PRO-ENERGY

"Promoting Energy Efficiency in Public Buildings of the Balkan-Mediterranean Territory"

WP3: Joint Regional Analysis, Strategy and Framework"

DELIVERABLE NUMBER: 3.1.2

TITLE OF DELIVERABLE: Good Practices' identification at regional/national/international level

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1. Definition of criteria for selecting good practices on energy efficiency interventions and overall methodology and tools

"*What is a "good practice"? why it is important? How it can choose and assessed?"* are some of the questions that this part is about to answer regarding good practices on energy efficiency interventions.

According to the Knowledge Forum of FAO - UN[1], "*Good Practice is simply a process or a methodology that represents the most effective way of achieving a specific objective*" or another way *of defining a good practice is "one that has been proven to work well and produce good results, and is therefore recommended as a model*". The essence of identifying and sharing good practices is to learn from others and to re-use knowledge. The biggest benefit consists in well-developed processes based on accumulated experience[2].

The criteria[3] that can be used for the identification for an initiative as a good practice are:

- Effective and successful (produce tangible results)
- Improvement of the environment (protecting the environment)
- Improvement in the socio-economic environment of the area / region.
- Socially acceptable (not offend or disturb social attitudes)
- Technically practicable (usable by people in their everyday life)
- Cost effectiveness (affordable alternative of other practices)
- Inherently participatory (common participation of stakeholders, community, partners)
- Replicable and adaptable
- Innovation
- Preservation / sustainability (economic development, social development, and environmental protection)

But what is the aim of a Good practice?

First, it aims at evolving become better as improvements are discovered. Moreover, it aims at following a standard way of doing things as well as at maintaining quality as an alternative to mandatory legislated standards and can be based on self-assessment and benchmarking[4].

Regarding the identification of good practices, their aim is to highlight several local / regional / national / European / International good practices related to the energy efficiency interventions in public buildings.

This collection will be achieved via desk research – and/or field research if necessary- according to a specific template, described below.

[1] Food and Agriculture Organization of the United Nations, http://www.fao.org/knowledge/goodpractices/gp-definitionsandcriteria/gp-definitions/en/

[2] Identifying and Sharing Good Practices, SDC Knowledge Management Toolkit (2004)

[3] Food and Agriculture Organization of the United Nations, http://www.fao.org/knowledge/goodpractices/gp-definitionsandcriteria/gp-definitions/en/

[4] http://en.wikipedia.org/wiki/Best_practice

2. Identification of good practices in relation to energy efficiency interventions (focus on public buildings and behavioural change).

2.1 Good Practice - #1

Name of the building:

Primary School of Boroi, Greece

Title of the good practice

Posters and official letters to school principle and local officials in Primary School of Boroi

Does this practice come from a European funding program?

Intelligent Energy Europe Programme of the European Union / EURONET 50/50 MAX

Short Summary of the practice

The Primary School of Boroi has done a remarkable job in promoting the issue of energy saving both in the very school environment as well as in buildings other than school facilities. In particular, the students who participated in the program created a best practice poster for energy saving, along with information leaflets and various thematic posts that have been uploaded on the school blog. In addition, a series of official letters have been sent to both the school management and the mayor of Phaistos Municipality, proposing a full toolkit of behavioural actions to enhance energy saving and therefore minimize relevant costs.

Detailed information on the practice

The thematic area of the intervention was Energy Awareness Raising through the change of behaviour. The main aim of the action was to alter energy consumption habits of the school's students by educating them on how to achieve significant energy savings in their school environment and to communicate them why this is important for the natural environment and for the people's overall quality of life.

In that respect, the participating teachers followed the EURONET 50/50 MAX guidebook to familiarize both themselves and the designated students' energy teams with the energy-related intricacies of their school building. They also worked to make the students ponder on the repercussions of illogical energy expenditures and challenge them to think of economically viable solutions to the detected energy-related problems.

The methodology that has been followed consists of 9 steps, namely:

- Setting up energy teams
- Organizing an "insider" energy tour, involving the project management team, the participating teachers and the maintenance personnel, in school's heating and energy facilities
- Enrichment of students' (members of energy teams) knowledge and awareness on energy issues
- Energy tour/inspection conducted by the energy teams
- Gathering Data
- Creation of the school's action plan
- Broadcast of results to all school-related agents
- Report measures which require small investments

- Use and report the money saved by the school with its efforts

Within this framework, the actions undertaken by the energy teams included -among others- energy inspections, measurements over consumption data and the installation of a solar oven as well as a solar water heater.

Then, the students' energy teams involved in the project decided to convincingly promote these solutions as a set of student-generated suggestions both to the school's officials and the local authorities. These suggestions were best communicated to all relevant parties via best-practice poster, thematic flyers and school blog entries. To achieve the aforementioned goals set by the energy teams, a variety of materials and tools were used, namely – among others:

- An energy saving poster (along with informative flyers) was created, detailing simple and effective energy saving practices. The poster was also presented to the students not involved directly in the project.
- Official letters were written by the members of the energy teams in order to inform both the school's officials and the local authorities on the merits of energy saving in the building and on cost-effective ways of achieving it.
- The school's blog was used as a promotional platform to report on all the energy saving actions and educational activities performed by participating teachers and students.

Involved acting parties included -on teacher's part - the Primary School Director and some of the teachers personnel, as well as – on students' part - energy teams comprising of students from classes E and F of the Primary School of Boroi (academic years 2013 – 2014, 2014 – 2015, 2015 - 2016).

Moreover, the Regional Authorities of Crete, the Municipality Authorities of Phaistos, involved students' families and the non-participating students shall also be considered as additional project stakeholders.

Last but not least, it is noted that in other types of public building the methodology is very similar, although specific purpose and use of the building needs to be strongly considered when establishing the energy team and planning optimization measures.

The 50/50 methodology can help local authorities demonstrate their role in energy saving and in reaching local climate & energy targets.

Evidence of success

The following table depicts the energy savings achieved during the years 2014 and 2015, when the EURONET 50/50 MAX program was actively implemented in the Primary School of Boroi:

	Energy savings achieved			
Year of program implementation	*in kW*	*in %*	*in EUR*	*in t CO2*
2014	2,215	41.82	243.65	1.02
2015	1,436	27.11	157.96	0.66

Challenges encountered

The participating students were really enthusiastic about the project and - guided by the supervising teachers - managed to significantly alter their own behaviour and mindset regarding energy saving. It was reported by many of the pupils, that they tried to convince their families and friends to adjust their energy spending habits and make them more in tune with the EURONET 50/50 MAX guidelines.

Although sceptical at first, several families seem to have gradually adapted to this novel approach in daily energy saving, a development that has given to the participating students an additional degree of satisfaction and fulfilment regarding their involvement within the project.

Potential for learning or transfer

As it is apparent, the very action is considered a best practice as there were significant energy savings achieved by this school, as depicted in the table above. However, the school is worth of being promoted as "best practice" not only for this.

Another reason is that its students took seriously the core principle of the program (i.e. making students conscious regarding the issue of energy saving in school and how to achieve it) and tried to promote the energy-saving message to the wider audience.

This was done by using all means at their disposal (e.g. the Internet) and appropriately prepared materials (e.g. the best practices energy saving poster and the official letters regarding energy saving practices) to reach out to the school's officials and the local community/authorities.

Essentially, the fact that they convinced locals to take notice on the issue of energy saving, question their energy consumption ways and be open to suggestions, is the greatest achievement of the participants.

Hence, the case of Primary School of Boroi has been included as a best practice in the EURONET 50/50 MAX methodology guidebook, thus enhancing transferability of projects results.

Given the poor energy-efficiency current state of play characterizing the vast majority of school facilities in Greece, as well as the need for setting up a holistic approach on the level of local communities, there is severe potential for replicating such kind of actions in various regions, aiming at both increasing energy efficiency in school buildings but also streamlining awareness on energy savings over local communities stakeholders.

In addition, the 50/50 methodology can be implemented in any public building, provided that its energy bills are covered from municipal budget (therefore achieved savings mean savings both for the Local Authorities and the building itself).

The methodology for calculating energy and financial savings is very simple (yet includes all important aspects, like weather conditions in a given year) and can be applied to any kind of buildings. The calculations can be based on the data gathered from invoices or energy meters, so no sophisticated energy monitoring systems are necessary.

Large part of the methodology is focusing on capacitating building users to optimise energy use. A lot of useful methodological and educational material is gathered on the project website. The model contract on the 50/50 implementation (signed between the local authority and the building manager) is available on-line and can be adapted to different local conditions.

Further information

http://www.euronet50-50max.eu/en/

https://blogs.sch.gr/dimvoron/

Photo

I. Photo of the public building	II. Photo of the best practice poster


ΕΞΟΙΚΟΝΟΜΗΣΗ ΕΝΕΡΓΕΙΑΣ ΣΤΟ ΣΧΟΛΕΙΟ
Εύκολες οδηγίες για να εξοικονομήσουμε ενέργεια
1. Όταν υπάρχει επαρκής φωτισμός από τον ήλιο, να κλείνουμε τα φώτα της τάξης.
2. Να κλείνουμε τα παράθυρα, όταν έχουμε ανοιχτή τη
3. Όταν φεύγω από τη τάξη μου, σβήνω το φως.
4. Όταν έχουμε έντονη ηλιοφάνεια, σβήνουμε τα φώτα.
5. Όταν τελειώσει το ολοήμερο κλείνουμε το
6. Να μην αφήνουμε τις συσκευές που είναι στη
σε αναμονή
7. Όταν θα πλένουμε τα χέρια μας, δεν αφήνουμε ανοιχτή τη χωρίς λόγο.
8. Δεν αφήνουμε ανοιχτούς τους υπολογιστές όταν δεν έχουμε δουλειά.
9. Ρυθμίζουμε το θερμοστάτη κεντρικής θέρμανσης στους 18-19°C.
10. Αντίστοιχα για τα
ρυθμίζω το θερμοστάτη στους 26-27°C, αφού και η ρύθμιση του θερμοστάτη ψηλότερα, δεν εξασφαλίζει την ταχύτητα θέρμανσης του σχολείου. Αντίθετα, αυξάνει την κατανάλωση ενέργειας.
Δημοτικό Σχολείο Θύρων
EURONET 50/50 max

2.2 Good Practice - #2

Name of the building(s):

City Hall and the Cultural Center of Edessa Municipality, Greece

Title of the good practice

Energy Saving Projects in Municipal Buildings in the City of Edessa

Does this practice come from a European funding program?

The practice came from Interreg Europe/ Support Project

Short Summary of the practice

A series of refurbishment interventions have been implemented in two (2) public buildings in the Municipality of Edessa, namely the City Hall and the Municipal Cultural Centre, aiming at enhancing energy efficiency and increasing awareness of employees and citizens on sustainability issues.

Detailed information on the practice

The reasons behind selecting the buildings of the City Hall and the Municipal Cultural Center for implementing the refurbishment works are directly connected with the increased energy consumption they recorded, as well as because of the high-circulation numbers of people in them and the interaction with the general public.

The interventions that have been implemented include a series of actions, namely:

- The replacement of old glazing and window frames (in both buildings) by new opening-type ones (406 m^2), with reclining features, having a coefficient U=-2.5 W/(m K^2). The new glass panels have a double thermal insulation, blocking out the noise. In addition, they are reflective, with low-emissivity (low-e) and they present a U=1.4 W/(m K^2) versus 3.4 W/(m K^2) of the old ones. Windows are now electrically opened, while a sun-protection system has been placed (shading), with adjustable aluminum shades, through the electrical mechanism. Furthermore, internal insulation was placed in the office area of the Cultural Centre.
- Both buildings are now heated using weather compensation sensors and independent indoor temperature control through a central heating system that consists of of a gas boiler and steel radiators (III 905) at each room.
- As long as the City Hall is concerned, replacement of lighting fixtures by new ones, with electronic ballast, reflector and sensor has taken place.
- Moreover, a Green Roof-extensive type has been installed in the City Hall building. The system consists of the following materials:
    - New waterproofing membrane, of modified polyolefin bags certified for root-growth protection.
    - Special protective membrane sheet of high strength.
    - Drainage/water storage system
    - Special geo-textile separator
    - Special soil substrate
    - Plants
    - A drip irrigation system

The project's total construction budget equals to 411,472.14 € and was funded by the Municipal Energy Savings Program "Exoikonomo".

Evidence of success

Annual energy savings recorded after the interventions:

- Replacement of luminaries in the City Hall: 38,458 kWh/year
- Installation of green roof in City Hall: 5,302 l oil or 53,075 kWh. The coefficient of thermal permeability of the un-insulated roof before planting is estimated at 3.2 W/m^{2}K and after planting at 1.2 W/m^{2}K
- Replacement of old glazing and window frames of the City Hall: 3,791 l oil or 37,950 kWh
- Replacement of old glazing and window frames of the Cultural Centre: 2,405 l oil or 24,076 kWh

Challenges encountered

The main challenge encountered was the installation of the Green Roof in the City Hall building. The fact, however, that the Head of the pertinent municipal department was an Agricultural engineer, specialized in such activities, helped to bring the project to a successful conclusion.

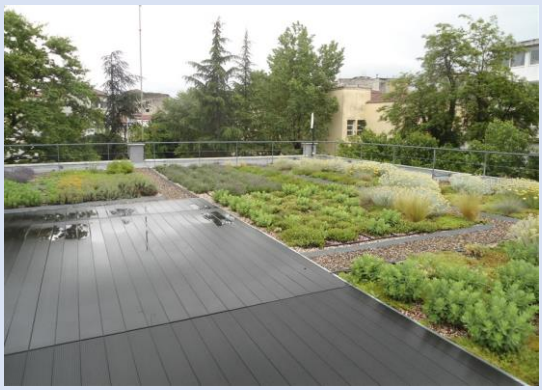
Potential for learning or transfer

- Improved energy-efficiency education and awareness raising on sustainability issues, as the building of the City Hall is open to visitors and to interested schools. In fact the visitors' record includes an educational visit by a school from Spain.
- Increase in the percentage of greenery of the City of Edessa
- Improvement of knowledge about the behavior of endemic plants on roofs and properties of the climatic conditions of Edessa
- Increased sense of pride of employees and executives since they work in a refurbished building with attractive and sophisticated outlook - not many public buildings in Greece have planted roof terraces.

Further information

https://www.interregeurope.eu/policylearning/good-practices/item/1813/energy-saving-projects-in-municipal-buildings/

Photo

I. Photo of the City Hall	II. Photo of the Cultural Centre
	

2.3 Good Practice - #3

Name of the building:

Town Hall in Gournes, Municipality of Hersonissos, Greece

Title of the good practice

Green Roof installation on the Town Hall of Gournes

Does this practice come from a European funding program?

Interreg Europe / Rebus Project

Short Summary of the practice

A pilot application of a green roof to demonstrate the building insulation and landscape enhancement.

Detailed information on the practice

Following the obligations and commitments arising from the Covenant of Mayors regarding the energy efficiency improvement of the municipal buildings, the Municipality of Hersonisos has decided to use all the available funds towards that direction (national funds, own recourses, European projects).

During the implementation of the E2STORMED European project that deals with urban stormwater sustainable management, the Municipality of Hersonissos proceeded with the implement the green roof project on the Town Hall.

The Town Hall is an old and bad maintained building, providing low-quality temperature and insulation conditions. Its roof covers a total surface of 30 m^2.

Following the successful green roof implementation on the Treasury building of the Ministry of Financial Affairs in Athens – Greece, the project has been designed as a pilot application of a green roof to demonstrate the building insulation and landscape enhancement.

The design uses an innovative technique designed for Mediterranean climatic conditions, which constitutes of a light-weight construction, which - even when wet - can keep water and maintain vegetation. This technique is a combination of geo-membranes, soil and geocellular pillows, which form the base of the green roof and upon which the plants, that are endemic aromatic species, are planted.

The green roof is self-maintained, demonstrates significant energy saving, it has improved comfort conditions for the building users and is also used by the Municipality to disseminate the idea of energy efficiency to the public. The total amount of invested capital expenditures equals to 4,000 Euros, while there are no management or maintenance costs. The human resources involved for the successful project implementation included one (1) agronomist and two (2) workers.

Evidence of success

There has been a severe increase in energy efficiency status of the Town Hall through the improvement of comfort conditions inside the building regarding heating and cooling. As a result, an approx. 20% reduction in electricity consumption has been recorded.

Moreover, the project has significant impact in terms of raising awareness as the Town Hall constitutes a demonstration site that supports dissemination and public awareness on energy efficiency measures.

Furthermore, the project has innovation characteristics, as it combines a series of materials and measures resulting in a low budget, self-maintained, energy efficiency improving application.

Challenges encountered

The project was easily implemented without any difficulties.

Potential for learning or transfer

- Successful implementation of energy efficiency application that does not require additional works on the building (construction enhancement, watering and drainage system)
- The applied technique creates an environment with minimum to none management requirements
- Easy to replicate to Mediterranean countries
- Demonstration site to disseminate the idea of energy efficiency to the public

Further information

https://www.interregeurope.eu/policylearning/good-practices/item/1228/green-roof-of-the-municipality-s-town-hall-in-gournes/

https://www.interregeurope.eu/rebus/

https://www.hersonisos.gr/

Photo

2.4 Good Practice - #4

Name of the building:

National Theatre of Prague, Czech Republic

Title of the good practice

EPC Project for National Theatre of Prague

Does this practice come from a European funding program?

The practice came from Interreg Europe/ Finerpol Project

Short Summary of the practice

Czech monumental building of the National Theatre successfully used financial instrument in form of energy performance contracting (EPC).

Detailed information on the practice

The EPC (energy performance contracting) method was used to modernize the energy systems of the National Theatre in Prague.

It was an ambitious project aiming at a significant and lasting reduction in the consumption of natural gas, electricity and water, as well as involving the use of renewable energy sources (solar energy and energy contained in the Vltava river).

The problem addressed by this method was big energy losses in this old monumental building.

The modernization, which took place in 2007, brought a reduction in energy of more than 50%.

The goal was not only to replace obsolete technology, but through interlacing and tuning of the whole technological system to gain maximum savings from the modernization.

Originally waste heat now heats up domestic water. The refrigeration machine can be used as a heat pump (depending on the weather and the needs of the user), but it can automatically re-heat the heat from the sunny rooms to colder rooms.

Warm air from the auditorium is used to heat the fresh air supplied, the amount of which regulates CO_2 sensors in halls.

Main beneficiary is the National Theatre that saves on energy, its employees who have ensured optimal comfort as well as the visitors of the theatre.

In addition, there are positive externalities in savings of energy and CO_2 emissions for all inhabitants of Prague.

Approximately 3 million Euros have been invested in order to accomplish the energy refurbishment of the building. Investment is paid by the guaranteed savings for this project, that amount to 400,000 Euros on an annual basis.

The duration of the project is 10 years and was funded on a commercial basis by the EPC.

Evidence of success

Since 2011, savings have been more than 50% of the original energy costs, while the Energy Services Company (ESCO) ENESA guarantees savings of at least 400,000 Euros per year.

The practice was so successful that, after the initiation of the first round energy efficiency measures that resulted to 800,000 Euros of energy savings within 3 years' time (approximately 260,000 Euros per year), the project was further enhanced with additional energy efficiency measures which raised total savings to 400,000 Euros per year.

Challenges encountered

Energy refurbishment Interventions had to be applied only in a way that shall not negatively affect the monumental outlook of the building, as it is located in Prague's historical city center.

Potential for learning or transfer

The National Theater is a historical building in the center of Prague and its energy intensity was perceived as a necessary tax for the protection of monument protection.

Through this very project, it is clear that even historic buildings without major interventions can provide a set of appropriate measures to reduce energy consumption using appropriate financial instruments – in this case the EPC tool.

Furthermore, an additional benefit of the project is that the life of the installed measures is at least twice the time required to repay the input costs. After the installments are terminated, the customer will remain in the budget for the entire savings achieved. Environmental benefits are an accompanying effect for EPC projects - Economics and ecology are not in a contradictory position here.

Moreover, the monumental nature of the building and the permanent interaction with several groups of stakeholders belonging to general public (visitors, citizens, audience) may lead to raising awareness on energy efficiency and sustainability issues.

Further information

https://www.interregeurope.eu/policylearning/good-practices/item/385/epc-project-for-national-theatre-in-prague-czech-republic/

Photo

I. Photo of the National Theatre	II. Photo of solar system used
	

2.5 Good Practice - #5

Name of the building:

Xrobb l-Għaġin Sustainable Development Centre, Malta

Title of the good practice

"Refurbishment of an abandoned radio station to serve as a Sustainable Development Centre and the creation of a Nature park"

Does this practice come from a European funding program?

The practice came from Interreg Europe/ Support Project. However, the refurbishment project was not funded by EU funds.

Short Summary of the practice

The practice involved the refurbishment and the restoration of a former – and currently abandoned - German radio station building to serve as a Sustainable Development Centre, along with the creation of a Nature park of more than 15,500 trees. Within this framework, and besides the energy upgrade interventions, open spaces for general public and educational facilities have been created aiming at raising public awareness for sustainability issues.

Detailed information on the practice

The Xrobb l-Għaġin Nature Park and Sustainable Development Centre consists of over 155,000 square metres on a jutting peninsula with scenic views in the south east of Malta within the locality of Marsaxlokk.

The purpose of the project is education, demonstration and research in sustainable environment solutions with the overall objective of increasing the use of renewable energy, wastewater management and safeguarding biodiversity.

- Renewable Energy: The site will serve as a research area on renewable sources of energy whilst producing energy from wind turbines and photovoltaic panels on site.
- Water and Wastewater: There will be optimal rainwater harvesting and practical use of both treated wastewater and collected rainwater.
- Biodiversity: Protection of existing natural habitats, namely garigue, steppe and endemic cliff communities as well as afforestation of over 15,000 trees with indigenous trees and shrubs within degraded areas.
- Energy efficiency measures and use of natural daylight and ventilation within the buildings to ensure that sustainable living is further promoted.
- Environmental education facilities including equipped conference and classroom facilities, hostel facilities on site, fully interpreted walking routes, information boards and lesson plans for organized day visits and overnight stays on environmental education.
- Promotion of eco-tourism within the south east of Malta including walking and cycling routes.

The Nature Park project development consisted of two schedules, namely:

- The restoration of a historical building (the abandoned radio station)

- The planting of more than 15,500 trees

A series of specific objectives have been set, including:

- The energy refurbishment of the building
- The protection of an area of high ecological value
- The demonstration of the benefits occurring from renewable energy sources installation
- The finetuning of wastewater treatment
- The creation of green open spaces, open for the general public
- The creation of scientific and educational facilities

The RES systems installed consist of both photovoltaics (PVs) and micro-wind turbines. As long as PVs are concerned, three different types of technologies were put in place, namely, mono-crystalline, poly-crystalline and thin-film PV panels. Moreover, two types of wind turbines have been installed, engaging micro turbines of both vertical and horizontal axis.

The PV and wind system of inverters was designed in a way that allows electricity generation both in grid connection mode as well as in "controlled" stand-alone mode. This means that, in the case of electrical grid failure, the aforementioned inverters system makes it possible to power the building to a limited extent - as long as the PV and wind devices are still generating electricity.

Once installed, the stand-alone inverter was programmed with a load shedding program to provide electricity only to the building's high priority loads. Both PV and micro-wind technologies are connected to a data-logging system, which can be used to monitor various environmental parameters. The solar water heating has been intended to provide hot water supply to toilets and showers.

The sum of energy savings and electricity production data are displayed in the building's lobby in real time, thus, contributing in raising awareness on sustainability issues.

Financial resources (724.641€) used for planting of trees and restoration of building breakdown is as follows:

- EEA Financial mechanism: 261.728 €;
- Norwegian financial mechanism: 373.997 €;
- Nature Trust Malta: 88.916€

Evidence of success

Annual energy savings recorded after the interventions:

- PV system installed: Energy savings: 23,500 kWh/year; Reduction of CO_2: 20.5 tns/year.
- Wind System installed: Energy savings: 16,000 kWh/year; Reduction of CO_2: 14 tns/year.
- SWH system installed: Energy savings: 20,075 kWh/year; Reduction of CO_2: 17.5 tns/year.

Challenges encountered

No challenges were encountered during project's implementation.

Potential for learning or transfer

The project results have shown many benefits and potentials for future projects, namely:
-better economy for stakeholders
-practical use of Renewable Energy Sources and use of treated wastewater
-development of ecotourism in the area
-showcase of the Nature Park and Sustainable Development Centre
-environmental education facilities
-possible future funding for other conservation projects
-education for Sustainable Development (ESD) through outdoor learning.
-holistic education across the curriculum for all ages

Further information

https://www.interregeurope.eu/policylearning/good-practices/item/2708/xrobb-l-ghagin-sustainable-development-centre/

https://www.xrobblghagin.org.mt/

Photo

I. Photo of Xrobb l-Għaġin Nature Park

3. Annex

4. References