



Efficient Irrigation Management
Tools for Agricultural
Cultivations and Urban
Landscapes

IRMA

Supply and installation of new meteorological stations

WP: 5

Action: 5.4

Deliverable: 5.4.2

“Scientific support for the installation of network Meteorological Stations”

Part I. Assessment Report for the Support Actions of the Contracting Authority in the installation, connection and operation of the Network Meteorological Stations



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Management Tools for
Agricultural Cultivations
and Urban Landscapes
(IRMA)**

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“Scientific support for the installation of network Meteorological Stations”

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A.1 Crossborder Programme

The Crossborder European Territorial Cooperation Programme “Greece- Italy 2007-2013” was approved by the European Commission on 28/03/2008 by Decision C (2008) 1132/28/03/2008.

The total budget for the programme amounts to 118,606,893 €, of which 29,651,723€ (25%) come from national funds, whereas 88,955,170 € (75%) come from the European Regional Development Fund (ERDF). Eligible areas of the programme are the Regions of Western Greece (Prefectures of Aetolokarnania and Achaia), of Ionian Islands (Prefectures of Corfu, Lefkada, Kefalonia and Zante) and of Epirus (Prefectures of Ioannina, Preveza and Thesprotia) in Greece, as well as the Region of Puglia in Italy (Provinces of Bari, Brindisi and Lecce). The Prefectures of Ilia and Arta in Greece and the Provinces of Taranto and Foggia in Italy are included in the Programme as adjacent territories.

The general objective of the Programme “Greece- Italy” is “to strengthen the competitiveness and territorial cohesion in the area towards the sustainable development by linking the potential on both sides of the cross-border maritime line”.

This general objective shall be achieved through the following strategic objectives:

- Strategic Objective 1: Support for sustainable economic growth by focusing on common comparative advantages
- Strategic Objective 2: Improvement of the accessibility potential to networks and services in the cooperation area, so as to enhance mobility of people and goods
- Strategic Objective 3: Improvement of the quality of life, preservation and effective management of the environment and increase of the social and cultural cohesion

A.2 Scope and Objectives of the Act

The Decentralised Administration of Epirus- Western Macedonia/ Directorate of Agricultural Affairs of Epirus announces Clipboard Competition with subject the award of the project: “PROVISION OF SUPPORTING SERVICES FOR THE IMPLEMENTATION OF THE SUB-PROJECT OF THE DECENTRALISED ADMINISTRATION OF EPIRUS & WESTERN MACEDONIA IN THE FRAMEWORK OF THE ACT ‘EFFICIENT IRRIGATION MANAGEMENT TOOLS FOR AGRICULTURAL CULTIVATIONS AND URBAN LANDSCAPES’ ”.

The corporate structure involves the TEI (Technological Educational Institute) of Epirus, the Decentralised Administration of Epirus- Western Macedonia, the Region of Puglia, the Development Association of the Region of Western Greece, the Institute of Agricultural Economy of Italy and the Research Institute of Food Production of the National Research Council of Italy.

A.2.1 Intervention Area of the Act

Municipality of Arta

The city of Arta constitutes the administrative, economic and cultural center of the homonymous Regional Unit, having formed a different culture, different from the one cultivated by the mountainous populations of Tzoumerka. Different civilisations have left their own indelible marks on architecture, cultural tradition and identity of the settlements of the Unit.

Two magnificent rivers, Arachthos and Louros, flow through it, while their deltas cross and pour into the Amvrakikos Gulf. The latter is the natural southern border of the Prefecture of Arta and forms a spectacular landscape, which consists of exceptionally beautiful wetlands and of the lagoons of Logarou and Tsakalou. This is the shelter for swans and flamingos, among others.

Arta is located in the midst of the chain of urban centers of the north-western part of Greece, which constitute a network of sites endowed with particular natural, ecological, historical archaeological and cultural interest. This axis of urban centers shall essentially constitute the road communication axis of the country with Albania and Italy as well (Ionian Road- Egnatia- Port of Igoumenitsa).

The historical center of the city, the clock of the castle and the surrounding districts lend a particular character to the city. In Arta, art and culture thrived, while the

economic growth gradually provided the city with several educational institutions, churches and monasteries, mansions, newly built roads, often as a result of local benefactors' donations.

Nowadays, Arta is a modern city with Technological Educational Institutes, museums, libraries, many cultural groups and choirs and, of course, the largest stone bridge of the country as its trademark. On the other side, populations of mountainous Tzoumerka developed a special lifestyle based on livestock, trade, constructions and crafts. Populations of the surrounding villages of the valley had been producers and caterers of the entire R.U. of Arta for centuries, in fact exporting various agricultural products to the rest of the country and abroad.

Nowadays, cultivations are constantly decreasing, whereas activities related to the Secondary and Tertiary Sector are being multiplied.

Municipality of Nikolaos Skoufas

The Municipality of Nikolaos Skoufas was established in 2011, after the implementation of "Callikrates" Programme. Its headquarters is located in Peta, while its historical headquarters is in Kommemo. The current municipality was formed after the integration of the municipalities of Peta, Arachthos and Kompoti and the community of Kommemo.

The Municipality bears great historical significance and it is named after the national hero and founder of "Filiki Etairia" (Friendly Society), Nikolaos Skoufas, who was born in Arta and dedicated his life to the idea of revolution of the Nation.

Moreover, several places of the Municipality are engraved in bold within the pages of modern history of the country. Important historical events that took place in this area is the battle of Peta on July 4, 1822 with the sacrifice of Greek and foreign volunteer philhellenes, the struggle against the Ottoman Rule and the Holocaust of Kommemo on August 16, 1943 with the massacre of 317 civilian victims of the Nazi troops.

In the mountainous northern part of the Municipality stands the capital, Peta, with the traditional square, the church of Saint George, the Monument of foreign Philhellenes, the Monastery of Virgin Mary, the Folklore Museum and the exquisite lake of Pournari with the panoramic view of Arta and the Amvrakikos Gulf.

The semi-mountainous region of the Municipality, full of greenery, is completed with the settlements Kleisto, Zygos, Markiniada, Megkla and Melas and offers spectacular lake view.

Following a stroll through the Municipality, one comes across the rapidly growing village of Agios Dimitrios with its charming square, the traditional village Neochoraki with stone houses, the lovely city of Amfithea and the picturesque city of Megarchi.

In the central part of the Municipality there is the settlement of Kompoti, featuring the following sites: Nikolas Skoufas' statue, Turkish guardhouses, the port, the Environmental Center in Kopraina and the old churches of Saint George and of the "Assumption" of Virgin Mary in Sellades. Traditionally built on the opposite hil, lies Peranthi with its huge plains of Arta and the Amvrakikos Gulf.

The southwestern part of the Municipality, which is flat and is crossed by the river Arachthos, is full of scattered rural settlements.

On the opposite side, next to the basin of Arachthos, one may find Neochori and the waterside park, the picturesque beach Platanaki and lagoons.

The villages Pachykalamos, Akropotamia, Anthotopos, Agia Paraskevi and Kolomodias complement the lovely landscape.

Region of Puglia

The Region of Puglia borders with the Region of Molise to the north , with Campania and Basilicata to the west, while it is washed by the Adriatic sea to the northeast and by the Ionian Sea to the southwest.

Puglia covers an area of 19,366 square km and its population amounts to 4,072,839 residents.

It is the Region with the least mountainous lands in Italy (2%), whereas large part of its territory is located at an altitude between 100 and 300 meters.

From hydrographic aspect, the Region of Puglia is passed through by various minor rivers, among which the most important one is Ofanto, having a length of 170 kilometers. The largest lakes are the ones of Lesina and Varano, to the north.

Major cities of the Region of Puglia are Bari, Foggia, Brindisi, Lecce and Taranto.

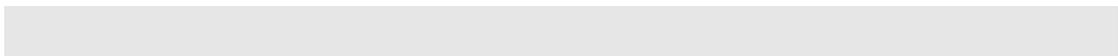
A.2.2 Objectives of the Act

The general objective of IRMA is to develop, implement and promote effective irrigation management tools and techniques in rural and urban environments. Other specific objectives of the Act are:

- the development of networking and other expertise transfer mechanisms;
- the research on local irrigation practices;
- the creation, implementation and evaluation of control procedures for irrigation systems;
- the development, implementation and evaluation of a fully functional Information System, which shall provide information about plant water needs, as well as tools and practical instructions on irrigation scheduling and irrigation planning/management systems;
- scientifically documented knowledge on drought-resistant crops/ varieties, sensors and irrigation management systems, as well as alternative water sources for agricultural and urban irrigation;
- actions for the diligent and cautious establishment of public, professional training/ certification on strategies and methods for efficient irrigation management.

A.3 Scope and Objectives of the Act

Within the scope of installing and connecting Meteorological Stations, the Contractor has undertaken the obligation to support the Contracting Authority throughout the whole process, from the receipt of the equipment up to the operation of the Stations.



B INSTALLATION OF METEOROLOGICAL STATIONS IN NETWORK IN THE AREA OF EPIRUS

B.1 General info

One of the major results of the implementation of the IRMA Project for the Intervention Area is undoubtedly the installation of a network of meteorological stations at selected points. These stations shall give local farmers the opportunity to have a complete image of the evolution of weather conditions, while planning their actions according to them. In addition, research institutions and organisations shall have the chance to carry out measurements and calculations, using validation.

The Decentralised Administration of Epirus and Western Macedonia, taking into account the objectives of the IRMA Project and in consultation with the other partners, has proceeded to the Declaration 57585/1782 on 05/09/2014 for finding the appropriate equipment for meteorological stations, so as to multiply the benefits of its installation for residents of the Intervention Areas.

According to the above, it has been decided that the newly established network of meteorological stations would include three different types of stations. Specifically:

- a) Six wireless (UHF) reference stations of high precision (Type A)
- b) Nine online stations of high precision (Type B)
- c) Five online stations of medium precision (Type C)

After the completion of the Declaration process, three different types of meteorological stations were selected, each of which corresponds to a type. Specifically, the following types were selected:

Type A: ADCON A753

Type B: DAVIS VANTAGE PRO 2

Type C: SYMMETRON STYLITIS 10

The features of each of the three types, as well as their compliance with the formalities of the Declaration 57585/1782 is reference object of the Deliverable “3.2 One (1)

Evaluation Report on the installation of Meteorological Stations” of this project and, therefore, it will not be further referred to in this Report.

B.2 Actions supporting the process of installation, connection and operation on behalf of the Contractor

The Contractor provided supporting services to the Decentralised Administration of Epirus and Western Macedonia throughout the course of installation, connection and operation of meteorological stations. In cooperation with specialised personnel (meteorologist) with years of experience in the operation of respective networks, the Contractor has ensured the optimum support for the Body.

It is noteworthy that there has been contact with the supplier of the technical equipment, always in consultation with the Decentralised Administration, in order for him to certify the features, the functionality and the credibility of the plants.

B.2.1 Technical Meetings

B.2.1.1 First Technical Meeting

The first meeting between the parties involved in the installation and operation of the plants took place on 29/01/2015 at the premises of the equipment supplier (SCIENTACT company) in Thessaloniki. The meeting took place following an initiative of the Decentralised Administration of Epirus and Western Macedonia (DAEWM) and after the consent of all attending partners. Present were the following representatives of the Decentralised Administration and the equipment Contractors, as well as its technical support services Contractors.

NAME	CONTACT NUMBER	BODY
Filis Vaggelis	2651090267	DAEWM
Toufidis Pantazis	2651090263	DAEWM
Kouvas Dimitrios	6945873501	SCIENTACT
Mamanis Giannis	6944733216	SCIENTACT

Pitidis Vangelis	6975858456	HYPERCO
Rammos Nikolaos	6983522806	HYPERCO
Kotoula Maria	6939475481	HYPERCO
Pantziou Konstantina	6971974661	HYPERCO

The meeting agenda included the following:

1. Detailed discussion about the meteorological equipment to be received by the DAEWM in the framework of the Project.
2. Clarification of the sites where such equipment is to be placed, as well as of Underwriters' role to support the installation process of the stations.
3. Clarification of the features of each type of plant.
4. Scheduling of in-spot inspection of the sites where the stations are to be placed.

After a comprehensive discussion among all participants in the meeting, they concluded in a plan to launch the implementation of the Project activities. This specific plan included the scheduling of a site visit to the areas where it was agreed to place meteorological stations, as well as the overall cooperation among all involved parties. Furthermore, it was decided that the SCIENTACT Company should administer technical brochures and certificates to the Body, which would certify the operational potentials of the plants, with the help of specialised staff of its Contractor.

Technical meetings concerning the installation, connection and operation of the plants took place several times also at the premises of the Decentralised Administration of Epirus and Western Macedonia, many of which were informal and relied on the close relation between the Body and the Contractor. Representatives of the Contractor were at all times ready to offer their services to the Body, whenever requested, while its specialised staff had phone or online contacts to clarify any problems that arose.

On the other side, the Contractor had continuous communication with the supplier of the meteorological equipment, both by phone and e-mail, as well as in personal meetings. The cooperation between the two sides is characterised as excellent, as there was mutual respect and convergence of views.

B.2.1.2 Second Technical Meeting

The second Technical Meeting in the context of the Body- Contractor cooperation for the implementation of the Project was held on 23/6/2015 at the premises of the Directorate of Rural Affairs of the Decentralised Administration of Epirus and Western Macedonia. Present were the following ones:

NAME	CONTACT NUMBER	BODY
Filis Vangelis	2651090267	DAEWM
Toufidis Pantazis	2651090263	DAEWM
Papiggioti Eleonora	6973316179	DAEWM
Vartzioti Fotini	2651090255	DAEWM
Kasioumi Maria	2651090267	DAEWM
Pitidis Vangelis	6975858456	HYPERCO
Rammos Nikolaos	6983522806	HYPERCO
Kotoula Maria	6939475481	HYPERCO
Koliou Vicky	2651065600	HYPERCO
Sforos Spyros	6945934837	HYPERCO

During this particular meeting, there was an update on the part of the Contractor on the Deliverables related to the installation and operation of the meteorological stations, which were being finalised. Moreover, all parties agreed that an additional visit to the mounting areas of the plants would significantly contribute to the deduction of more comprehensive results about the functionality and sustainability of the network.

The Contractor drew and sent to all participants detailed Reports with records of all the technical meetings held.

B.2.2 In situ visits to the area

B.2.2.1 First Visit

As participants agreed in the technical meeting of 29/01/2015, an in situ visit took place in the sites selected for the installation of the meteorological equipment on 05/02/2015. Present at the visit were representatives of the Decentralised Administration, as well as of the Underwriters of the equipment and of the technical support services.

The meeting agenda included the following topics:

1. In situ inspection of some spots where the meteorological equipment was to be installed.
2. Detailed examination of the site, so that the most adequate mounting location of the meteorological equipment could be identified.
3. Eligibility criteria were the sustainability of the plants (protection- security of materials), the infrastructure for continuous operation and uninterrupted data transmission, as well as the topography of the area.

Participants visited selected locations of the Regional Unit of Arta, where they agreed to install meteorological equipment. At each spot, the most appropriate mounting location of the equipment was looked for, given the morphology of the ground, the orientation and the particularities of the place. In addition, the existing infrastructure and the possibility of their exploitation for the operation of meteorological stations were examined. Finally, excluded were the cases in which the morphology of the ground and the activities carried in the area could affect the operation of the plants.

Specifically, the following positions were inspected:

Area	Location	Type of Plant
Pantanassa	Creamery “Pappas Bros.”	DAVIS VANTAGE PRO 2
Kampi	Butchery “Kokkalis”	ADCON A753
Vlacherna	Nursery “Vitsios”	SYMMETRON STYLITIS 10
Kompoti	Poultry house “Giannoulis”	ADCON A753

Megarchi	Elementary School of Megarchi	SYMMETRON STYLITIS 10
Foteino	Community Bureau	DAVIS VANTAGE PRO 2
Kalogiros Bridge	Nursery “Giozgatoglou”	DAVIS VANTAGE PRO 2
Agios Spyridonas	Greenhouses “Apostolidis”	ADCON A753
Kalovatos	Local Organisation of Land Reclamations of Kalovatos (TOEV)	DAVIS VANTAGE PRO 2
Kostakioi	Technological Educational Institute of Arta	DAVIS VANTAGE PRO 2

Additional visits to the mounting locations of the rest of plants were performed in other periods of time, in which the Contractor had constant presence and opinion on the adequacy of each of them and on the infrastructure projects probably needed to ensure the sustainability of their operation.

Lastly, the following representatives per organisation attended this visit:

NAME	CONTACT NUMBER	BODY
Filis Vangelis	2651090267	DAEWM
Toufidis Pantazis	2651090263	DAEWM
Kouvas Dimitrios	6945873501	SCIENTACT
Mamanis Giannis	6944733216	SCIENTACT
Trompoukis Efthymios	6945203675	HYPERCO
Ramos Nikolaos	6983522806	HYPERCO

B.2.2.2 Second Visit

Following the first visit to the mounting locations of meteorological stations, another visit to the stations not easily approached during the first visit was considered appropriate from all aspects.

For this reason and following an initiative of the Decentralised Administration of Epirus and Western Macedonia, participants conducted a second visit on 03/03/2015 to selected plants in the valley of Arta, where they inspected the sufficient

accomplishment of the pursued targets, as drawn in the scheduling of the Project. Full data of the visit: the agenda included:

1. In situ inspection of spots where the meteorological equipment was to be installed.
2. Detailed examination of the site, so that the most adequate mounting location of the meteorological equipment could be identified.
3. Check of the installed equipment.

The locations tested were the following ones:

Area	Location	Type of Plant
Flampoura	Eurofarm SA	DAVIS VANTAGE PRO 2
Aneza	Photovoltaic Park of Pavlos	SYMMETRON STYLITIS 10
Vigla	Pumping station of GOEV (General Organisation of Land Reclamations)	ADCON A753
Glykorizo	Sewage Station of DEYAA (Public Enterprise for Water Supply and Sanitation)	SYMMETRON STYLITIS 10
Psathotopi	Aeroclub of Epirus	DAVIS VANTAGE PRO 2

During the visit, spot inspection of the positions and installation of plants were conducted, wherever it was possible. The conclusions of the visit are summarised below :

Eurofarm SA- Flampoura

The group of experts examined the premises of Eurofarma SA and concluded that the necessary prerequisites for the installation of equipment are fulfilled, while the site is adequately fenced. However, it was detected that internet connection lacked, but it would be promptly restored, as company managers assured. Lastly, the plant was immediately established in the site.

Photovoltaic Park of Pavlos - Aneza

During a check conducted at the spot and the premises, it was revealed that the mounting location is appropriate for the establishment of the plant, the internet access –however-was weak. Company technicians restored this problem immediately.

Pumping station of the General Organisation of Land Reclamations (GOEV)- Vigla

Premises of GOEV fulfill the necessary prerequisites for the mounting of meteorological equipment, while there is already properly fenced place that could be used. The deforestation of the fenced area would increase the smooth operation of the station. The company committed to install the meteorological equipment on the same day.

Sewage Station of Arta- Glykorizo

The area fulfills the prerequisites of mounting of the meteorological equipment and it will be installed promptly.

Aeroclub of Arta- Psathotopi

The premises of the Aeroclub of Arta, due to the existence of relevant infrastructure, constitute ideal mounting location of the meteorological equipment. Additionally, at the premises of the Aeroclub there is a fenced area, selected for the immediate installation of the plant.

B.2.3 Operation of the meteorological stations

After the installation and connection of the plants, process during which the Contractor was continuously updated on the course of implementation, the stations began to broadcast the first results of their measurements. These results are included in the Deliverable 3.4 “One (1) Report on pilot operation of the Network of Meteorological Stations”, which also includes the assessment of the efficient/ non efficient operation of the network.

The supplier of the meteorological equipment bares the responsibility of its maintenance, whereas the Decentralised Administration of Epirus and Western Macedonia, in cooperation with the LP Project, conducts the continuous monitoring of its results.



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Authoring team:

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Innovative Solutions

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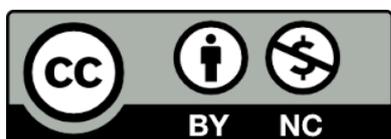
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A.1 Crossborder Programme

The Crossborder European Territorial Cooperation Programme “Greece- Italy 2007-2013” was approved by the European Commission on 28/03/2008 by Decision C (2008) 1132/28/03/2008.

The total budget for the programme amounts to 118,606,893 €, of which 29,651,723€ (25%) come from national funds, whereas 88,955,170 € (75%) come from the European Regional Development Fund (ERDF). Eligible areas of the programme are the Regions of Western Greece (Prefectures of Aetolokarnania and Achaea), of Ionian Islands (Prefectures of Corfu, Lefkada, Kefalonia and Zante) and of Epirus (Prefectures of Ioannina, Preveza and Thesprotia) in Greece, as well as the Region of Puglia in Italy (Provinces of Bari, Brindisi and Lecce). The Prefectures of Ilia and Arta in Greece and the Provinces of Taranto and Foggia in Italy are included in the Programme as adjacent territories.

The general objective of the Programme “Greece- Italy” is “to strengthen the competitiveness and territorial cohesion in the area towards the sustainable development by linking the potential on both sides of the cross-border maritime line”.

This general objective shall be achieved through the following strategic objectives:

- Strategic Objective 1: Support for sustainable economic growth by focusing on common comparative advantages
- Strategic Objective 2: Improvement of the accessibility potential to networks and services in the cooperation area, so as to enhance mobility of people and goods
- Strategic Objective 3: Improvement of the quality of life, preservation and effective management of the environment and increase of the social and cultural cohesion

A.2 Scope and Objectives of the Act

The Decentralised Administration of Epirus- Western Macedonia/ Directorate of Agricultural Affairs of Epirus announces Clipboard Competition with subject the award of the project: “PROVISION OF SUPPORTING SERVICES FOR THE IMPLEMENTATION OF THE SUB-PROJECT OF THE DECENTRALISED ADMINISTRATION OF EPIRUS & WESTERN MACEDONIA IN THE FRAMEWORK OF THE ACT ‘EFFICIENT IRRIGATION MANAGEMENT TOOLS FOR AGRICULTURAL CULTIVATIONS AND URBAN LANDSCAPES’ ”.

The corporate structure involves the TEI (Technological Educational Institute) of Epirus, the Decentralised Administration of Epirus- Western Macedonia, the Region of Puglia, the Development Association of the Region of Western Greece, the Institute of Agricultural Economy of Italy and the Research Institute of Food Production of the National Research Council of Italy.

A.2.1 Intervention Area of the Act

Municipality of Arta

The city of Arta constitutes the administrative, economic and cultural center of the homonymous Regional Unit, having formed a different culture, different from the one cultivated by the mountainous populations of Tzoumerka. Different civilisations have left their own indelible marks on architecture, cultural tradition and identity of the settlements of the Unit.

Two magnificent rivers, Arachthos and Louros, flow through it, while their deltas cross and pour into the Amvrakikos Gulf. The latter is the natural southern border of the Prefecture of Arta and forms a spectacular landscape, which consists of exceptionally beautiful wetlands and of the lagoons of Logarou and Tsakalou. This is the shelter for swans and flamingos, among others.

Arta is located in the midst of the chain of urban centers of the north-western part of Greece, which constitute a network of sites endowed with particular natural, ecological, historical archaeological and cultural interest. This axis of urban centers shall essentially constitute the road communication axis of the country with Albania and Italy as well (Ionian Road- Egnatia-Port of Igoumenitsa).

The historical center of the city, the clock of the castle and the surrounding districts lend a particular character to the city. In Arta, art and culture thrived, while the economic growth gradually provided the city with several educational institutions, churches and monasteries, mansions, newly built roads, often as a result of local benefactors' donations.

Nowadays, Arta is a modern city with Technological Educational Institutes, museums, libraries, many cultural groups and choirs and, of course, the largest stone bridge of the country as its trademark. On the other side, populations of mountainous Tzoumerka developed a special lifestyle based on livestock, trade, constructions and crafts. Populations of the surrounding villages of the valley had been producers and caterers of the entire R.U. of Arta for centuries, in fact exporting various agricultural products to the rest of the country and abroad.

Nowadays, cultivations are constantly decreasing, whereas activities related to the Secondary and Tertiary Sector are being multiplied.

Municipality of Nikolaos Skoufas

The Municipality of Nikolaos Skoufas was established in 2011, after the implementation of “Callikrates” Programme. Its headquarters is located in Peta, while its historical headquarters is in Kommeno. The current municipality was formed after the integration of the municipalities of Peta, Arachthos and Kompoti and the community of Kommeno.

The Municipality bears great historical significance and it is named after the national hero and founder of “Filiki Etairia” (Friendly Society), Nikolaos Skoufas, who was born in Arta and dedicated his life to the idea of revolution of the Nation.

Moreover, several places of the Municipality are engraved in bold within the pages of modern history of the country. Important historical events that took place in this area is the battle of Peta on July 4, 1822 with the sacrifice of Greek and foreign volunteer philhellenes, the struggle against the Ottoman Rule and the Holocaust of Kommeno on August 16, 1943 with the massacre of 317 civilian victims of the Nazi troops.

In the mountainous northern part of the Municipality stands the capital, Peta, with the traditional square, the church of Saint George, the Monument of foreign Philhellenes, the Monastery of Virgin Mary, the Folklore Museum and the exquisite lake of Pournari with the panoramic view of Arta and the Amvrakikos Gulf.

The semi-mountainous region of the Municipality, full of greenery, is completed with the settlements Kleisto, Zygos, Markiniada, Megkla and Melas and offers spectacular lake view.

Following a stroll through the Municipality, one comes across the rapidly growing village of Agios Dimitrios with its charming square, the traditional village Neochoraki with stone houses, the lovely city of Amfithea and the picturesque city of Megarchi.

In the central part of the Municipality there is the settlement of Kompoti, featuring the following sites: Nikolas Skoufas’ statue, Turkish guardhouses, the port, the Environmental Center in Kopraina and the old churches of Saint George and of the “Assumption” of Virgin Mary in Sellades. Traditionally built on the opposite hill, lies Peranthi with its huge plains of Arta and the Amvrakikos Gulf.

The southwestern part of the Municipality, which is flat and is crossed by the river Arachthos, is full of scattered rural settlements.

On the opposite side, next to the basin of Arachthos, one may find Neochori and the waterside park, the picturesque beach Platanaki and lagoons.

The villages Pachykalamos, Akropotamia, Anthotopos, Agia Paraskevi and Kolomodion complement the lovely landscape.

Region of Puglia

The Region of Puglia borders with the Region of Molise to the north , with Campania and Basilicata to the west, while it is washed by the Adriatic sea to the northeast and by the Ionian Sea to the southwest.

Puglia covers an area of 19,366 square km and its population amounts to 4,072,839 residents.

It is the Region with the least mountainous lands in Italy (2%), whereas large part of its territory is located at an altitude between 100 and 300 meters.

From hydrographic aspect, the Region of Puglia is passed through by various minor rivers, among which the most important one is Ofanto, having a length of 170 kilometers. The largest lakes are the ones of Lesina and Varano, to the north.

Major cities of the Region of Puglia are Bari, Foggia, Brindisi, Lecce and Taranto.

A.2.2 Objectives of the Act

The general objective of IRMA is to develop, implement and promote effective irrigation management tools and techniques in rural and urban environments. Other specific objectives of the Act are:

- the development of networking and other expertise transfer mechanisms;
- the research on local irrigation practices;
- the creation, implementation and evaluation of control procedures for irrigation systems;
- the development, implementation and evaluation of a fully functional Information System, which shall provide information about plant water needs, as well as tools and practical instructions on irrigation scheduling and irrigation planning/management systems;
- scientifically documented knowledge on drought-resistant crops/ varieties, sensors and irrigation management systems, as well as alternative water sources for agricultural and urban irrigation;
- actions for the diligent and cautious establishment of public, professional training/ certification on strategies and methods for efficient irrigation management.

A.3 Scope and Objectives of the Act

Within the scope of installing and connecting Meteorological Stations, the Contractor has undertaken the obligation to support the Contracting Authority throughout the whole process, from the receipt of the equipment up to the operation of the Stations.

B INSTALLATION OF METEOROLOGICAL STATIONS

B.1 General Information

As part of the installation of meteorological stations in the area of Epirus, the Contractor conducted consulting activities on the sitting and on the functional potentials of each of the three types of the meteorological stations placed in the area. Indicatively, the following obligations of the Contractor towards the Decentralised Administration of Epirus and Western Macedonia mentioned:

- Determination of the accurate location of the final installation as compared to the originally designated positions;
- Detailed designation of the features and the operational mode of meteorological stations;
- Indication of possible spots that may require additional infrastructure projects (e.g. fencing, bracing, etc.) for the reception and proper functioning of the plants;
- Assessment of the electricity supply efficiency of the plants;
- Assessment of the Internet coverage existing in the mounting area of the plants.

The station network to be established shall be composed of:

- a) Six wireless (UHF) reference stations of high precision (Type A)
- b) Nine online stations of high precision (Type B)
- c) Five online stations of medium precision (Type C).

Below there is a designation of the characteristic features of the stations and of the spots where these plants were mounted. Additionally, there is a reference to any power supply or Internet network problems identified in some of the mounting spots, as well as to infrastructure projects carried out in some places to ensure the functionality of the stations.

B.2 Features of each type of station

In accordance with the requirements of the Declaration 57585/1782 of 05/09/2014 of the Decentralised Administration of Epirus and Western Macedonia on the equipment supply for the implementation of the IRMA Project, as mentioned above, there is provision for the placement of three types of stations (Type A, Type B and Type C), with distinct characteristics for each of them. The features required for each type of station are listed below:

B.2.1 “Type A” Stations

“Type A” Stations and their peripheral ones shall operate with photovoltaic modules. The photovoltaic modules (and therefore the energy needs of the plant) should have very small dimensions, so that the maximum possible thefts for any other use would be prevented, since they will be fully exposed outdoors.

All structural units of plants shall be distinct, easily identifiable and easily detachable from the station, to facilitate the shipment of their parts to suppliers, in case of calibration or repair.

The communication of all stations shall be based on combination of wireless UHF, GPRS connection and TCP/IP via wired Internet network.

Data from all stations will be transmitted to the center every 60 minutes.

Alarm paging for “Type A” stations

Specialised editing software on the received measurements will operate in the measurement center.

However, in addition to the above, the network itself should directly provide alarms for the following cases:

- Excess of limits of measured parameters. For each parameter it should be possible to determine at least 5 maximum and 5 minimum alarm limits.
- Possibility to create an alarm condition, in which at least 5 parameters could be engaged.
- Delay of taking measurements from the stations. For each station, it should be possible to set at least 2 different alarm times.
- Supply voltage drop. Option to set at least 3 different levels for each plant.
- Disconnection of solar collector.
- Installation temperature. Option to set at least 2 maximum and 2 minimum levels for each station.

For each case, an e-mail message will be sent describing the incident.

On the basis of these specific features, the ADCON A753 Type of Weather Station was selected, highly meeting all the requirements set in the Declaration 57585/1782. Complete functional features and the operating mode of the Station are attached to this Report. Also attached are the features of the supplementary schemes used for their operation (e.g photovoltaic system, battery, etc.).

B.2.2 “Type B” Stations

For “Type B” Stations, the following are predicted:

There shall be automatic recording of the incident and its duration, separately for each station and in total for the whole network, while the aforementioned alarm archives will be accessible online.

- The plant shall be composed of two parts, the external and the internal one. The external part will include sensors, will operate with solar collector and will transmit measurements to the internal part wirelessly.
- The internal part shall receive measurements and forward them to the reception center via LAN and online.
- It will be supplied from the public electricity network, accompanied by suitable adapter/ power supply system.
- The plant will be connected to LAN via Ethernet gate.

In consideration of the above features, DAVIS Vantage Pro2 was selected for this type. The features of this type, attached together with this Report, meet all the aforementioned requirements; therefore, it is approved by the present Report.

B.2.3 “Type C” Stations

For “Type C” Stations, the following features are predicted:

- Stations will be placed in public buildings.
- They shall be supplied from the public electricity network, accompanied by suitable adapter/ power supply system.
- They shall be connected to LAN via Ethernet gate.

In consideration of the above features, SYMMETRON STYLITIS 10 was selected for this type, the features of which are attached together with this Report and meet all the aforementioned requirements; therefore, the model is approved in its turn.

B.3 Mounting location of the Stations

The Table below depicts the mounting locations of meteorological stations within the Intervention Area. It is noteworthy that there have been no reported differences compared to the original positions designated for installation. It is obvious that there have been placed six (6) “Type A” Stations, nine (9) “Type B” Stations and five (5) “Type C” Stations, exactly as envisaged in the Declaration.

Following the attached Table, there is a presentation of each of the Stations separately, with a photograph and its operating standards, as predicted by the supplier.

Table 1: Precise Location of Meteorological Stations in the Intervention Area

	TYPE OF STATION	AREA	LOCATION	LATITUDE	LONGITUDE
S01	DAVIS VantagePro2	Kostakioi	Technological Educational Institute of Epirus, Kostakioi	39.121797°	20.946733°
S02	ADCON A753	Vigla	Pumping station of GOEV (General Organisation of Land Reclamations)	39.07898°	20.88533°
S03	SYMMETRON STYLITIS 10	Glykorizo	Sewage Station of DEYAA (Public Enterprise for Water Supply and Sanitation)	39.13597°	20.99102°
S04	DAVIS VantagePro2	Kalogiros Bridge	Nursery "Giozgatoglou" Ch.	39.172316°	20.892165°
S05	DAVIS VantagePro2	Kalomodia	Aeroclub of Epirus	39.08772°	20.97194°
S06	ADCON A753	Agios Spyridonas	Greenhouses "Apostolidis Pavlos"	39.14904°	20,87591°
S07	DAVIS VantagePro2	Foteino	Community Bureau	39.134203°	21.108202°
S08	ADCON A753	Kostakioi	Technological Educational Institute of Epirus	39.12208°	20.94737°
S09	ADCON A753	Kommeno	Farm of the Municipality of Zois	39.05061°	21.01207°
S10	DAVIS VantagePro2	Kopraina	Environmental Education Center of Arachthos, Kopraina	39.03866°	21.07444°
S11	SYMMETRON STYLITIS 10	Megarchi	Elementary Schools	39.13636°	21.06944°
S12	ADCON A753	Kampi	Butchery "Kokkalis"	39.21634°	20.91295°
S13	SYMMETRON STYLITIS 10	Vlacherna	Nursery "Vitsios"	39.16651°	20.99159°
S14	DAVIS VantagePro2	Kalovatos	TOEV of Louros (Local Organisation of Land Reclamations)	39.12073°	20.91134°
S15	DAVIS VantagePro2	Psathotopi	Breeding Farm "Geitonas"	39.07188°	20.96672°
S16	SYMMETRON STYLITIS 10	Stroggyli	Community Bureau	39.12519°	20.81140°
S17	DAVIS VantagePro2	Flampoura	Eurofarm "Chelia"	39.07635°	20.76173°
S18	SYMMETRON STYLITIS 10	Aneza	Photovoltaic Park of Pavlos	39.09419°	20.92764°
S19	DAVIS VantagePro2	Pantanassa	Creamery "Pappas Bros."	39.235484°	20.865280°
S20	ADCON A753	Kompoti	Poultry house "Giannoulis Bros."	39.09518°	21.06071°

B.4 Determination of the final positions for the placement of stations

During the installation of the aforementioned 20 meteorological stations, it was observed that the initial positions were suitable for mounting 19 of the 20 stations. Problematic was only the case of the Elementary School of Neochori, where it was observed that not all requirements for mounting “Type B” Station were fulfilled, as there was not adequate Internet network.

Therefore, it was decided that a station would be mounted in the Aeroclub of Epirus, between Psathotopi and Kalomodias, as in this particular spot the requirements for the placement of stations were fully satisfied.

B.5 Spots demanding additional infrastructure projects

After the spot inspection conducted in the suggested mounting locations of the stations, it was noted that in some of them the construction of small, in situ infrastructure projects was necessary, so that their sustainability would be ensured. These projects were considered indispensable, since some of the stations are placed in open places (e.g. fields) where they are left unprotected against any attacks.

Thus, with views to ensure their sustainability, mainly by protecting them from possible thefts, some of the stations were placed in the envisaged spots along with the construction of fencing. Fencing projects were carried out at the following stations:

Table 2: Stations demanding additional infrastructure projects

Name of Station	Type	Area	Location	Project
S06	ADCON A753	Agios Spyridonas	Greenhouses “Apostolidis Pavlos”	Fencing
S10	DAVIS VantagePro2	Kopraina	Environmental Education Center of Arachthos, Kopraina	Fencing
S14	DAVIS VantagePro2	Kalovatos	TOEV of Louros (Local Organisation of Land Reclamations)	Fencing
S20	ADCON A753	Kompoti	Poultry house “Giannoulis Bros.”	Fencing

C PRESENTATION OF METEOROLOGICAL STATIONS

In this section follows a detailed presentation of each of the meteorological stations placed under the IRMA Act. In the context of this presentation, there will be also pictures of stations in situ, after their installation.

C.1 Station ADCON A753

Name of Station:	S08
Area:	Technological Educational Institute of Epirus, Kostakioi
Latitude:	39,12208
Longitude:	20,94737
Picture:	
Name of Station:	S06
Area:	Greenhouses "Apostolidis Pavlos", Agios Spyridonas
Latitude:	39,14904
Longitude:	20,87591
Picture:	

Name of Station:	S12
Area:	Butchery "Kokkalis", Kampi
Latitude:	39,21634
Longitude:	20,91895
Picture:	
Name of Station:	S02
Area:	Pumping station of GOEV, Vigla
Latitude:	39,07898
Longitude:	20,88533
Picture:	

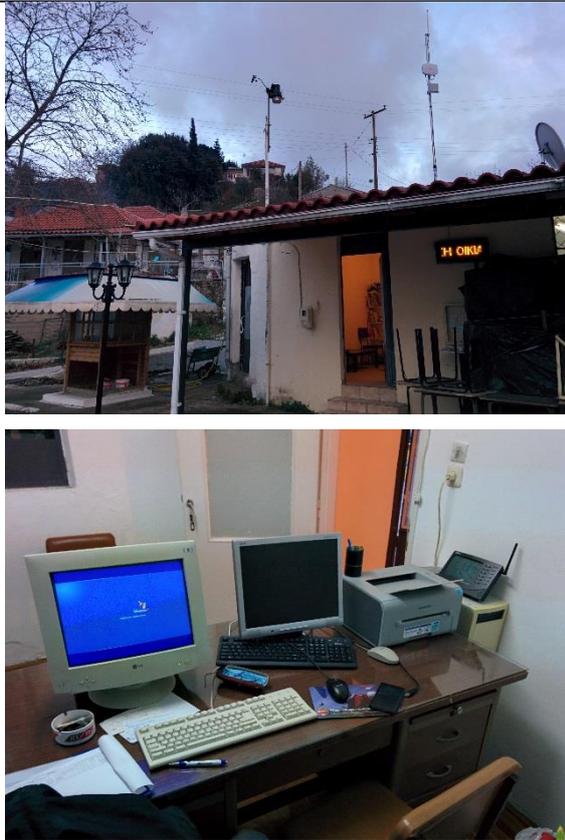
Name of Station:	S09
Area:	Farm of the Municipality of Zois, Kommeno
Latitude:	39,05061
Longitude:	21,01207
Picture:	

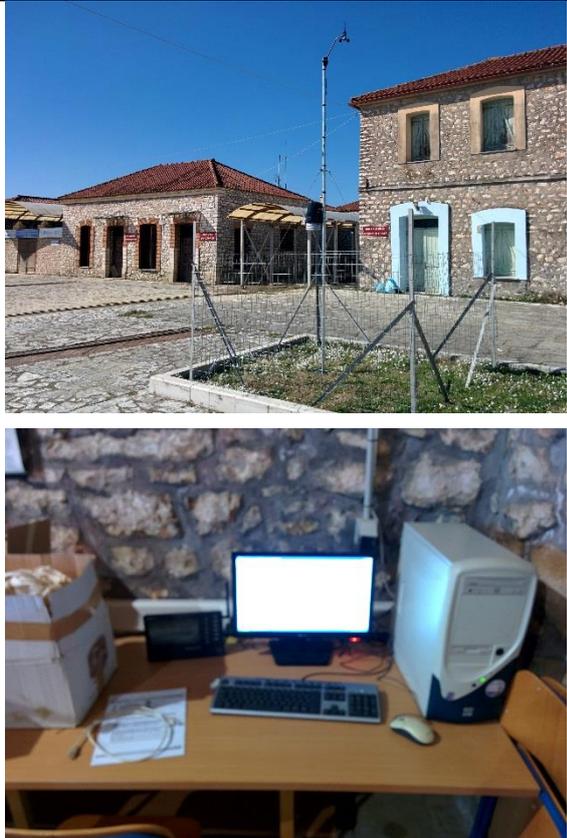
Name of Station :	S20
Area:	Poultry house "Giannoulis Bros.", Kompoti
Latitude:	39,09518
Longitude:	21,06071
Picture:	

C.2 Σταθμοί Davis VantagePro2

Name of Station:	S01
Area:	Technological Educational Institute of Epirus, Kostakioi
Latitude:	39,121797
Longitude:	20,946733
Picture:	
Name of Station:	S04
Area:	Nursery "Giozgatoglou" Ch., Kalogiros Bridge
Latitude:	39,172316
Longitude:	20,946733
Picture:	

Name of Station:	S05
Area:	Aeroclub of Epirus
Latitude:	39.08772°
Longitude:	20,97194
Picture:	

Name of Station	S07
Area:	Community Bureau (Foteino)
Latitude:	39,134203
Longitude:	20,892165
Picture:	

Name of Station:	S10
Area:	Environmental Education Center of Arachthos, Kopraina
Latitude:	39,03866
Longitude:	21,07444
Picture:	

Name of Station:	S14
Area:	TOEV of Louros, Kalovatos
Latitude:	39,12073
Longitude:	20,91134
Picture:	
Name of Station:	S19
Area:	Creamery "Pappas Bros.", Pantanassa
Latitude:	39,235484
Longitude:	20,865280
Picture:	

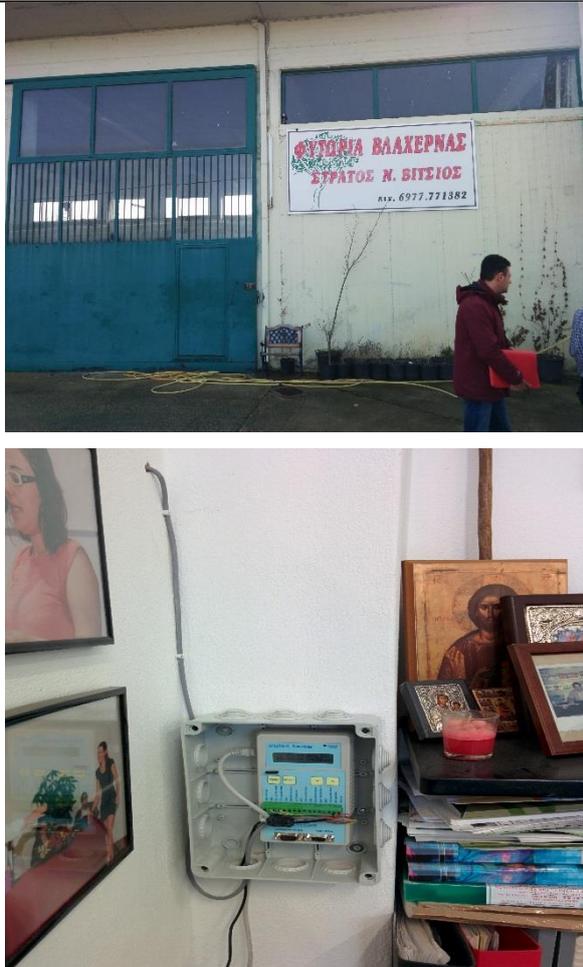
Name of Station:	S15
Area:	Breeding Farm "Geitonas", Psathotopi
Latitude:	39,07188
Longitude:	20,96672
Picture:	

Name of Station:	S17
Area:	Eurofarm "Chelia", Flampoura
Latitude:	39,07635
Longitude:	20,76173
Picture:	

C.3 Σταθμοί SYMMETRON STYLITIS 10

Name of Station:	S03
Area:	Sewage Station of DEYAA, Glykorizo
Latitude:	39,13597
Longitude:	20,99102
Picture:	

Name of Station:	S11
Area:	Elementary Schools, Megarchi
Latitude:	39,13636
Longitude:	20,06944
Picture:	

Name of Station:	S13
Area:	Nursery "Vitsios", Vlacherna
Latitude:	39,16651
Longitude:	20,92764
Picture:	

Name of Station:	S16
Area:	Community Bureau, Stroggvi
Latitude:	39,12519
Longitude:	20,81140
Picture:	

Name of Station:	S18
Area:	Photovoltaic Park of Pavlos, Aneza
Latitude:	39,09419
Longitude:	20,92764
Picture:	



European Territorial Cooperation Programme

**Greece - Italy
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WP: 5

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Part III. One (1) Geographic Information System with the positions of Meteorological Stations



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Innovative Solutions

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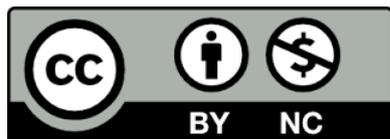
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Deliverable: **5.4.2 Supply and installation of new meteorological stations**
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A.2.1 Intervention Area of the Act

Municipality of Arta

The city of Arta constitutes the administrative, economic and cultural center of the homonymous Regional Unit, having formed a different culture, different from the one cultivated by the mountainous populations of Tzoumerka. Different civilisations have left their own indelible marks on architecture, cultural tradition and identity of the settlements of the Unit.

Two magnificent rivers, Arachthos and Louros, flow through it, while their deltas cross and pour into the Amvrakikos Gulf. The latter is the natural southern border of the Prefecture of Arta and forms a spectacular landscape, which consists of exceptionally beautiful wetlands and of the lagoons of Logarou and Tsakalou. This is the shelter for swans and flamingos, among others.

Arta is located in the midst of the chain of urban centers of the north-western part of Greece, which constitute a network of sites endowed with particular natural, ecological, historical archaeological and cultural interest. This axis of urban centers shall essentially constitute the road communication axis of the country with Albania and Italy as well (Ionian Road- Egnatia- Port of Igoumenitsa).

The historical center of the city, the clock of the castle and the surrounding districts lend a particular character to the city. In Arta, art and culture thrived, while the economic growth gradually provided the city with several educational institutions,

churches and monasteries, mansions, newly built roads, often as a result of local benefactors' donations.

Nowadays, Arta is a modern city with Technological Educational Institutes, museums, libraries, many cultural groups and choirs and, of course, the largest stone bridge of the country as its trademark. On the other side, populations of mountainous Tzoumerka developed a special lifestyle based on livestock, trade, constructions and crafts. Populations of the surrounding villages of the valley had been producers and caterers of the entire R.U. of Arta for centuries, in fact exporting various agricultural products to the rest of the country and abroad.

Nowadays, cultivations are constantly decreasing, whereas activities related to the Secondary and Tertiary Sector are being multiplied.

Municipality of Nikolaos Skoufas

The Municipality of Nikolaos Skoufas was established in 2011, after the implementation of "Callikrates" Programme. Its headquarters is located in Peta, while its historical headquarters is in Kommemo. The current municipality was formed after the integration of the municipalities of Peta, Arachthos and Kompoti and the community of Kommemo.

The Municipality bears great historical significance and it is named after the national hero and founder of "Filiki Etairia" (Friendly Society), Nikolaos Skoufas, who was born in Arta and dedicated his life to the idea of revolution of the Nation.

Moreover, several places of the Municipality are engraved in bold within the pages of modern history of the country. Important historical events that took place in this area is the battle of Peta on July 4, 1822 with the sacrifice of Greek and foreign volunteer philhellenes, the struggle against the Ottoman Rule and the Holocaust of Kommemo on August 16, 1943 with the massacre of 317 civilian victims of the Nazi troops.

In the mountainous northern part of the Municipality stands the capital, Peta, with the traditional square, the church of Saint George, the Monument of foreign Philhellenes, the Monastery of Virgin Mary, the Folklore Museum and the exquisite lake of Pournari with the panoramic view of Arta and the Amvrakikos Gulf.

The semi-mountainous region of the Municipality, full of greenery, is completed with the settlements Kleisto, Zygos, Markiniada, Megkla and Melas and offers spectacular lake view.

Following a stroll through the Municipality, one comes across the rapidly growing village of Agios Dimitrios with its charming square, the traditional village Neochoraki with stone houses, the lovely city of Amfithea and the picturesque city of Megarchi.

In the central part of the Municipality there is the settlement of Kompoti, featuring the following sites: Nikolas Skoufas' statue, Turkish guardhouses, the port, the Environmental Center in Kopraina and the old churches of Saint George and of the "Assumption" of Virgin Mary in Sellades. Traditionally built on the opposite hill, lies Peranthi with its huge plains of Arta and the Amvrakikos Gulf.

The southwestern part of the Municipality, which is flat and is crossed by the river Arachthos, is full of scattered rural settlements.

On the opposite side, next to the basin of Arachthos, one may find Neochori and the waterside park, the picturesque beach Platanaki and lagoons.

The villages Pachykalamos, Akropotamia, Anthotopos, Agia Paraskevi and Kolomodion complement the lovely landscape.

Region of Puglia

The Region of Puglia borders with the Region of Molise to the north, with Campania and Basilicata to the west, while it is washed by the Adriatic sea to the northeast and by the Ionian Sea to the southwest.

Puglia covers an area of 19,366 square km and its population amounts to 4,072,839 residents.

It is the Region with the least mountainous lands in Italy (2%), whereas large part of its territory is located at an altitude between 100 and 300 meters.

From hydrographic aspect, the Region of Puglia is passed through by various minor rivers, among which the most important one is Ofanto, having a length of 170 kilometers. The largest lakes are the ones of Lesina and Varano, to the north.

Major cities of the Region of Puglia are Bari, Foggia, Brindisi, Lecce and Taranto.

A.2.2 Objectives of the Act

The general objective of IRMA is to develop, implement and promote effective irrigation management tools and techniques in rural and urban environments. Other specific objectives of the Act are:

- the development of networking and other expertise transfer mechanisms;
- the research on local irrigation practices;
- the creation, implementation and evaluation of control procedures for irrigation systems;
- the development, implementation and evaluation of a fully functional Information System, which shall provide information about plant water needs, as well as tools and practical instructions on irrigation scheduling and irrigation planning/management systems;
- scientifically documented knowledge on drought-resistant crops/ varieties, sensors and irrigation management systems, as well as alternative water sources for agricultural and urban irrigation;
- actions for the diligent and cautious establishment of public, professional training/ certification on strategies and methods for efficient irrigation management.

A.3 Scope and Objectives of the Act

Within the scope of installing and connecting Meteorological Stations, the Contractor has undertaken the obligation to support the Contracting Authority throughout the whole process, from the receipt of the equipment up to the operation of the Stations.

B.1 General Description

As part of the installation of meteorological stations in the area of Epirus, the Contractor conducted consulting activities on the sitting and on the functional potentials of each of the three types of the meteorological stations placed in the area. Indicatively, the following obligations of the Contractor towards the Decentralised Administration of Epirus and Western Macedonia are mentioned:

- Determination of the accurate location of the final installation as compared to the originally designated positions;
- Detailed designation of the features and the operational mode of meteorological stations;
- Indication of possible spots that may require additional infrastructure projects (e.g. fencing, bracing, etc.) for the reception and proper functioning of the plants;
- Assessment of the electricity supply efficiency of the plants;
- Assessment of the Internet coverage existing in the mounting area of the plants.

The station network to be established shall be composed of:

- a) Six wireless (UHF) reference stations of high precision (Type A)
- b) Nine online stations of high precision (Type B)
- c) Five online stations of medium precision (Type C)

Below there is a designation of the characteristic features of the stations and of the spots where these plants were mounted. Additionally, there is a reference to any power supply or Internet network problems identified in some of the mounting spots, as well as to infrastructure projects carried out in some places to ensure the functionality of the stations.

B.2 The implementation software

For the process of the above geospatial information, the widely deployed open-source software Quantum GIS (qgis.org) will be used; this software is capable of integrating all types of the data collected in the previous group of actions, combining them with information of the digital background of the basin.

B.2.1 Quantum GIS (QGIS)

Quantum GIS (QGIS) is a user friendly open-source software, where the display, management, processing, analysis and configuration of maps is made possible.

It incorporates powerful analytical capabilities through its integration with GRASS. It runs on Linux, Unix, Mac OSX and Windows.

It supports multiple vector, raster file formats, multiply database types and corresponding functionality to them.

B.2.2 Basic Features

The major features of the software used for the realisation of this particular Geographical Information System are the following ones:

- Graphical User Interface:
 - Identification and selection of features;
 - Editing/ visualisation/ search for descriptive features;
 - Direct change of projection system;
 - Configuration of printings;
 - Feature symbols;
 - Changes to symbols of vector and raster data;
 - Listing of new levels.
- Easy preview of many vector and raster standards of digital files:
 - Tables of PostgreSQL database;
 - Support for most of vector standards, including the ESRI shapefiles, MapInfo, SDTS and GML;

- Support for raster data, such as Digital Elevation Standards, aerial photographs and satellite pictures;
- Support for GRASS standards (Geographic Resources Analysis Support System);
- Support for reading online services of OGC viewing and uploading (WMS and WFS).
- Creation, editing and output of spatial data with the use of:
 - GRASS digitization tools and the shapefile standard;
 - the additional geo-reference (plugin)
 - GPS tools to import and export GPX files, to transform them from other GPS models or to upload files directly to GPS receiver.
- Realization of spatial analysis with fTools and GRASS plugins, such as:
 - Algebra maps;
 - Landscape Analysis;
 - Hydrological modeling;
 - Network analysis.
- Publication on the Internet
- Architecture with additives (plugins)
- Compliance with OGC standards (WMS,WFS).

C MAPPING OF THE LOCATION OF STATIONS IN QGIS INTERFACE

The final product of the processing of the data collected in the framework of this particular Deliverable is available in the storage unit listed along with the present Report.

It is noted that, along with the edited file produced, offered for installation is also QGIS Programme, as well as instructions for the accurate navigation of a novice in the environment of this specific software.

It is reminded that, for the needs of the IRMA Project, the Decentralised Administration of Epirus and Western Macedonia received a total of twenty (20) meteorological stations, of three different types, the dispersion of which is held as follows:

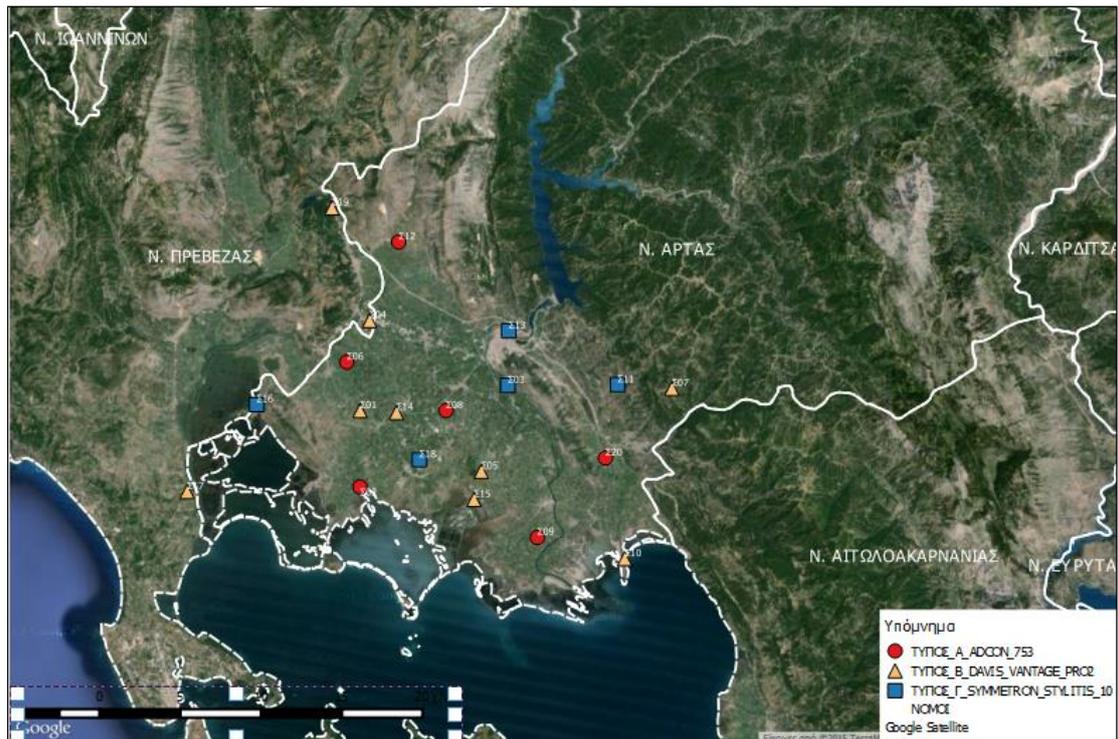
1. Six (6) “Type A” Stations (ADCON 753),
2. Nine (9) “Type B” Stations (Davis Vantage PRO 2),
3. Five (5) “Type C” Stations (Symmetron Stylitis 10).

The following Table lists the code for each Station, its Type and its exact coordinates. Onwards, in the Picture that follows, noticeable is the dispersion of stations in the Intervention Area. The code assigned to each of the stations is indicated in the picture.

Table 1: **Precise Location of Meteorological Stations in the Intervention Area**

	TYPE OF STATION	AREA	LOCATION	LATITUDE	LONGITUDE
S01	DAVIS VantagePro2	Kostakioi	Technological Educational Institute of Epirus, Kostakioi	39.121797°	20.946733°
S02	ADCON A753	Vigla	Pumping station of GOEV (General Organisation of Land Reclamations)	39.07898°	20.88533°
S03	SYMMETRON STYLITIS 10	Glykorizo	Sewage Station of DEYAA (Public Enterprise for Water Supply and Sanitation)	39.13597°	20.99102°
S04	DAVIS VantagePro2	Kalogiros Bridge	Nursery "Giozgatloglou" Ch.	39.172316°	20.892165°
S05	DAVIS VantagePro2	Kalomodia	Aeroclub of Epirus	39.08772°	20.97194°
S06	ADCON A753	Agios Spyridonas	Greenhouses "Apostolidis Pavlos"	39.14904°	20,87591°
S07	DAVIS VantagePro2	Foteino	Community Bureau	39.134203°	21.108202°
S08	ADCON A753	Kostakioi	Technological Educational Institute of Epirus	39.12208°	20.94737°
S09	ADCON A753	Kommeno	Farm of the Municipality of Zois	39.05061°	21.01207°
S10	DAVIS VantagePro2	Kopraina	Environmental Education Center of Arachthos, Kopraina	39.03866°	21.07444°
S11	SYMMETRON STYLITIS 10	Megarchi	Elementary Schools	39.13636°	21.06944°
S12	ADCON A753	Kampi	Butchery "Kokkalis"	39.21634°	20.91295°
S13	SYMMETRON STYLITIS 10	Vlacherna	Nursery "Vitsios"	39.16651°	20.99159°
S14	DAVIS VantagePro2	Kalovatos	TOEV of Louros (Local Organisation of Land Reclamations)	39.12073°	20.91134°
S15	DAVIS VantagePro2	Psathotopi	Breeding Farm "Geitonas"	39.07188°	20.96672°
S16	SYMMETRON STYLITIS 10	Stroggyli	Community Bureau	39.12519°	20.81140°
S17	DAVIS VantagePro2	Flampoura	Eurofarm "Chelia"	39.07635°	20.76173°
S18	SYMMETRON STYLITIS 10	Aneza	Photovoltaic Park of Pavlos	39.09419°	20.92764°
S19	DAVIS VantagePro2	Pantanassa	Creamery "Pappas Bros."	39.235484°	20.865280°
S20	ADCON A753	Kompoti	Poultry house "Giannoulis Bros."	39.09518°	21.06071°

Figure 1: **Display the positions of Meteorological Stations in Intervention Area**





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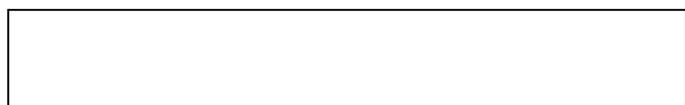
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IRMA

Supply and installation of new meteorological stations

WP: 5

Action: 5.4

Deliverable: 5.4.2

“Scientific support for the installation of network Meteorological Stations”

Part IV. One (1) Report of the pilot operation Network Meteorological Stations



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IRMA - PARTENERS



LP, Lead Partner, TEIEP

Technological Educational Institution of Epirus

<http://www.teiep.gr>, <http://research.teiep.gr>



P2, AEPDE

Olympiaki S.A., Development Enterprise of the Region of Western Greece

<http://www.aepde.gr>



P3, INEA / P7, CRA

Istituto Nazionale di Economia Agraria

<http://www.inea.it>



P4, ISPA-CNR

Consiglio Nazionale delle Ricerche - Istituto di Scienze delle Produzioni Alimentari

<http://www.ispa.cnr.it/>



P5, ROP

Regione di Puglia

<http://www.regione.puglia.it>



P6, ROEDM

Decentralized Administration of Epirus- Western Macedonia

<http://www.apdhp-dm.gov.gr>

PROJECT TEAM

Involved partner:



P6, ROEDM

**Decentralized Administration of Epirus-
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<http://www.apdhp-dm.gov.gr>

Authoring team:

Project Team

HYPERCO S.A.

Innovative Solutions

Place and time: Thessaloniki, July 2015.



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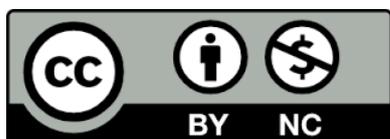
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WP: 5 Irrigation management tools

Deliverable: **5.4.2 Supply and installation of new meteorological stations**

“Scientific support for the installation of network Meteorological Stations”

The work that is presented in this ebook has been co-financed by EU / ERDF (75%) and national funds of Greece and Italy (25%) in the framework of the European Territorial Cooperation Programme (ETC.P) GREECE-ITALY 2007-2013 (www.greece-italy.eu): IRMA project (www.irrigation-management.eu), subsidy contract no: I3.11.06.



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A.1 Crossborder Programme

The Crossborder European Territorial Cooperation Programme “Greece- Italy 2007-2013” was approved by the European Commission on 28/03/2008 by Decision C (2008) 1132/28/03/2008.

The total budget for the programme amounts to 118,606,893 €, of which 29,651,723€ (25%) come from national funds, whereas 88,955,170 € (75%) come from the European Regional Development Fund (ERDF). Eligible areas of the programme are the Regions of Western Greece (Prefectures of Aetolokarnania and Achaea), of Ionian Islands (Prefectures of Corfu, Lefkada, Kefalonia and Zante) and of Epirus (Prefectures of Ioannina, Preveza and Thesprotia) in Greece, as well as the Region of Puglia in Italy (Provinces of Bari, Brindisi and Lecce). The Prefectures of Ilia and Arta in Greece and the Provinces of Taranto and Foggia in Italy are included in the Programme as adjacent territories.

The general objective of the Programme “Greece- Italy” is “to strengthen the competitiveness and territorial cohesion in the area towards the sustainable development by linking the potential on both sides of the cross-border maritime line”.

This general objective shall be achieved through the following strategic objectives:

- Strategic Objective 1: Support for sustainable economic growth by focusing on common comparative advantages
- Strategic Objective 2: Improvement of the accessibility potential to networks and services in the cooperation area, so as to enhance mobility of people and goods
- Strategic Objective 3: Improvement of the quality of life, preservation and effective management of the environment and increase of the social and cultural cohesion

A.2 Scope and Objectives of the Act

The Decentralised Administration of Epirus- Western Macedonia/ Directorate of Agricultural Affairs of Epirus announces Clipboard Competition with subject the award of the project: “PROVISION OF SUPPORTING SERVICES FOR THE IMPLEMENTATION OF THE SUB-PROJECT OF THE DECENTRALISED ADMINISTRATION OF EPIRUS & WESTERN MACEDONIA IN THE FRAMEWORK OF THE ACT ‘EFFICIENT IRRIGATION MANAGEMENT TOOLS FOR AGRICULTURAL CULTIVATIONS AND URBAN LANDSCAPES’ ”.

The corporate structure involves the TEI (Technological Educational Institute) of Epirus, the Decentralised Administration of Epirus- Western Macedonia, the Region of Puglia, the Development Association of the Region of Western Greece, the Institute of Agricultural Economy of Italy and the Research Institute of Food Production of the National Research Council of Italy.

A.2.1 Intervention Area of the Act

Municipality of Arta

The city of Arta constitutes the administrative, economic and cultural center of the homonymous Regional Unit, having formed a different culture, different from the one cultivated by the mountainous populations of Tzoumerka. Different civilisations have left their own indelible marks on architecture, cultural tradition and identity of the settlements of the Unit.

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A.3 Scope and Objectives of the Act

Within the scope of installing and connecting Meteorological Stations, the Contractor has undertaken the obligation to support the Contracting Authority throughout the whole process, from the receipt of the equipment up to the operation of the Stations.

B.1 Preamble

After the successful installation of meteorological stations in the envisioned locations agreed with the Contracting Authority, the implementation of the project started.

In the framework of the implementation of the IRMA Project, the Decentralised Administration of Epirus and Western Macedonia undertook the obligation to establish twenty (20) meteorological stations in the area of Epirus. The exact location of the stations resulted after consultation of all partners of the Act and under the supervision of the Lead Partner.

Among all contracting parties, it was agreed that the best outcome on the desired data to be received from the stations could be achieved with the placement of three different types of stations. Specifically:

- a) Six wireless (UHF) reference stations of high precision (Type A)
- b) Nine online stations of high precision (Type B)
- c) Five online stations of medium precision (Type C).

Below there is a designation of the characteristic features of the stations and of the spots where these plants were mounted.

B.2 Features of meteorological stations per type

In accordance with the requirements of the Declaration 57585/1782 of 05/09/2014 of the Decentralised Administration of Epirus and Western Macedonia on the equipment supply for the implementation of the IRMA Project, as mentioned above, there is provision for the placement of three types of stations (Type A, Type B and Type C), with distinct characteristics for each of them. The features required for each type of station are listed below:

B.2.1 "Type A" Stations

"Type A" Stations and their peripheral ones shall operate with photovoltaic modules. The photovoltaic modules (and therefore the energy needs of the plant) should have very small dimensions, so that the maximum possible thefts for any other use would be prevented, since they will be fully exposed outdoors.

All structural units of plants shall be distinct, easily identifiable and easily detachable from the station, to facilitate the shipment of their parts to suppliers, in case of calibration or repair.

The communication of all stations shall be based on combination of wireless UHF, GPRS connection and TCP/IP via wired Internet network.

Data from all stations will be transmitted to the center every 60 minutes.

Alarm paging for “Type A” stations

Specialised editing software on the received measurements will operate in the measurement center.

However, in addition to the above, the network itself should directly provide alarms for the following cases:

- Excess of limits of measured parameters. For each parameter it should be possible to determine at least 5 maximum and 5 minimum alarm limits.
- Possibility to create an alarm condition, in which at least 5 parameters could be engaged.
- Delay of taking measurements from the stations. For each station, it should be possible to set at least 2 different alarm times.
- Supply voltage drop. Option to set at least 3 different levels for each plant.
- Disconnection of solar collector.
- Installation temperature. Option to set at least 2 maximum and 2 minimum levels for each station.

For each case, an e-mail message will be sent describing the incident.

On the basis of these specific features, the ADCON A753 Type of Weather Station was selected, highly meeting all the requirements set in the Declaration 57585/1782. Complete functional features and the operating mode of the Station are attached to the Deliverable “3.2 One (1) Assessment Report on the Installation of Meteorological Stations”.

B.2.2 “Type B” Stations

For “Type B” Stations, the following are predicted:

There shall be automatic recording of the incident and its duration, separately for each station and in total for the whole network, while the aforementioned alarm archives will be accessible online.

- The plant shall be composed of two parts, the external and the internal one. The external part will include sensors, will operate with solar collector and will transmit measurements to the internal part wirelessly.
- The internal part shall receive measurements and forward them to the reception center via LAN and online.
- It will be supplied from the public electricity network, accompanied by suitable adapter/ power supply system.
- The plant will be connected to LAN via Ethernet gate.

In consideration of the above features, DAVIS Vantage Pro2 was selected for this type. Complete functional features and the operating mode of the Station are attached to the Deliverable “3.2 One (1) Assessment Report on the Installation of Meteorological Stations”.

B.2.3 “Type C” Stations

For “Type C” Stations, the following features are predicted:

- Stations will be placed in public buildings.
- They shall be supplied from the public electricity network, accompanied by suitable adapter/ power supply system.
- They shall be connected to LAN via Ethernet gate.

In consideration of the above features, SYMMETRON STYLITIS 10 was selected for this type. Complete functional features and the operating mode of the Station are attached to the Deliverable “3.2 One (1) Assessment Report on the Installation of Meteorological Stations”.

B.3 Mounting Locations of meteorological stations

The Table below depicts the mounting locations of meteorological stations within the Intervention Area. It is noteworthy that there have been no reported differences compared to the original positions designated for installation. It is obvious that there have been placed six (6) “Type A” Stations, nine (9) “Type B” Stations and five (5) “Type C” Stations, exactly as envisaged in the Declaration.

Table 1: *Precise Location of Meteorological Stations in the Intervention Area*

	TYPE OF STATION	AREA	LOCATION	LATITUDE	LONGITUDE
S01	DAVIS VantagePro2	Kostakioi	Technological Educational Institute of Epirus, Kostakioi	39.121797°	20.946733°
S02	ADCON A753	Vigla	Pumping station of GOEV (General Organisation of Land Reclamations)	39.07898°	20.88533°
S03	SYMMETRON STYLITIS 10	Glykorizo	Sewage Station of DEYAA (Public Enterprise for Water Supply and Sanitation)	39.13597°	20.99102°
S04	DAVIS VantagePro2	Kalogiros Bridge	Nursery “Giozgatloglou” Ch.	39.172316°	20.892165°
S05	DAVIS VantagePro2	Kalomodia	Aeroclub of Epirus	39.08772°	20.97194°
S06	ADCON A753	Agios Spyridonas	Greenhouses “Apostolidis Pavlos”	39.14904°	20,87591°
S07	DAVIS VantagePro2	Foteino	Community Bureau	39.134203°	21.108202°
S08	ADCON A753	Kostakioi	Technological Educational Institute of Epirus	39.12208°	20.94737°
S09	ADCON A753	Kommeno	Farm of the Municipality of Zois	39.05061°	21.01207°
S10	DAVIS VantagePro2	Kopraina	Environmental Education Center of Arachthos, Kopraina	39.03866°	21.07444°
S11	SYMMETRON STYLITIS 10	Megarchi	Elementary Schools	39.13636°	21.06944°
S12	ADCON A753	Kampi	Butchery “Kokkalis”	39.21634°	20.91295°
S13	SYMMETRON STYLITIS 10	Vlacherna	Nursery “Vitsios”	39.16651°	20.99159°
S14	DAVIS VantagePro2	Kalovatos	TOEV of Louros (Local Organisation of Land Reclamations)	39.12073°	20.91134°
S15	DAVIS VantagePro2	Psathotopi	Breeding Farm “Geitonas”	39.07188°	20.96672°
S16	SYMMETRON STYLITIS 10	Stroggyli	Community Bureau	39.12519°	20.81140°
S17	DAVIS VantagePro2	Flampoura	Eurofarm “Chelia”	39.07635°	20.76173°
S18	SYMMETRON STYLITIS 10	Aneza	Photovoltaic Park of Pavlos	39.09419°	20.92764°
S19	DAVIS VantagePro2	Pantanassa	Creamery “Pappas Bros.”	39.235484°	20.865280°
S20	ADCON A753	Kompoti	Poultry house “Giannoulis Bros.”	39.09518°	21.06071°

The establishment of Meteorological Stations was carried out in very short period of time, after the immediate mobilisation of the Contracting Authority. Their operation during the first two weeks was in pilot phase, giving nevertheless a significant sample of those elements that could impede their proper functioning.

It is crucial to highlight that, according to their type, meteorological stations have different system of deducting results and this fact sets different difficulties in their operation. Therefore, it is appropriate to examine each type separately, since each of the networks operates in different degrees.

C.1 Operation of “Type A” Stations

“Type A” Stations were established in selected public and private venues and, due to their function and the high risk of their physical damage, in most cases, they required special infrastructure projects, such as fencing. It is noteworthy that no attempt of physical damage was observed in none of the stations. Moreover, the hourly data mission from the stations via Internet was largely observed in the Technological Educational Institute of Epirus, which has undertaken their general management. Stations data is directly accessible by anyone, as they are posted online and specifically on the website of the Project and the following address:

<http://system.irrigation-management.eu/>

During the operation of stations, no particular problems occurred; however, it is noteworthy that in some cases the insufficient coverage of wireless Internet network led to a temporary suspension of the posting of measurements on the aforementioned website. These problems were addressed immediately and without causing particular difficulties in the overall flow of measurements. In general, the operational autonomy of this particular type of stations led generally to a very satisfying level of successful operation, as it does not require their continuous monitoring, but only the local presence in the field, whenever any problem arises. Cooperation with the Lead Partner of the Act at this level is considered excellent.

C.2 Operation of “Type B and C” Stations

The operation of “Type B and C” Stations exhibited, of course, more problems than that of “Type A” Stations. Partly, this fact was expected, also due to the way they function; however, the final result highlights the inherent concerns raised from the beginning, to a greater extent than expected.

One of the main criteria for the placement of “Type B and C” Stations was the adequacy of electricity and wireless digital network. Additionally, the vast majority of these stations was placed in public and private buildings, while there was also the requirement for their in situ control by people present in the field at any time. The combination of these two elements seems that it has not particularly helped to ensure their continuous function, as the mobilisation of the human resources not directly engaged with the Act led to the outburst of several functional problems, despite the fact that their placement eventually took place in places where there was sufficient coverage of both networks.

The main problem that arose was the inadequate repair of problems in some of the networks, which is primarily attributed to the lack of communication among parties, but also to the shortage of those present in the field. Incidents of negligence were observed in a large number of stations, whereas the unstable weather conditions in the area also led to the outburst of multiple problems than the expected ones.

It is noteworthy that it is not possible to draw reliable conclusions from the so far measurements of these stations, since a large number of them has been out of order for quite a long period of time. The Internet network is considered sufficient; however, frequent downtime of their operation should be immediately noticed and motivate a communication network that will ensure their immediate restoration. This requires the coordination among the bodies responsible for the elaboration of measurements and the people present in geographic proximity with the plants, which is so far not observed at satisfying level.

C.3 Conclusions

The implementation of the IRMA Act gives effect to a very ambitious project related to the establishment of an integrated Network of Meteorological Stations, which will be a major tool for the determination of the irrigation policy for all local bodies, both in Public Administration and in the Private Sector. Local farmers could obtain a reference

point to minimise their costs, while contributing to the environmental sustainability of their area.

It should be stressed that the experiment of the involvement of public institutions and individuals in a wide network of weather forecasts seems to fail, since their interest in its proper functioning is at least limited, as it is easily noticed from the results of the operation of “Type B and C” stations. On the contrary, “Type A” stations, thanks to their high degree of autonomy in their operation, showed an extremely high degree of smooth operation, highlighting them as ideal to be placed in future Projects.

Nevertheless, the pilot operation of the Network of Meteorological Stations clearly demonstrates the need for continuous understanding between the bodies involved in the process. Furthermore, it also indicates the need to inform local actors about the benefits that could bring the proper operation of the Network, which may lead to their awareness and their further active participation. Local authorities should understand that the safe forecast of weather conditions creates the conditions for a competitive Primary Sector, which will be able to provide a robust basis for the development of the local economy.

The generated network, despite the problems it presents, could be a basis for the creation of a comprehensive tool of irrigation policy both for local authorities and for local growers. Its expansion through its connection to other networks that already exist in the intervention area, as well as through its reinforcement with additional units, is considered essential, as it could afford a more comprehensive picture of the whole area of Epirus. The future of the Network is undoubtedly in the hands of all bodies- public and private- involved in the configuration and exercise of the irrigation policy.



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