



KYONOS
SMARTISLAND



KYTHNOS ISLAND, GREECE

Located in the northwest Cyclades and although just a couple of hours away from Athens, Kythnos is among the so-called “calmer” Greek islands, offering limited tourism facilities and services targeting, at least until recently, mainly Greek visitors.

Permanent population: 1 608

Area: 99.4 km²

Distance from the mainland: 2hrs by boat

Main economic activities: tourism, construction, farming, fishing

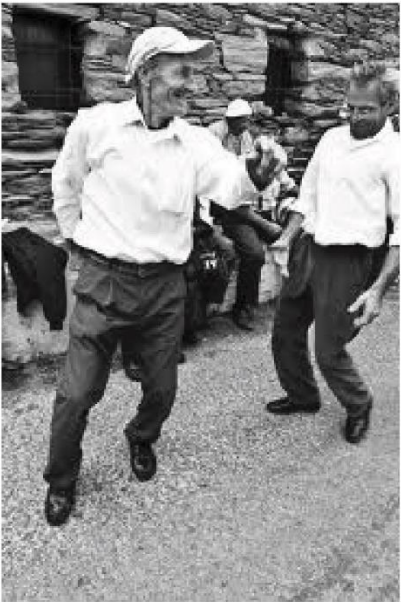


Electrical system: Non-interconnected
Peak demand: 2.7MW
Thermal station: 5.2MW total capacity
Fuel: Diesel
AVC: 212€/MWh
RES share: 268 kW PV, 665 kW Wind (out of order)

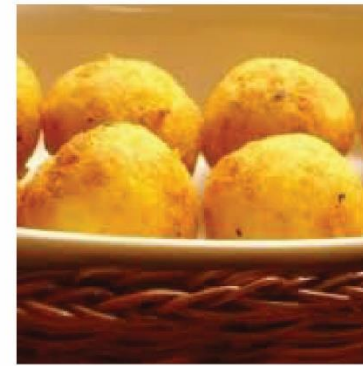
Villages & Beaches



Traditional music – Ballos dance



Gastronomy & Thyme honey



Moreover, Kythnos since early 80's has been a frontrunner island living lab in the field of renewable energy production and management in insular energy system conditions



The Living Lab story



1st wind farm in Europe (5 x 20kW)



New wind turbines (5 x 33kW)



Installation of an additional wind turbine Vestas 500kW



Establishment of the off-grid Gaidouromandra microgrid

WT repower (still on progress)

1982

1983

PV system 100kW with battery storage 400kWh



1989

1992

New PV inverters



1998

2000

Operation of a fully automated system



2001

2016

Launch of the WiseGRID project



An aerial photograph of a coastal town on a hillside. The buildings are predominantly white with red-tiled roofs. In the background, there are large, brown, hilly mountains under a blue sky with some clouds. The foreground shows a grassy slope with some stone walls and a few scattered buildings.

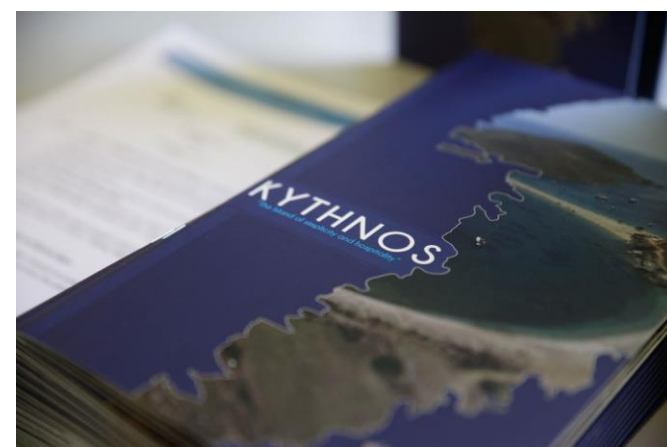
Kythnos Smart Island master plan

Vision for sustainable economic development

The transition of the island towards a smart and sustainable development model; one that will foster the broadening of the tourism season all while reducing the negative impacts of the relevant activities.

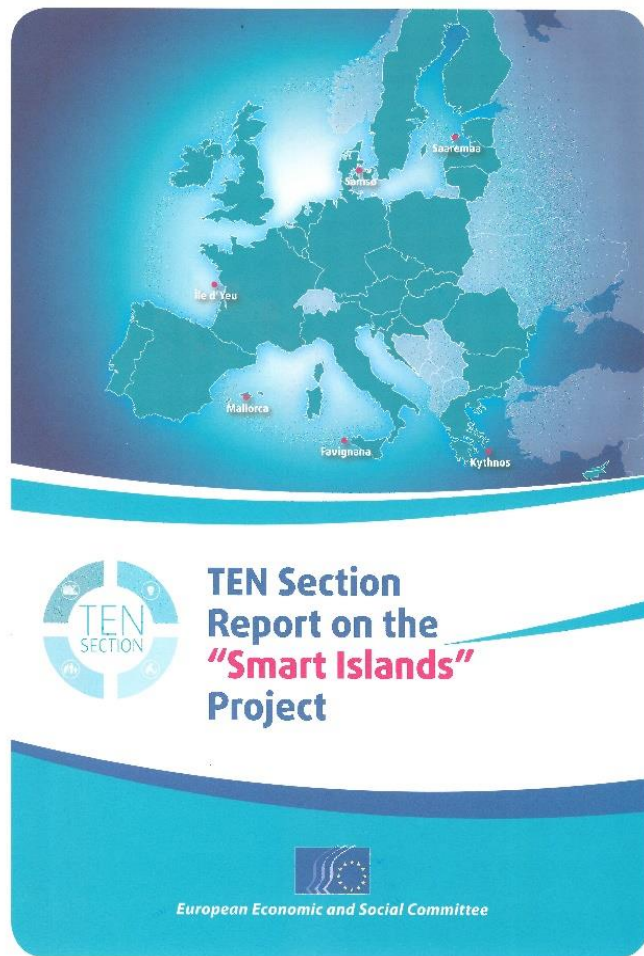
Building momentum and support | May 2016

Visit of the European Economic and Social Committee



Building momentum and support | September 2016

European Economic and Social Committee “Smart Islands” report

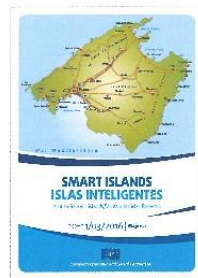


Presentation of the islands



Located in the Atlantic, Ile d'Yeu is an island and a municipality, just off the Vendée coast of western France. With a surface area of 23 km², the island has 4 600 inhabitants. Around 10km long with an average width of 4km, its surface area is around 23km². The island's two harbours, Port-Jeuville in

the north and Port de la Vieule, located in this rocky inlet of the southern granite coast, have been famous for the fishing of turbot and lobster. However, the decline of fishing activities is pushing Ile d'Yeu's community toward the development of tourism, renewable energy and the digital economy.



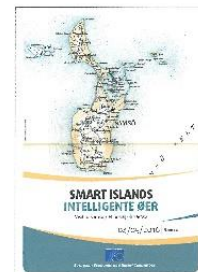
The Balearic Islands are located in the middle of the Mediterranean Sea, and have a population of 1,120 million. Mallorca is the largest island in the archipelago which has a total surface area of 4,497km². The island's capital, Palma, is also the capital of the autonomous community of the Balearic Islands. Since the 1970s, the archipelago's economy has diversified from a model based

on subsistence farming to one based on tourism. However, the Balearic Islands are facing saturation of the traditional tourism model. The answer is to diversify tourism by exploiting digital and new technologies. The objective is to make the islands more competitive by boosting the economy using innovation, particularly in the digital economy.



Located in western Sicily, the Egadi Islands are an archipelago of 37,45km² made up of three main islands (Favignana, Levanzo and Marettimo) and two islets (Formica and Maraone). The main municipality, Favignana, includes the three islands of Favignana, Marettimo and Levanzo. Favignana is the largest of the three main Egadi islands, with a surface area of 19,8km² and a population of 4,230 (31st december 2015). The island is famous for its caves of calcarenite rock (locally known as "tufo") and the ancient fishing

technique of "tonnara" which involved the trapping and "mazzanza" (culling) of Bluefin tuna. Essentially based on tourism and fishing, the economy is driven by the Egadi Marine Protected Area (RIPA), established by the government and managed since 2001 by the Municipality of Favignana. It is the largest marine reserve in the Mediterranean and has shaped a local policy which aims to extend the tourist season, repopulate the island and boost the economy.



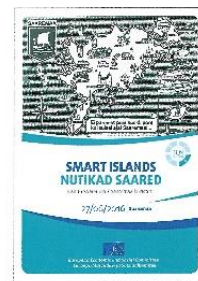
Samsø is a Danish island and municipality located 15km off the Jutland Peninsula. Covering an area of 114km², the island was used during the Viking Age. Part of the island is Natura 2000 protected. The population of Samsø fluctuates from 3 700 (winter) to 25 000 (summer). The island is split between the north and the south. Residents use around 1 500 vehicles and have a network of cycle paths. Samsø's economy is based on

small scale fishing, farming (particularly potatoes and asparagus) and tourism. Ten years after the Kyoto Protocol entered into force (1997), Samsø won a national competition, reaching 99,6% renewable energy within ten years. Samsø is meeting its challenges (demography, transport and waste management) through an interactive approach which is already operating very well in the field of energy.



Kythnos is a 100km² island and municipality located in the Western Cyclades. Very windy, the island hosts the first wind farm ever installed in Europe. The north of the island is a Natura 2000 protected area. Kythnos economy was driven in the 19th century by mining activities which prevail in today's economy. It is based on small scale fishing, the diversification of agriculture toward products with Geographical Indications (GI), and the development of a

sustainable tourism model. The island's population is around 2 400, rising to 25 000 during the summer. Remarkably, the local population is increasing. Today, the population is ready to promote Kythnos, adopting self-development (as opposed to the excessive tourism activities which prevail in Mykonos, for instance). Kythnos is also on the way to develop a Sustainable Energy Action Plan Master Plan Proposal entitled "Smart Island Kythnos".



Located between the Gulf of Riga and the Baltic Sea, Saaremaa is the largest of the 2 222 Estonian Islands. Measuring 2 673 km², this big island has a population of 35 000, which is shrinking. The island's economy is diverse and generates growth and jobs, as illustrated by the industry. Apart from food, shipyards, small craft building, electrical

equipment, plastic products (films for garbage and seas for car air conditioning systems), the municipality estimates that 94 SMEs employ around 1 000 people. In addition, companies from abroad are developing activities. Relatively wealthy, Saaremaa is trying to increase tourism and to improve its accessibility.

Horizon 2020 WiseGRID

November 2016



Local meetings | 6-8 June 2017

EU meeting on smart grids

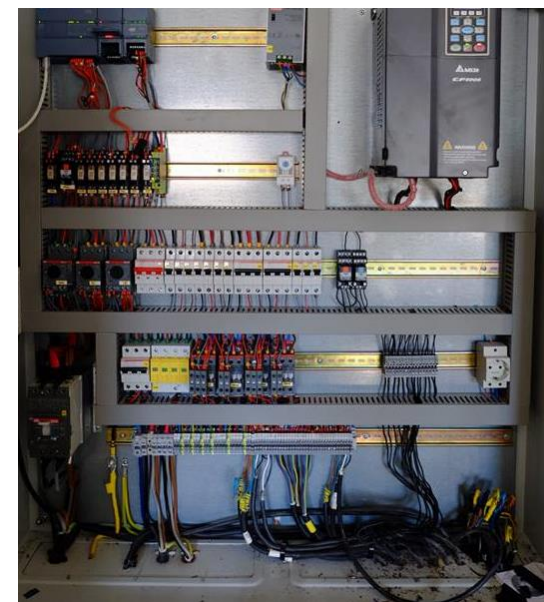


Local meetings | 9 June 2017

Sustainable tourism in Kythnos



Participatory planning activities



The Smart Islands Initiative



The **Smart Islands Initiative** is a bottom-up effort of European island authorities and communities which seeks to communicate the significant potential of islands to function as laboratories for technological, social, environmental, economic and political innovation through the uptake of **Island Quadruple Helix Ecosystems**.



The Smart Islands Initiative | An integrated approach



ENERGY



TRANSPORT



WATER



WASTE



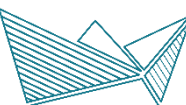
GOVERNANCE



ICT



ECONOMY



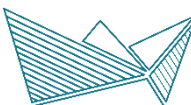
Smart Islands Declaration

EU Parliament, March 2017



We want to become smart, inclusive and thriving societies and to this end we will:

1. Take action to mitigate and adapt to climate action and build resilience at local level
2. Trigger the uptake of smart technologies to ensure the optimal management and use of our resources and infrastructures
3. Move away from fossil fuels by tapping our significant renewables and energy efficiency potential
4. Introduce sustainable island mobility including electric mobility
5. Reduce water scarcity by applying non-conventional and smart water resources management
6. Become zero-waste territories by moving to a circular economy
7. Preserve our distinctive natural and cultural capital
8. Diversify our economies by exploiting the intrinsic characteristics of our islands to create new and innovative jobs locally
9. Strengthen social inclusion, education and citizens' empowerment
10. Encourage the shift towards alternative, yearlong, sustainable and responsible tourism



Application for financing of the “Kythnos Smart Island” project

July 2017

KYONOS
SMART ISLAND



Project duration: 3.5years

Project budget: 8M€

Implemented by:



**National Technical
University of Athens**

SIEMENS

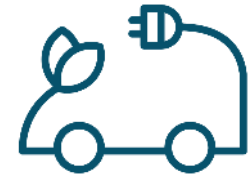
The project is funded by Siemens in the framework of the Settlement Agreement between the Hellenic Republic and Siemens.

Innovative solutions for the efficient upgrade & smart management of local infrastructures

Kythnos returns as a living lab, where clean energy and smart grids **enable the efficient management of water, waste and mobility**



ENERGY &
SMART GRIDS



TRANSPORT &
MOBILITY



WASTE
MANAGEMENT



WATER
MANAGEMENT



STREET
LIGHTING



BUILDINGS & PUBLIC SPACE
RETROFITTING



ENERGY & SMART GRIDS

Acceleration of the clean energy transition through multiple applications, such as demand side management, integration of storage in the distribution network, research on a local microgrid and extensive sector coupling.



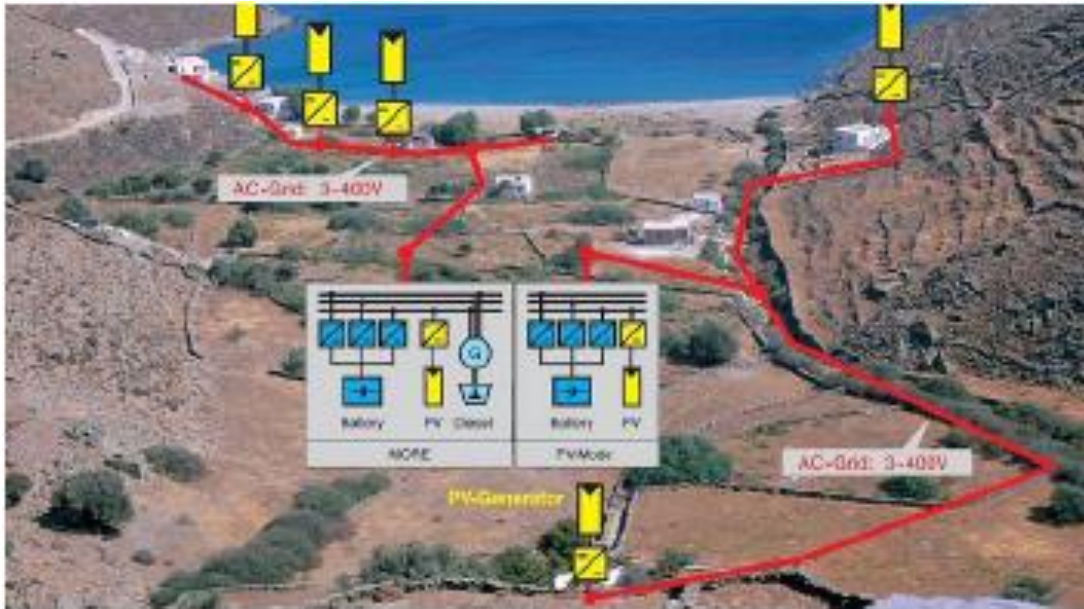
An aerial photograph of a coastal village. In the foreground, several white, single-story buildings are scattered across a dry, grassy hillside. A dirt road winds through the area. In the middle ground, a sandy beach meets the sea, with a few people and umbrellas visible. The background features a range of mountains under a clear blue sky. The text 'Repowering the Gaidouromantra off-grid microgrid' is overlaid in white, centered on the image.

Repowering the Gaidouromantra off-grid microgrid

2001: The establishment of the microgrid

EU funded project:

- PV-MODE, JOR3-CT98-0244 and
 - MORE, JOR3CT98-0215
- LV microgrid with PVs, batteries and diesel generator
 - 12 summer houses
 - Loads: lighting, fridge, water pump and small appliance



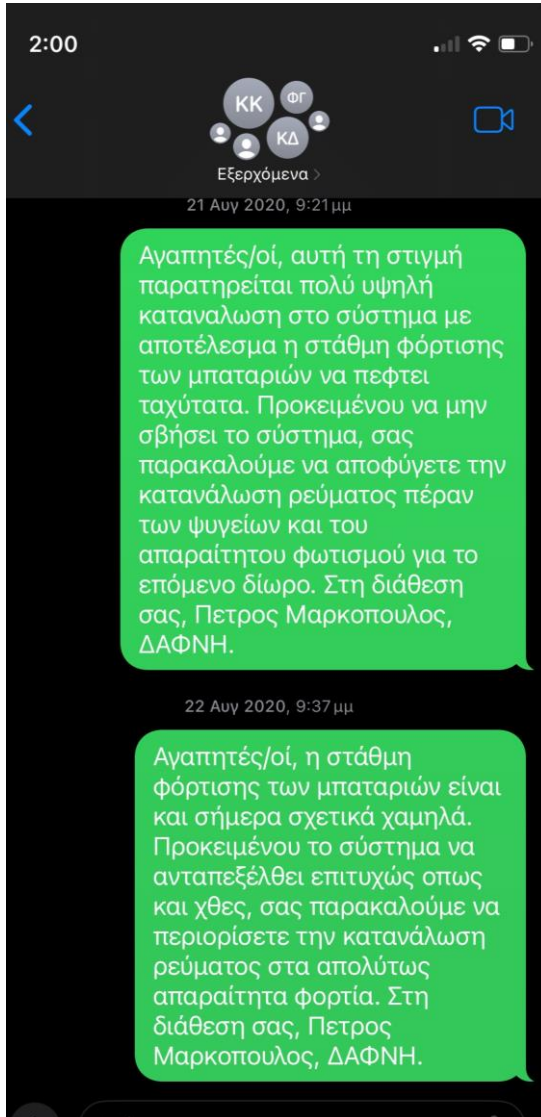
Infrastructure fatigue and malfunctioning



Repower | diesel generator replacement (22kVA)



Operation | monitoring and informing



Dear all, currently we are monitoring very high electricity consumption at the system and as a result the state of charge of the batteries is dropping rapidly. To avoid shut down of the system please avoid for the next two hours using electricity for any need beyond your fridges and the essential lighting.

At your availability, Petros Markopoulos, DAFNI

Repower | replacing the BESS (90kWh)



Testing | installation of small pilot WT (3 kW)



Upgrade | installation of 1,5km. fiber optics



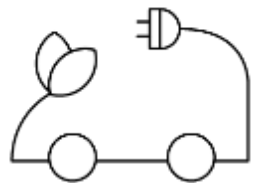
Upgrade | smart meters installation



Repower | replacement of PVs (18kW) and inverters







TRANSPORT & MOBILITY

Decarbonize the island's transport sector through the uptake of electromobility on land and sea transportation.



Installation of 9 publicly available EV charging stations



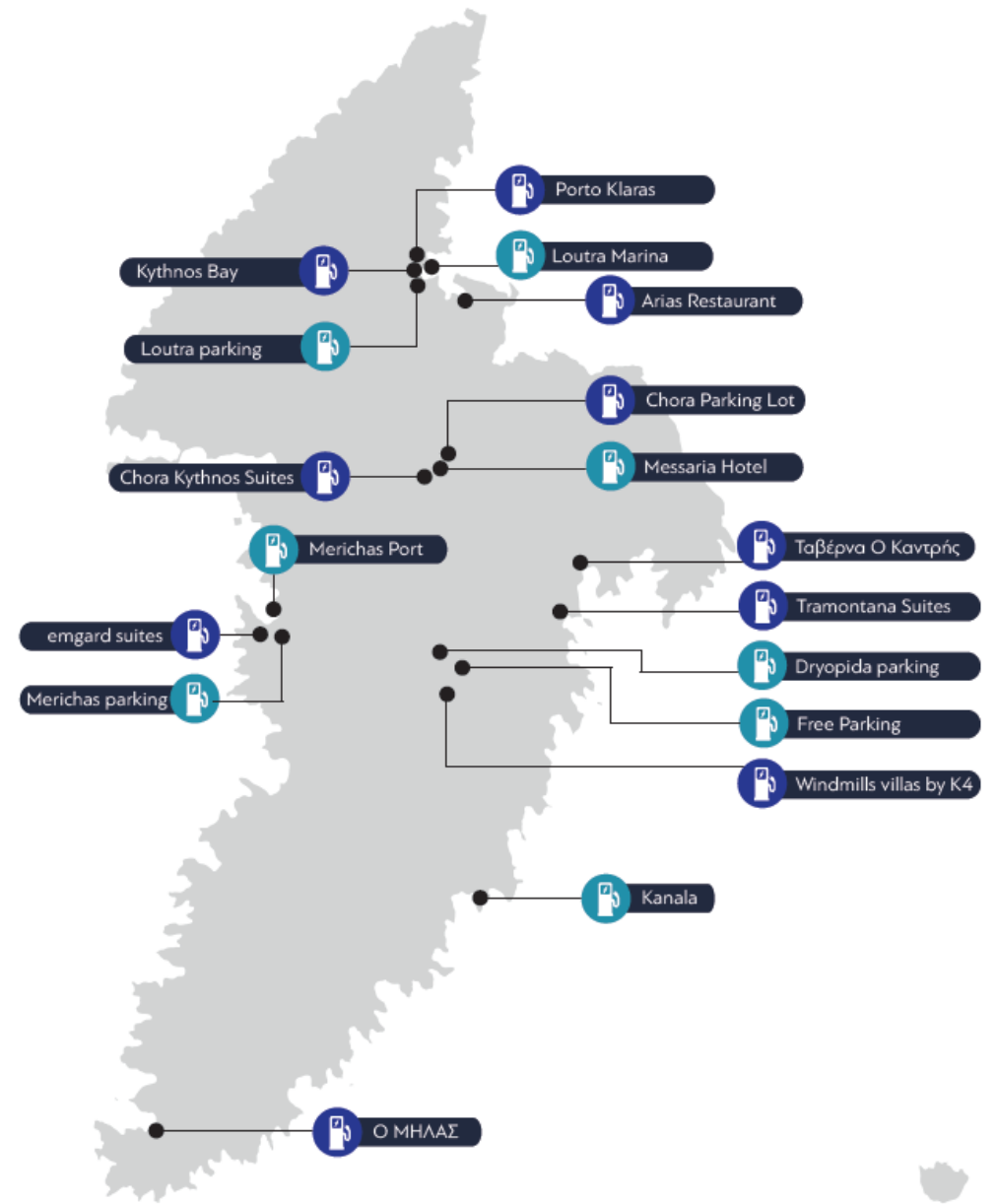
Installation of 9 publicly available EV charging stations





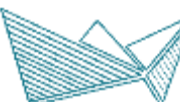
Installation of 10 EV charging stations in hotels & restaurants



An extensive EV charging station network



-  ΔΗΜΟΣΙΑ ΠΡΟΣΒΑΣΙΜΟΙ ΣΤΑΘΜΟΙ
-  ΣΤΑΘΜΟΙ ΣΕ ΙΔΙΩΤΙΚΟΥΣ ΧΩΡΟΥΣ



Electrification of municipal fleet



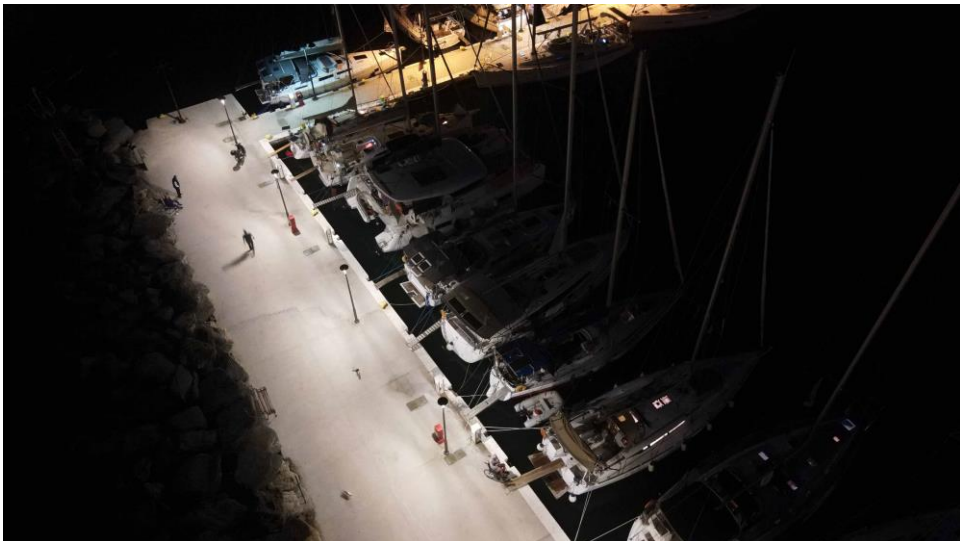
Electrification of municipal fleet



An aerial photograph of Loutra Marina, a coastal town in Greece. The image shows a harbor with several boats docked at a pier. The water is a mix of green and blue, indicating varying depths and possibly some seaweed. The harbor is bordered by a concrete wall and a rocky breakwater. To the left, there is a sandy beach with some umbrellas. The surrounding area is built up with modern buildings, some with red roofs. The overall scene is a well-developed coastal town with a functional marina.

Transformation of Loutra Marina to Smart Marina

Smart street lighting system

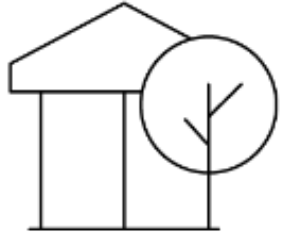


New electricity and water supply berth pillars



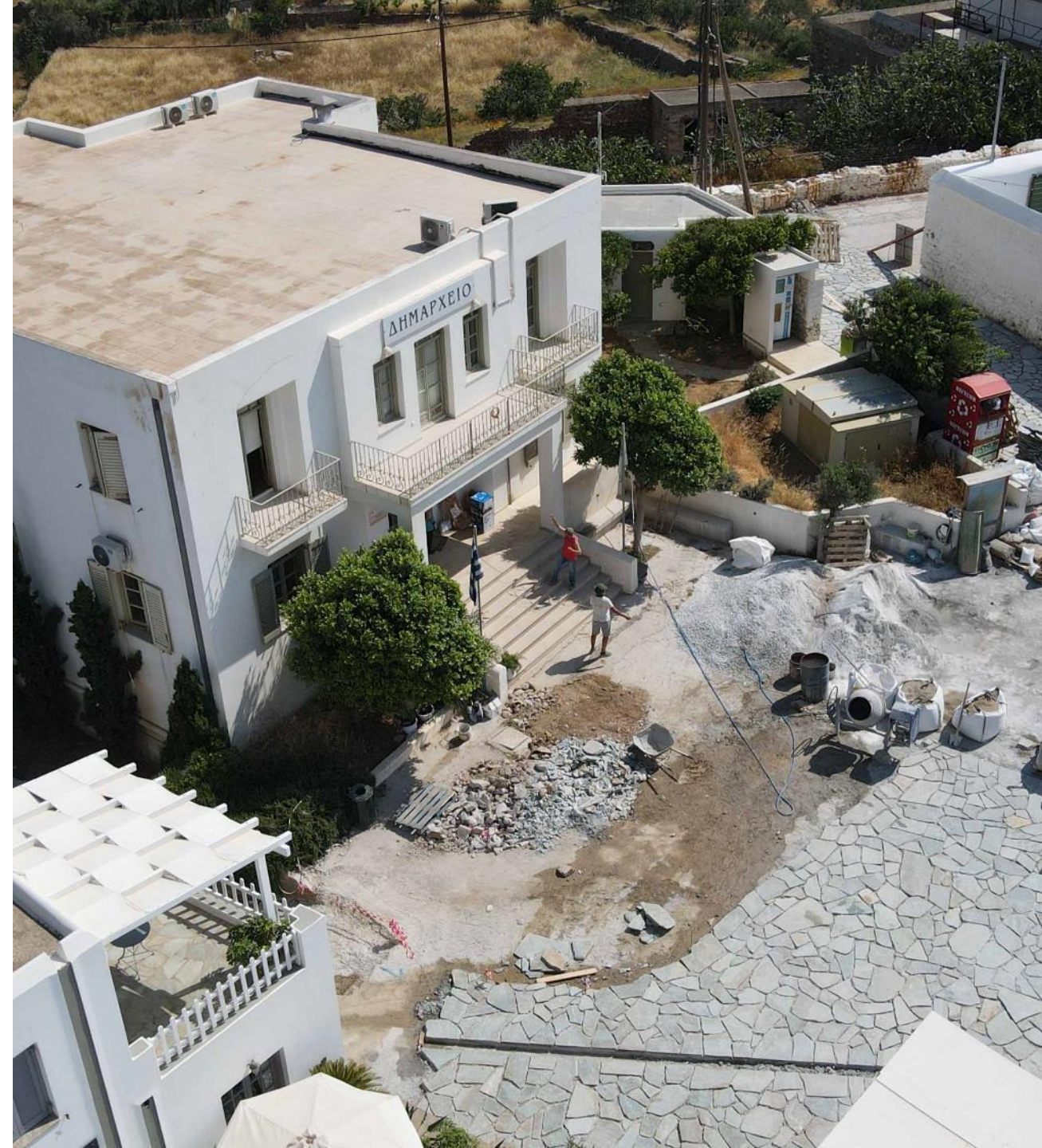
EV chargers installed in hotels and publicly accessible points





BUILDINGS & PUBLIC SPACE RETROFITTING

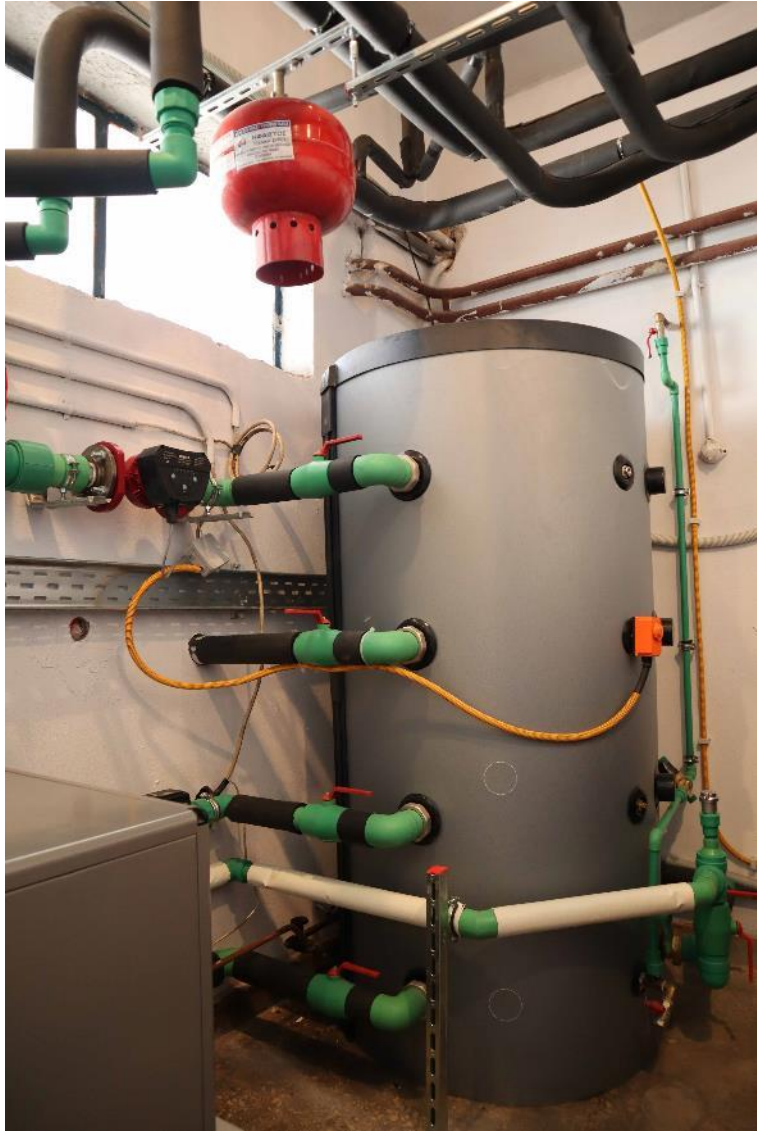
Energy upgrade of municipal buildings into
Nearly Zero Energy Buildings and sustainable
regeneration of public space



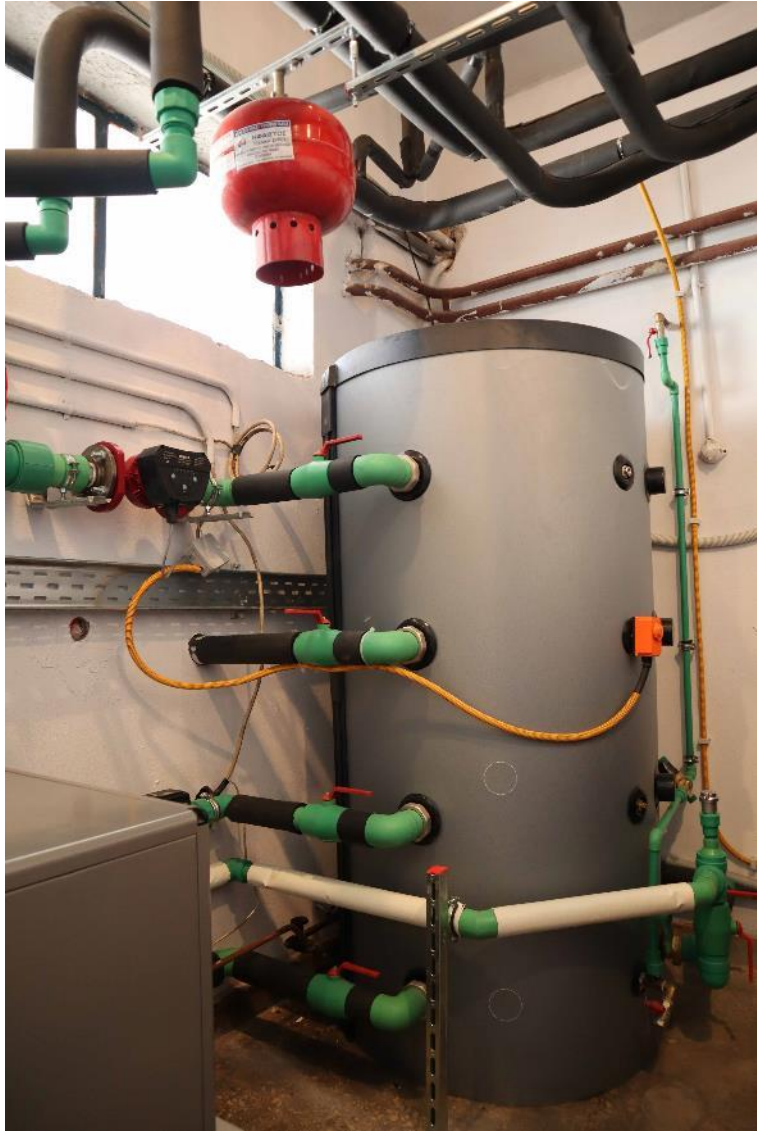
Upgrade of the HVAC systems in Highschool building



Upgrade of the HVAC systems in Highschool building



Upgrade of the HVAC systems in Highschool building



PV & BESS installation in public buildings



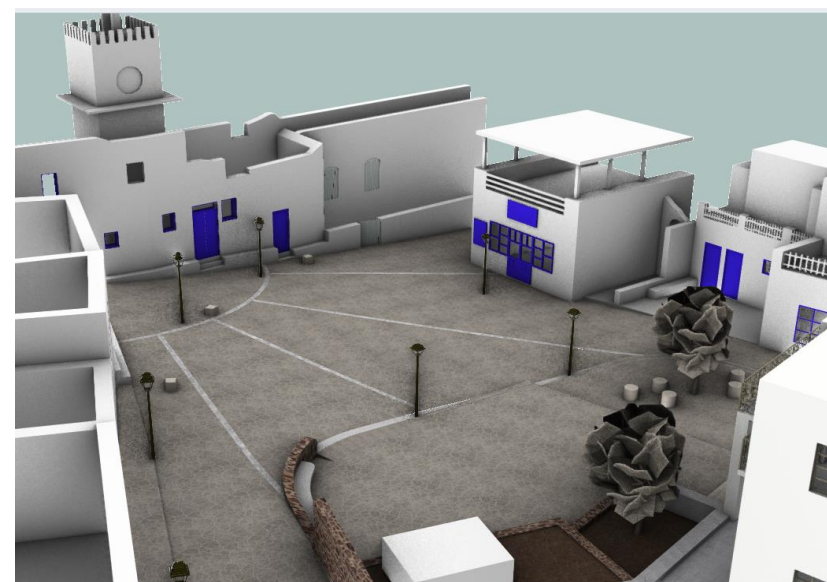
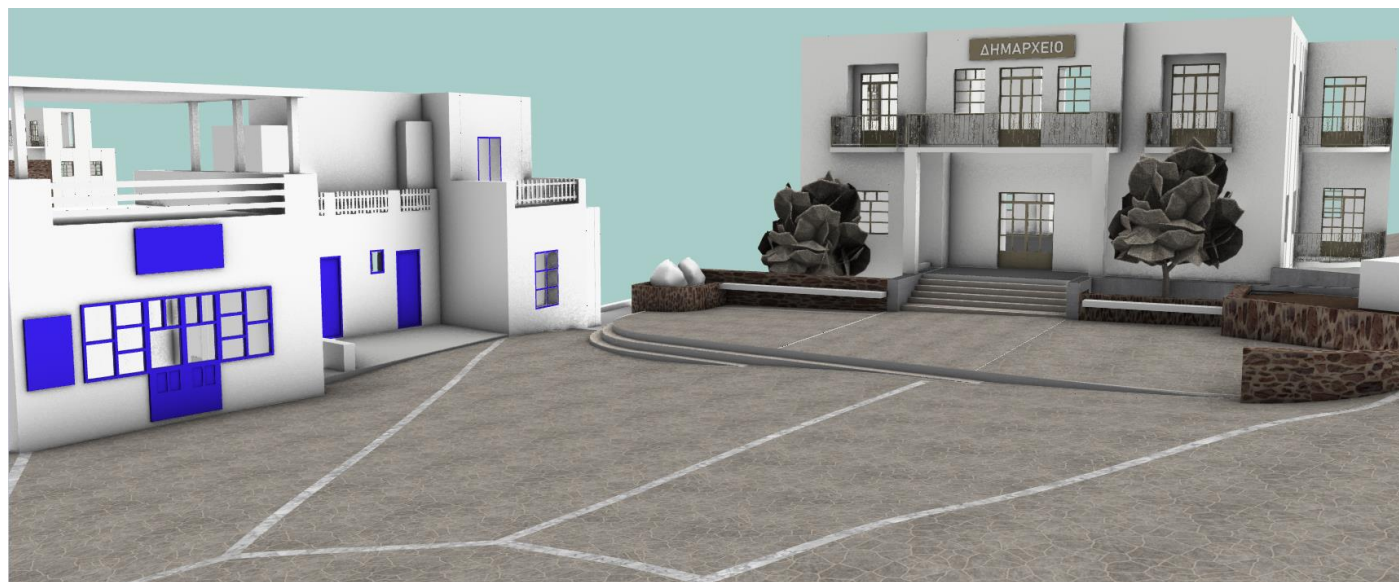
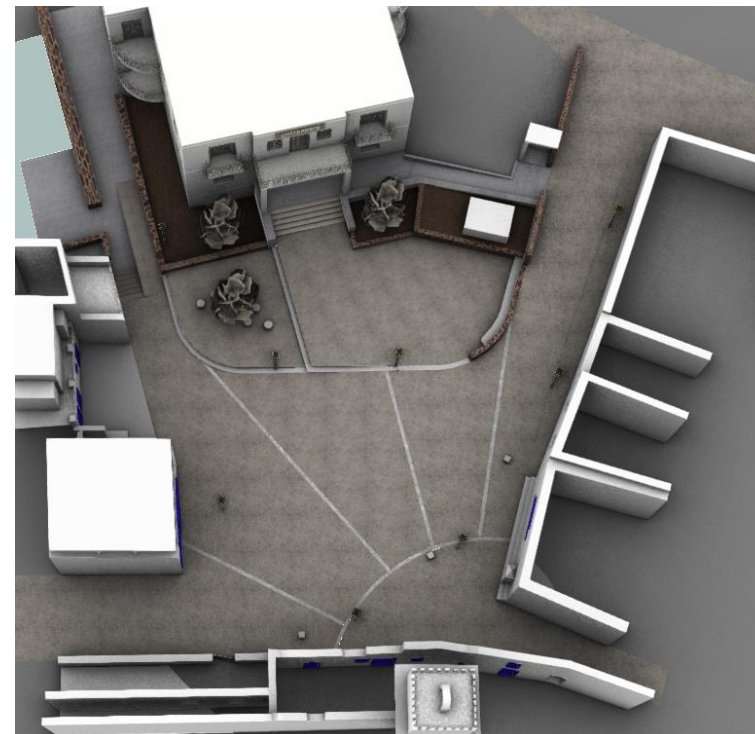
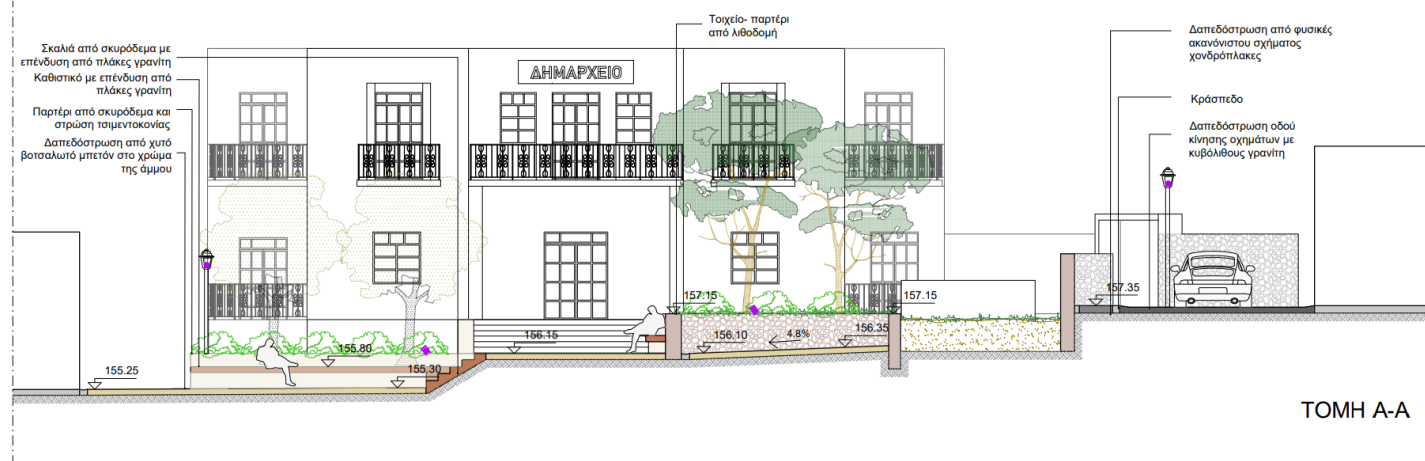
- 3 PV systems
- Total capacity 25 kW
- BESS storage capacity 30 kWh
- Zero injection to the grid



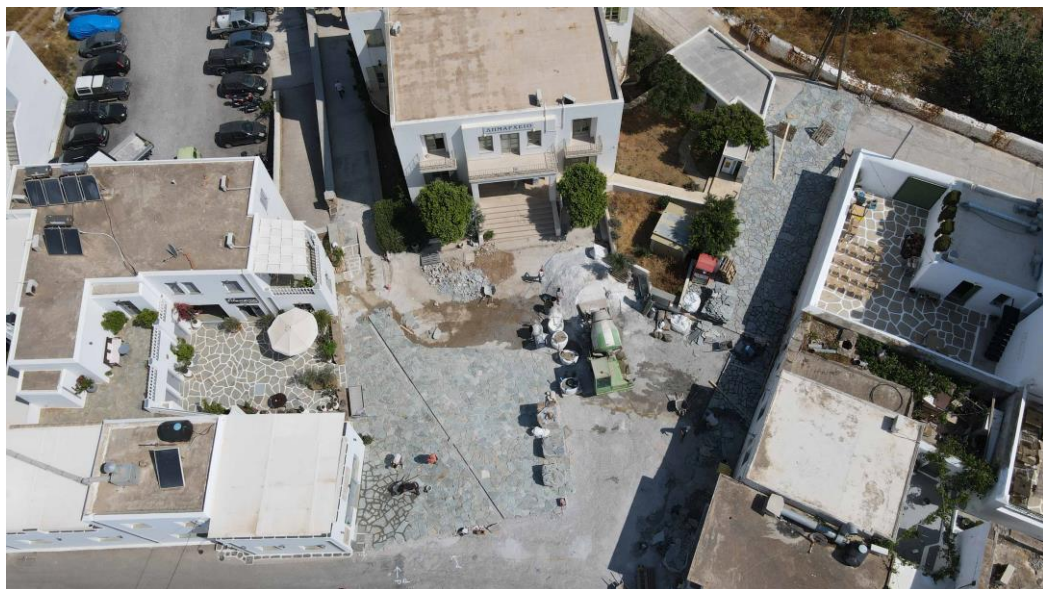
An aerial photograph showing a public square regeneration project. The central square is paved with grey bricks and features a circular planter in the middle. The square is surrounded by white buildings with various roof types, including red tiles and flat roofs. A building on the left has a sign that says "BAKERY". The square is bordered by a stone-paved area with some greenery and palm trees. The text "Public space regeneration" is overlaid in white on the square.

Public space regeneration

Chora square



Chora square



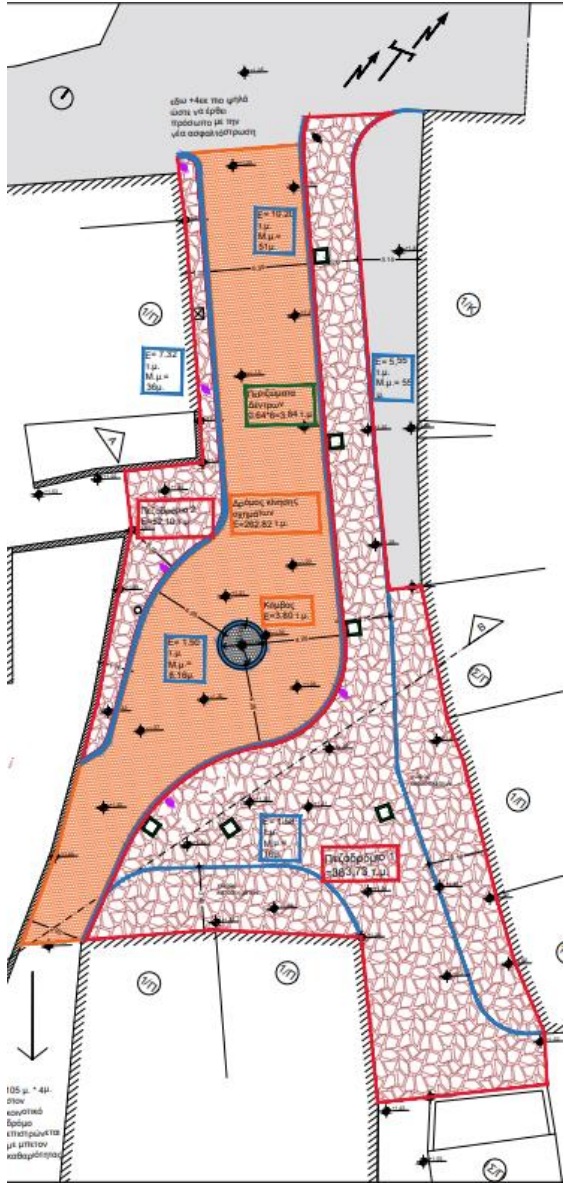
Chora square



Chora square



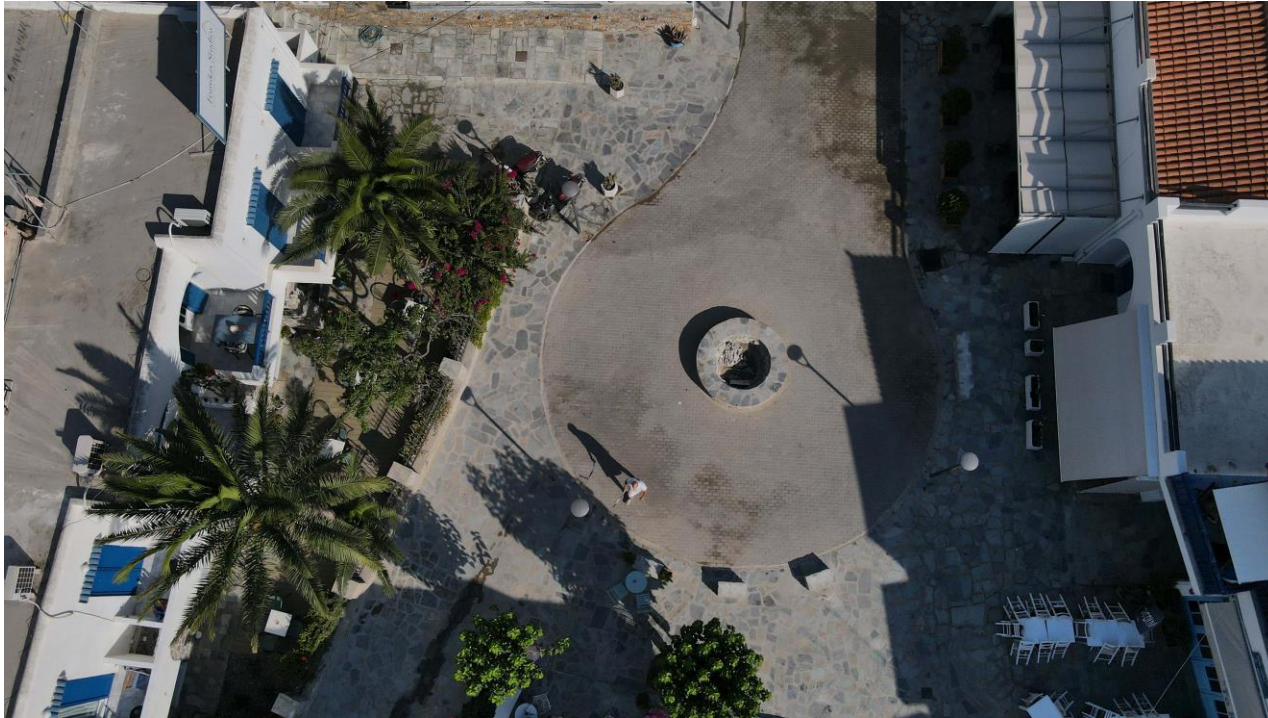
Merichas square



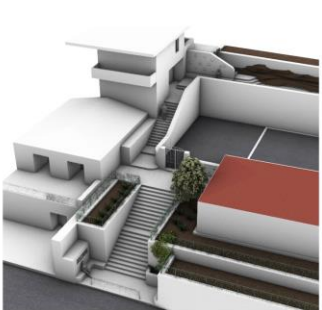
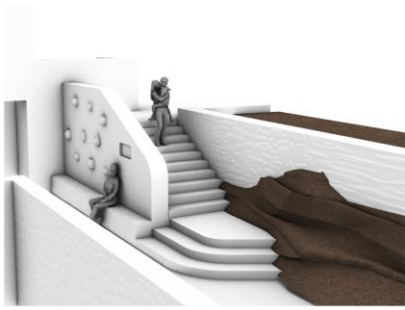
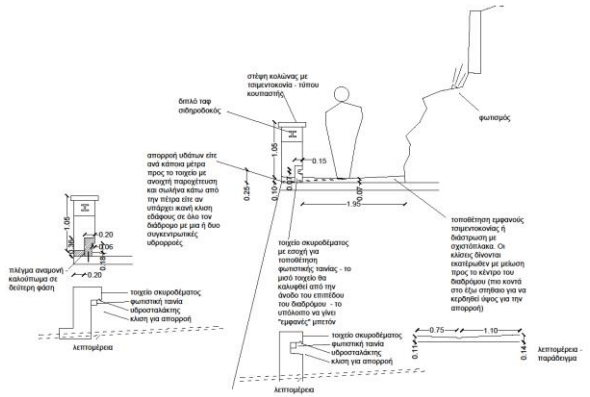
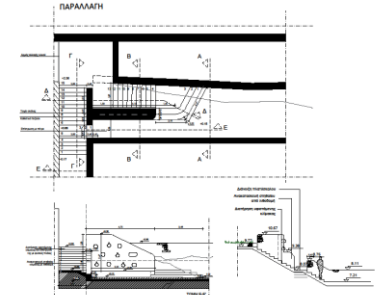
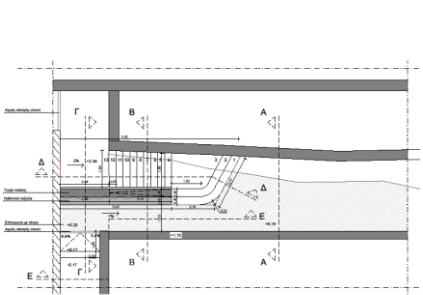
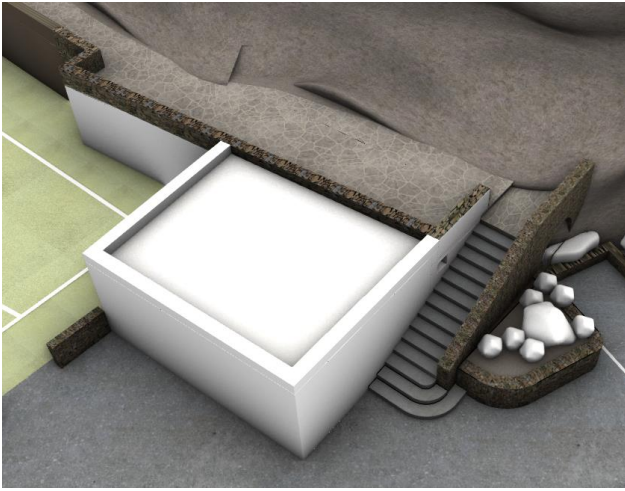
Merichas square



Merichas square



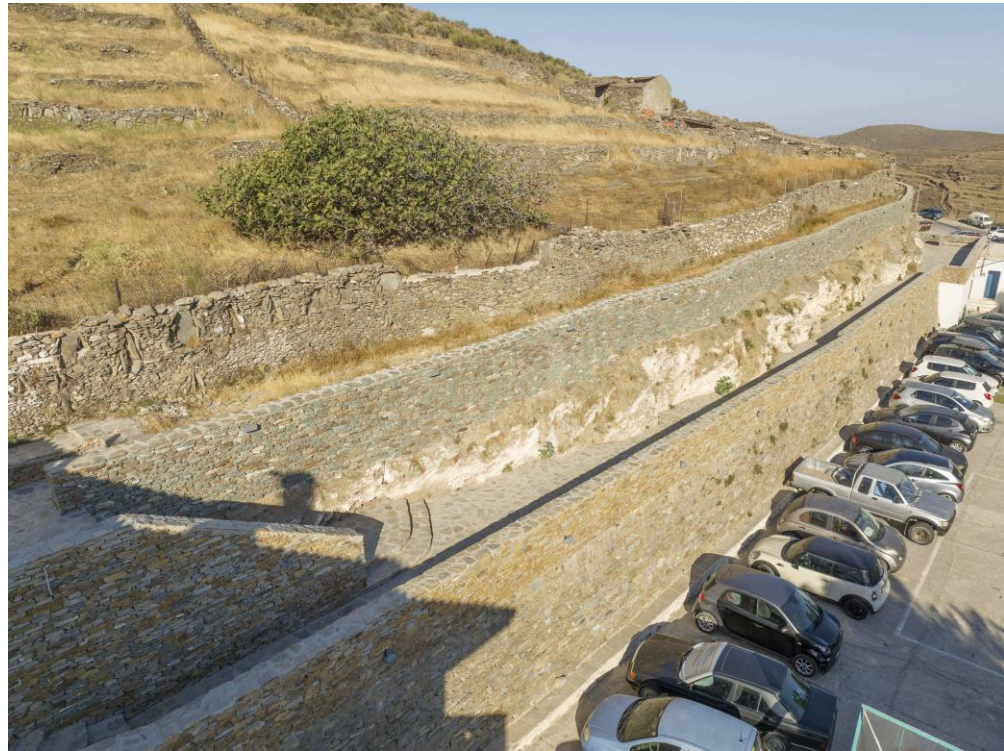
Dryopida entrance path



Dryopida entrance path

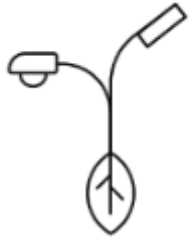


Dryopida entrance path



Dryopida entrance path





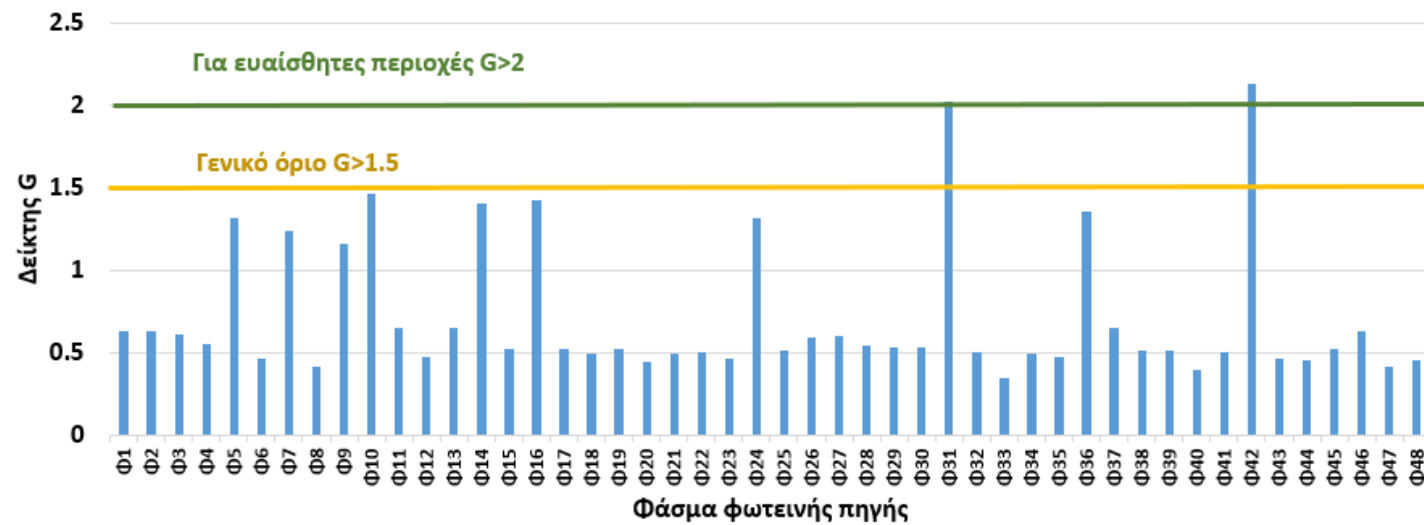
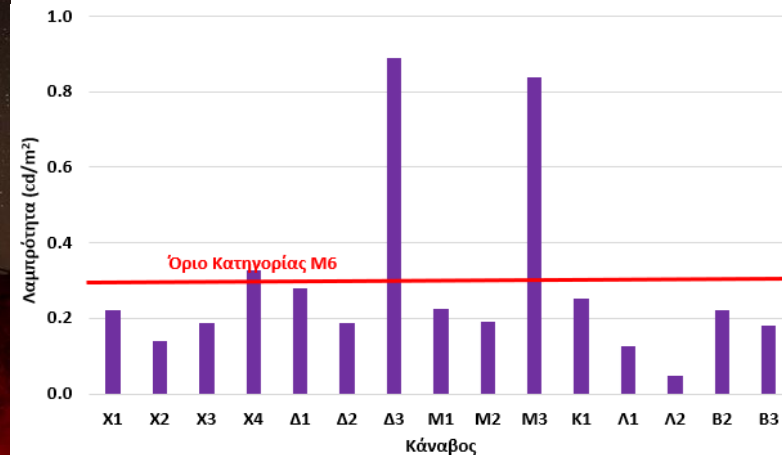
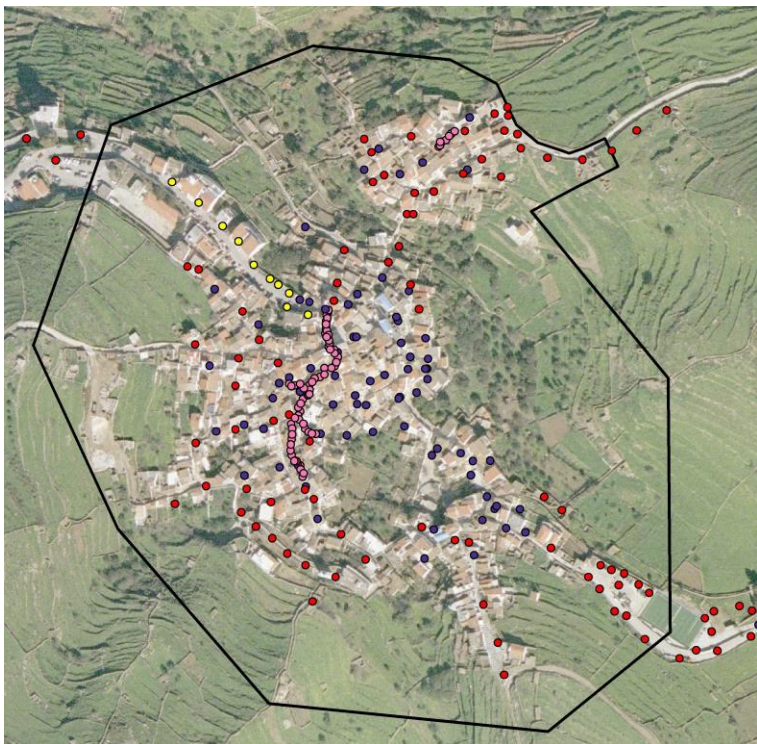
STREET LIGHTING

Energy upgrade and smartening of the island's street lighting network, while improving visual comfort and minimizing lighting pollution



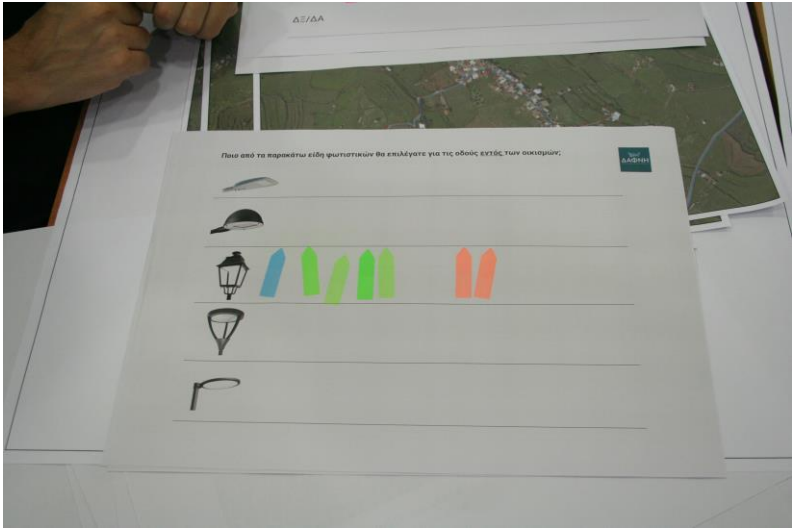
Preparatory actions

Inventory of current situation



Preparatory actions

Participatory planning workshop – July 2019



Preparatory actions

Round table meeting with technology providers



Pilot demonstrative installations | March 2021

8-12 ΜΑΡΤΙΟΥ
ΕΒΔΟΜΑΔΑ
ΕΠΙΔΕΙΚΤΙΚΩΝ
ΕΓΚΑΤΑΣΤΑΣΕΩΝ
ΓΙΑ ΤΗΝ
**ΑΝΑΒΑΘΜΙΣΗ ΔΗΜΟΣΙΟΥ
ΟΔΟΦΩΤΙΣΜΟΥ**

Στο πλαίσιο του έργου:
**ΚΥΘΝΟΣ
SMARTISLAND**

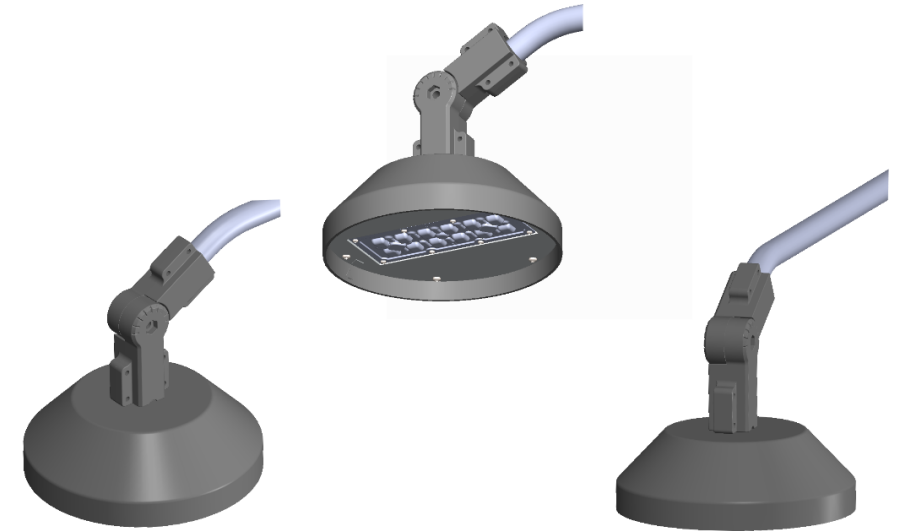
Υποστηρικτές:
ΔΑΦΝΗ, ΕΠΙΧΕΙΡΗΣΗ ΕΚΚΑΤΑΣΤΑΣΕΩΝ ΕΡΓΩΝ, ΔΗΜΟΣ ΚΥΘΝΟΥ

Με την υποστήριξη:
BRIGHT, sielight, SREC



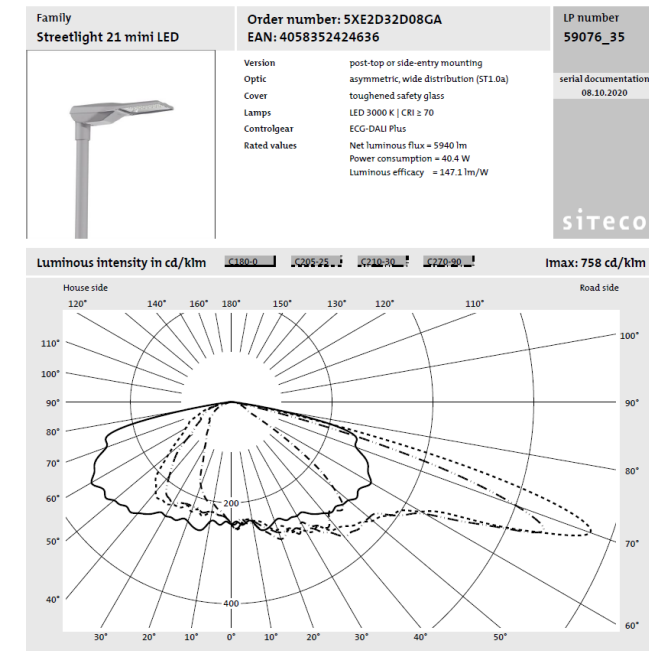
Choice of the adequate high-quality luminaires:

- Protected from grid instability
- Resistance to island weather conditions
- Compliance with the aesthetics of traditional settlements

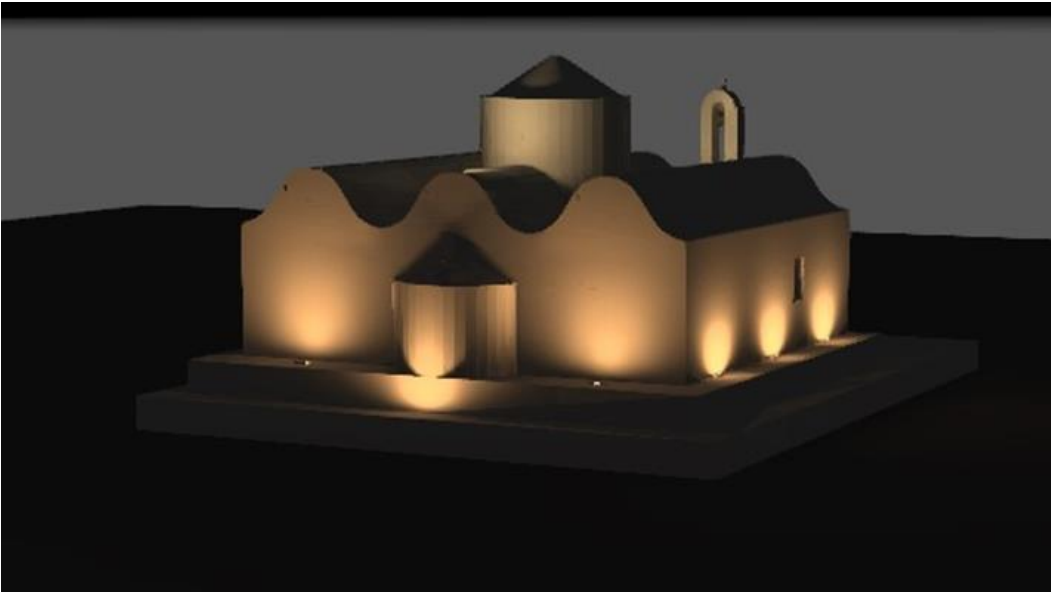
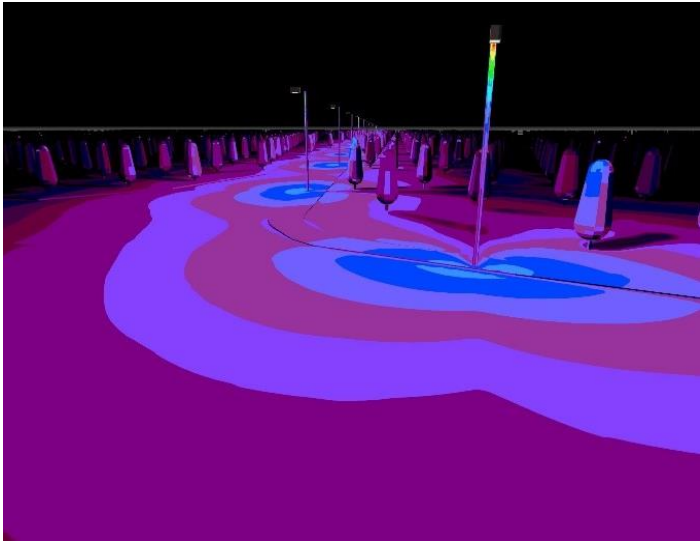
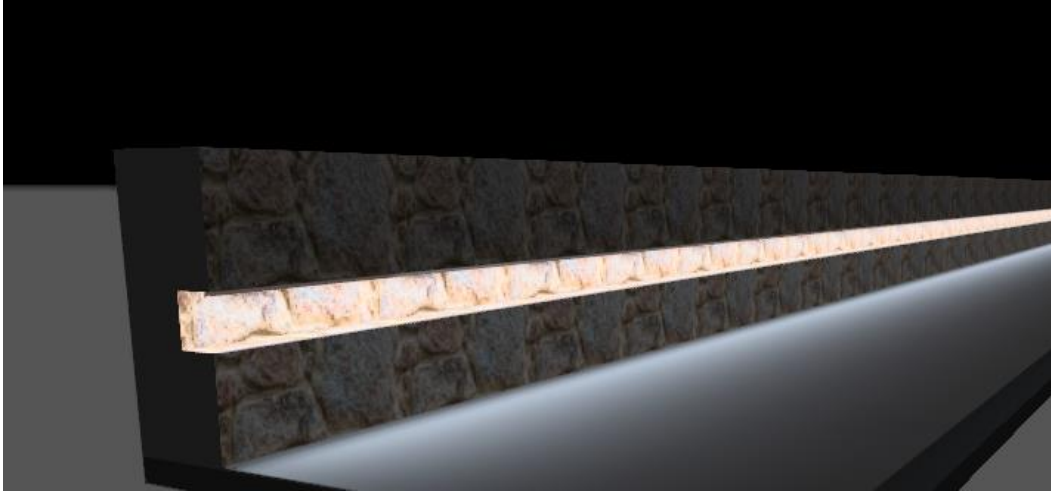
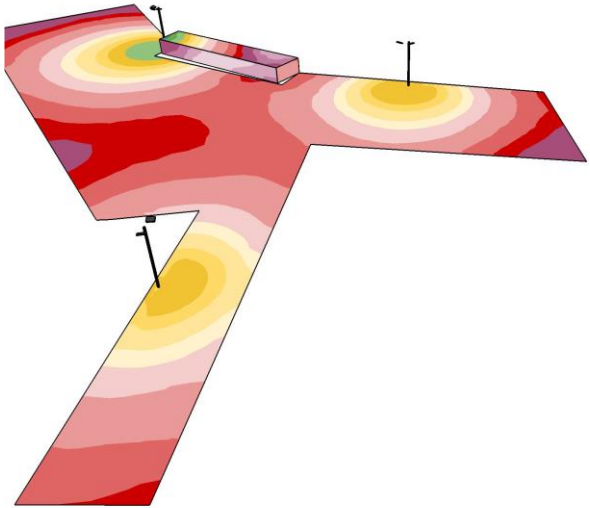


Moreover:

- ✓ Redesign and analysis of the street lighting
- ✓ Development of new luminaire sections
- ✓ Adaptation of luminaires height and installation of new of luminaires in the settlements



Lighting studies



3 types of street lights



Replacing street lighting



Replacing street lighting



Redesign of settlement lighting







WATER MANAGEMENT

Demonstrate the integrated water resource management at island scale, while reducing the water production cost and water losses at the distribution system.



A scenic coastal landscape featuring a winding asphalt road on a rocky, vegetated hillside. The road curves along the edge of a steep cliff overlooking a bay with exceptionally clear, turquoise water. In the distance, a small white building is perched on a rocky outcrop. The sky is a deep, clear blue, and the overall scene is bright and sunny.

Water resources management

Ανάπτυξη ολοκληρωμένου Γενικού Σχεδίου Ύδρευσης (Masterplan) Δήμου Κύθνου

Ανάλυση και αξιολόγηση της υφιστάμενης κατάστασης του υδρευτικού συστήματος

- Γεωχωρική καταγραφή του δικτύου ύδρευσης
- Αποτύπωση υφιστάμενων υποδομών ύδρευσης
- Ανάλυση ετήσιας ζήτησης ύδατος για το σύνολο του νησιού και ανά οικισμό
- Υπολογισμός της εποχιακής ζήτησης (θερινή περίοδος) ανά οικισμό βάσει δεδομένων τηλεμετρικού συστήματος στις δημοτικές δεξαμενές
- Ποιοτική ανάλυση υπόγειων υδάτων
- Υδατικό ισοζύγιο για το σύνολο του νησιού και ανά υδρολογική λεκάνη

Interventions

- Installation of desalination plants
- Upgrade of the water distribution network to reduce losses
- Development of small dams to enhance aquifer
- Upgrade of existing wastewater treatment plant



Installation of desalination plants

Installation of desalination plants to purify high-salinity underground water at Merichas port

Capacity: 200m³/d



Seasonal use of a municipal water drill in addition to the existing desalination

Installation of desalination plants to purify high-salinity underground water at Merichas port



A photograph of a rocky hillside with blue pipes and green plants. The scene shows a rugged, rocky terrain with sparse vegetation. In the foreground, a large blue pipe runs horizontally across the frame. Another blue pipe runs diagonally across the middle ground, crossing over the first pipe. The background features a steep, rocky slope with some green shrubs and a clear blue sky. The overall scene suggests a water distribution network in a mountainous or hilly region.

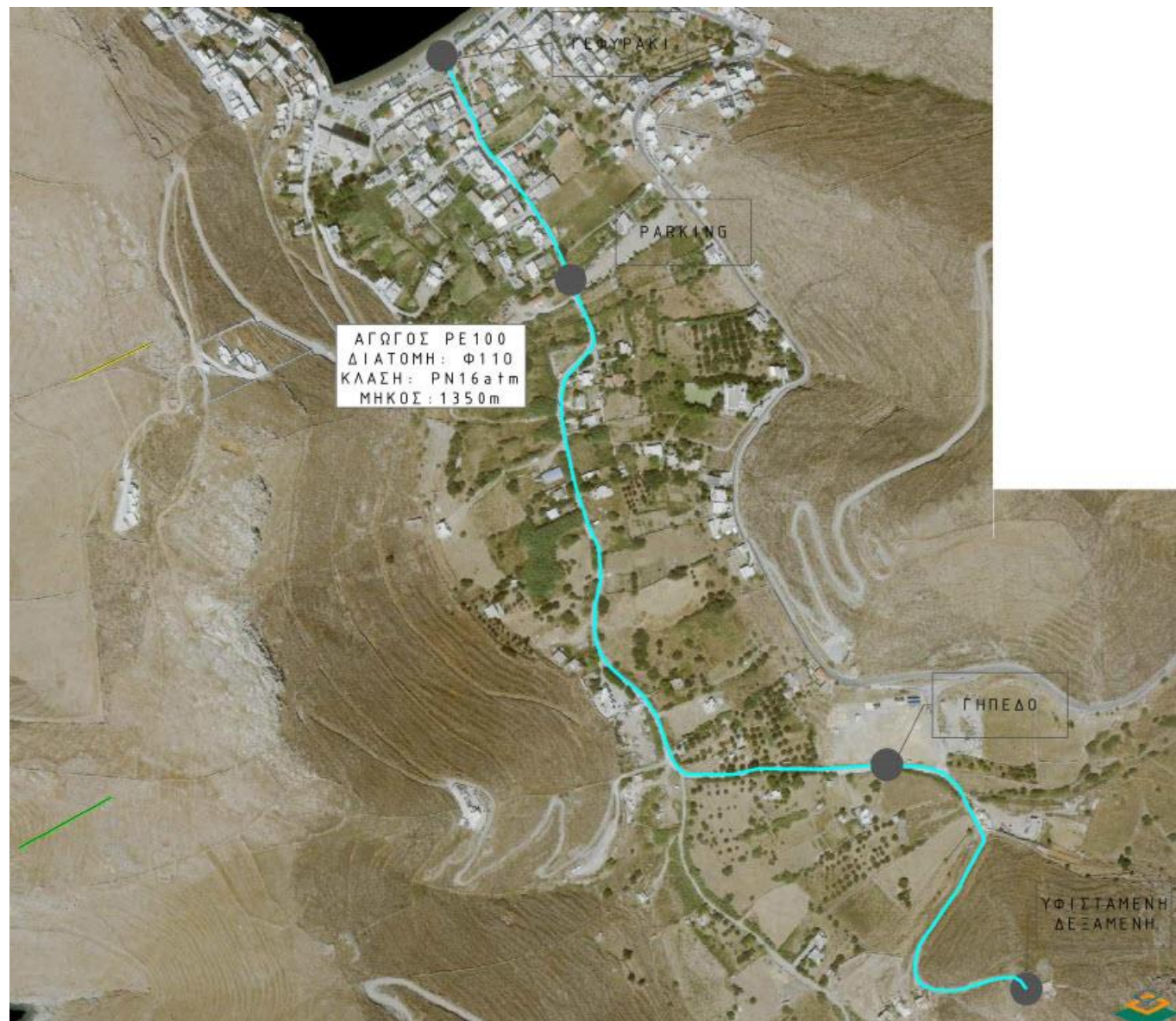
**Upgrade of the distribution
network to reduce losses**

New water distribution network

Pipeline $\Phi 110$ PE100, PN16, 1350 m

Connecting the water storage reservoirs at an altitude of 60m. and ending at the coastline of the settlement at 1,6m.

Increasing the quality of water at the tap!



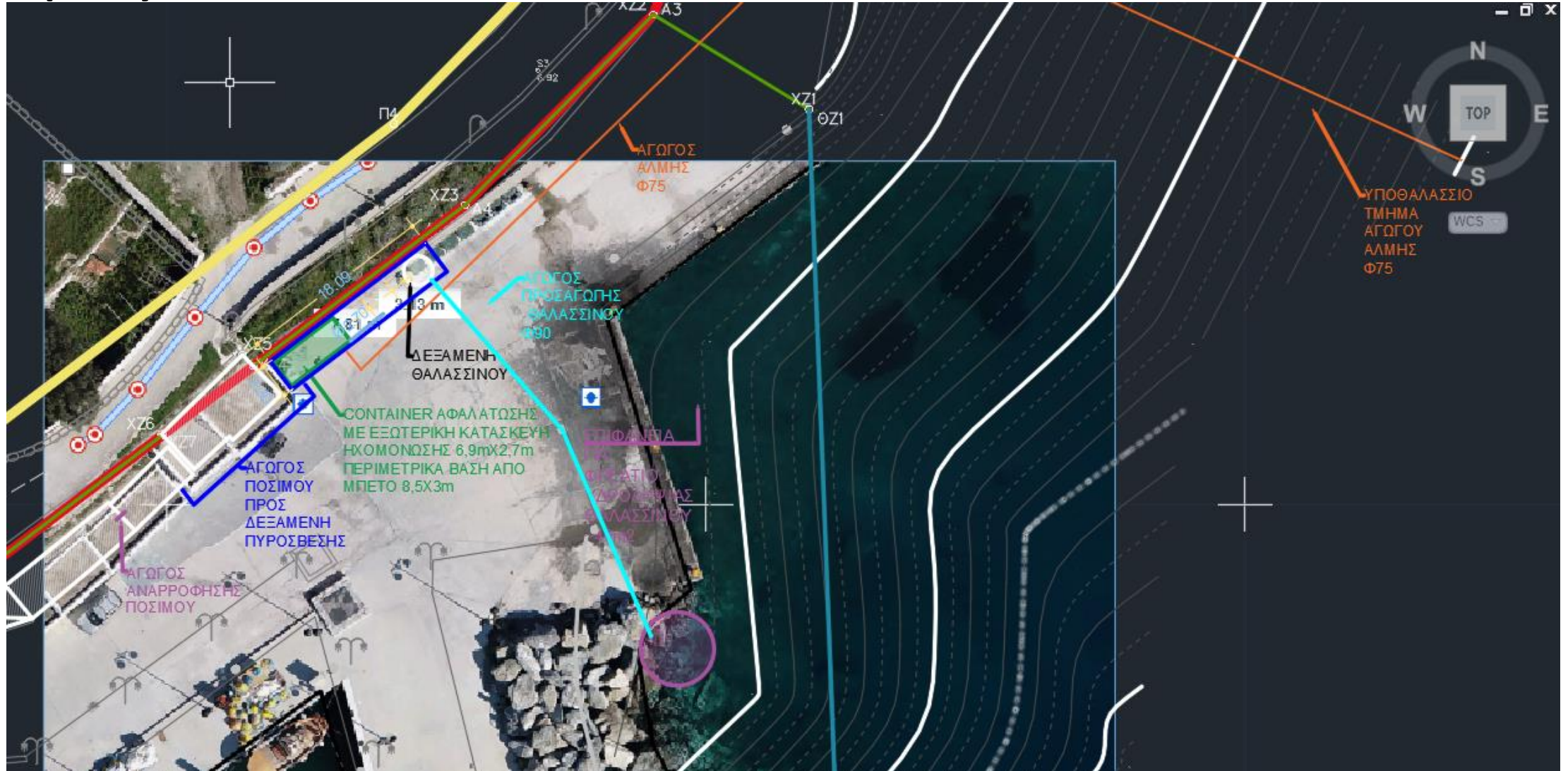
Installation of desalination plants to purify high-salinity underground water at the remote settlement of Agios Dimitrios

Capacity: 60m³/d



Installation of seawater desalination plant to supply the Loutra port

Capacity: 200m³/d



Aquifer enrichment through the development of small dams | Water Storage



Odor management of existing wastewater treatment plant



Enhancement of wastewater treatment plant

- Short term solution





WASTE MANAGEMENT

Demonstrate the potential to transform an island into a zero-waste area, while maximizing valorization of waste and minimizing environmental impact



A photograph showing a man in a dark shirt and red pants loading a white truck with large black bags of recycling waste. The truck is parked on a street at night, with its rear lights illuminated. A motorcycle is parked next to the truck. In the background, there are buildings and a blue and red no-parking sign. The text "Recycling waste separation at source and door-to-door collection from businesses" is overlaid in white on the image.

**Recycling waste separation at
source and door-to-door
collection from businesses**



Door-to-door collection benefits

- Tackle peak waste production
- Avoid overfilled waste bins on the roads
- Reduce transfer of waste from business staff to the bins
- Keep the settlements clean
- High separation percentage of recycled waste

Door-to-door recycling waste collection from businesses

Kythnos Smart Business



Door-2-door collection with LEV



Short-term storage points



Pressing and packaging



Delivery to the mainland recycling centres





Working with students



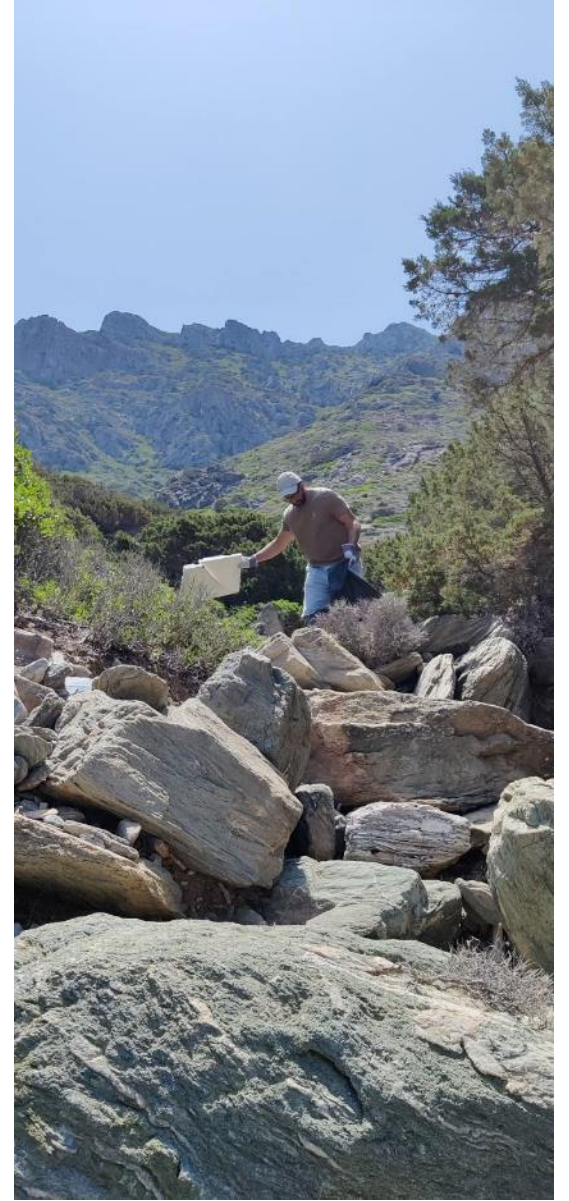
ΑΝΑΚΥΚΛΩΣΗ ΠΛΑΣΤΙΚΩΝ ΜΠΟΥΚΑΛΙΩΝ & ΧΑΡΤΙΟΥ

2 ΝΟΕΜΒΡΙΟΥ 2022

ΓΥΜΝΑΣΙΟ ΜΕ Λ.Τ. ΜΕΡΙΧΑ
ΔΗΜΟΤΙΚΟ ΣΧΟΛΕΙΟ ΚΥΘΝΟΥ









An aerial photograph of a waste management center. The site is a large, cleared area of brown earth, surrounded by green, terraced hills. A dirt road runs through the center, with several vehicles and piles of waste. A river is visible on the right side. The text "Operation of Bulky & Green Waste Management Demonstrative Center" is overlaid in white.

Operation of Bulky & Green Waste Management Demonstrative Center

Bulky & Green Waste Management

Quantity and quality measurements



Collection & transfer | mattresses



Collection & transfer | Electrical appliances



Collection & transfer | Bulky plastic

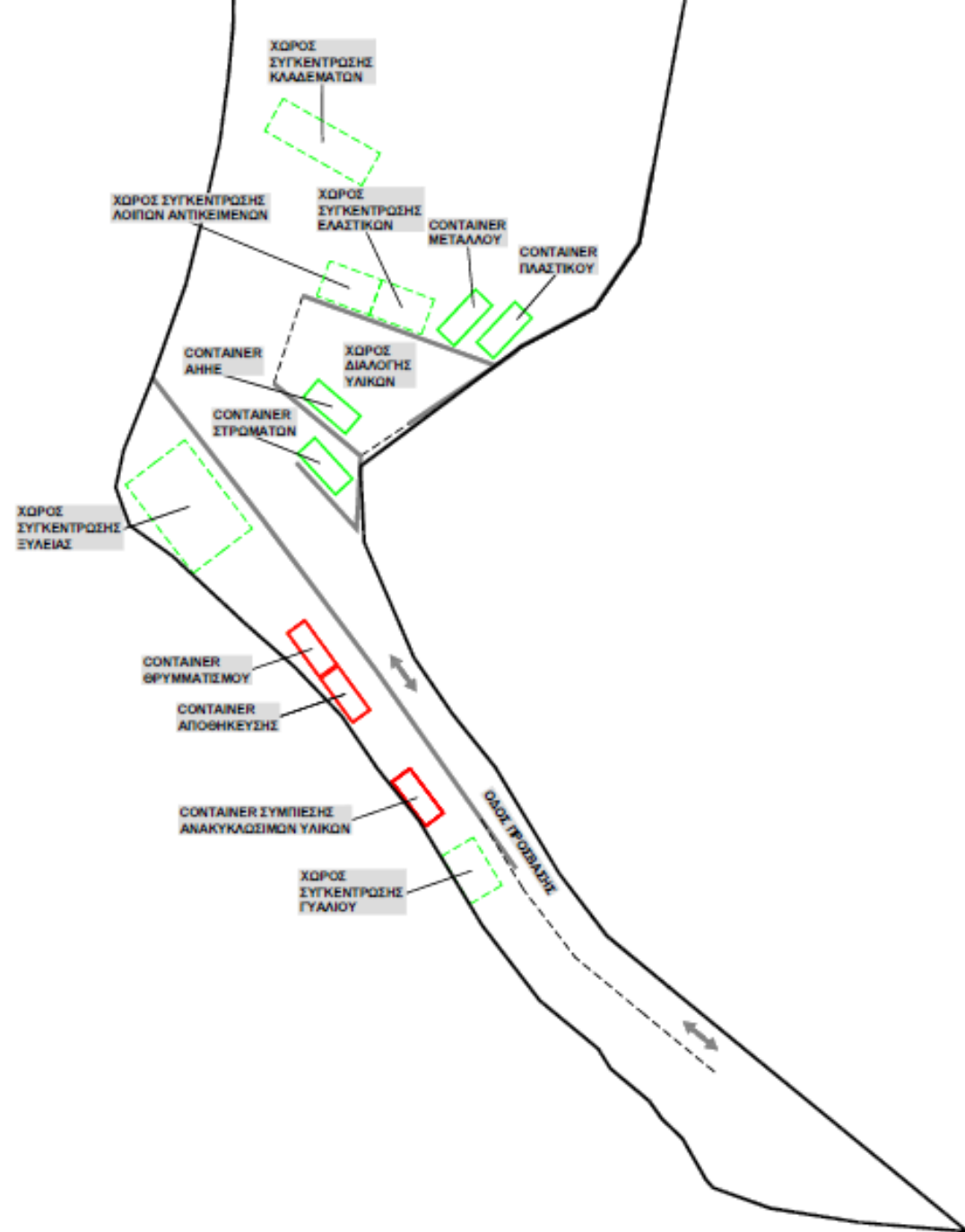
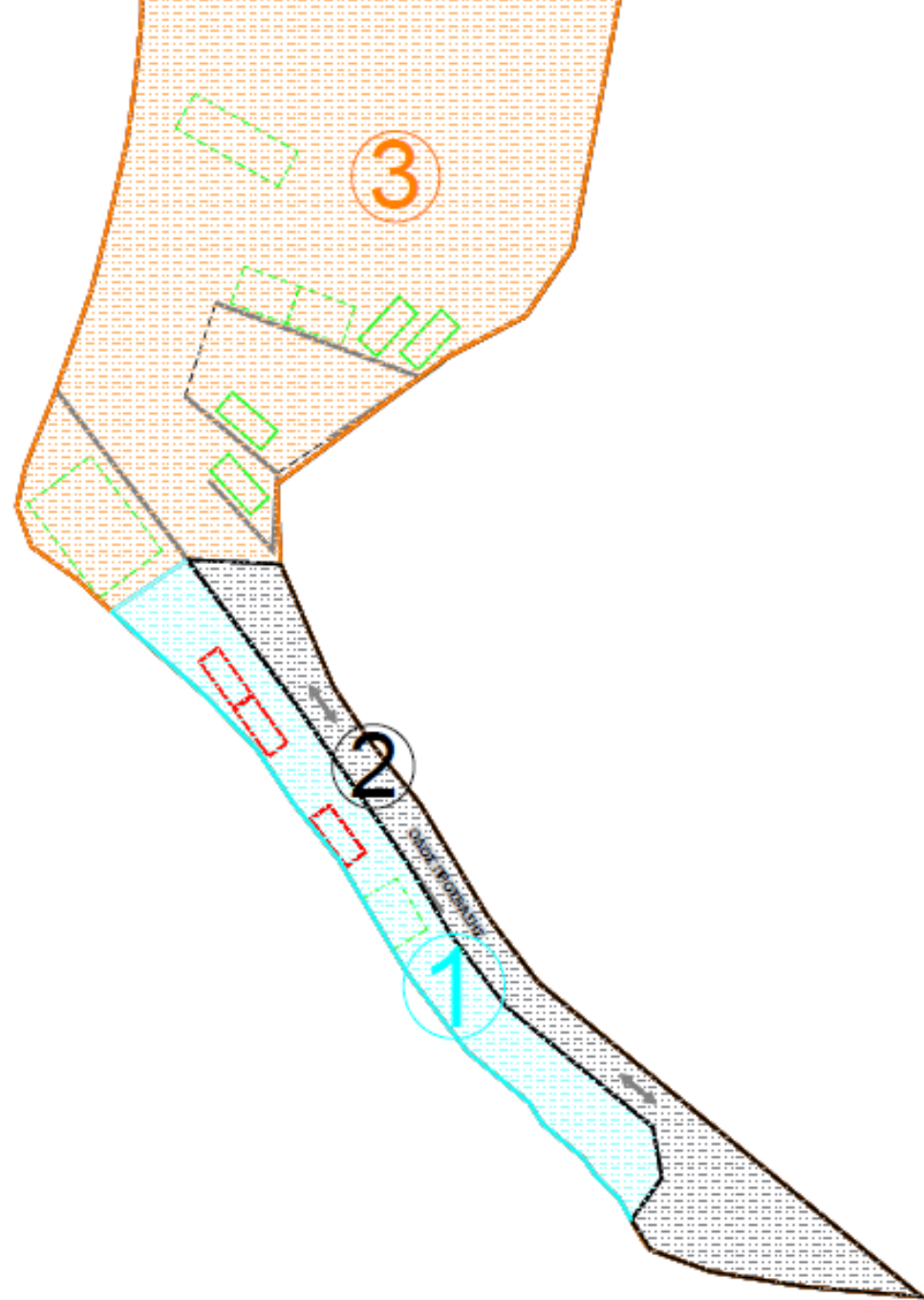


Collection & transfer | Bulky metal



Collection & transfer | Wood





Equipment

- Separation
- Storage
- Loading
- Volume reduction
- Working space





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