal Waste Management- European Union’s New Targets-Tools and Solutions”, Central Union of Municipalities of Greece, 65 Akadimias Street & 8 Gennadiou Street, 10678, Athens, Monday 15th December 2014 (Agenda, Invitation)
• ANNEX 6.42 of the final report: Prof. Maria Loizidou represented the ATHENS-BIOWASTE working team with the speech with title “The ATHENS-BIOWASTE Initiative” in the Seminar, organised by the Association of Composting Enterprises and the Ecological Recycling Society under the auspices of the Hellenic Recycling Organisation, the City of Athens and the International Social Economy Network RReuse with title: “Composting and Alternative Waste Management by Local Authorities”, Amphitheater of the Municipality of Athens & INNOVATHENS Building at Technopolis in Gazi, 26-28 November 2014 (Seminar Agenda, Presentation)
• ANNEX 6.43 of the final report: Dr. Dimitris Malamis represented the ATHENS-BIOWASTE working team by presenting the ATHENS-BIOWASTE project in the networking meeting with projects implementing actions on waste management in the framework of the project “Promoting ZEROWASTE” (MED CAP 2007-2013) on 1st October 2014 (http://www.zerowastepro.eu/events/networking-workshop-in-athens-greece). This was a networking activity (Waste Related Projects that were presented (in Greek)
• ANNEX 6.44 of the final report: Dr. Dimitris Malamis represented the ATHENS-BIOWASTE working team by presenting the ATHENS-
BIOWASTE project in the LIFE+ WASP-Tool Workshop (networking activity in Greek) on 23rd September 2014

- **ANNEX 6.45 of the final report**: TV coverage at national level: SKAI TV: 9th November 2011 (Broadcast with the title: ECONEWS), SKAI TV: 15th July 2013 (Broadcast with the title: ECONEWS) & SKAI TV (Broadcast with title: LIFE)

- **ANNEX 6.46 of the final report**: TV coverage at national level: ALPHA TV: 12 June 2014: [https://www.youtube.com/watch?v=gsfyjduVazA](https://www.youtube.com/watch?v=gsfyjduVazA)

- **ANNEX 6.47 of the final report**: Promotion release by Xrusi Eukairia with thousands of recipients all around Greece: [http://sendy.xe.gr/w/a3Yc892RIa3L9LeLK7AzMvlQ/s9892892OrfLnN8kt27l2WPDXw/VhhpAyoAUC71sF27637EBVSA](http://sendy.xe.gr/w/a3Yc892RIa3L9LeLK7AzMvlQ/s9892892OrfLnN8kt27l2WPDXw/VhhpAyoAUC71sF27637EBVSA)

- **ANNEX 6.48 of the final report**: Layman’s Report (in Greek and English)