



TECHNICAL UNIVERSITY OF CRETE (TUC)
SCHOOL OF ENVIRONMENTAL ENGINEERING
RENEWABLE AND SUSTAINABLE ENERGY
SYSTEMS LABORATORY



THE GOZO BUSINESS CHAMBER



MINISTRY FOR GOZO

The Digital Transformation of European Islands
INSULEUR Forum, 25 October 2019, Mgarr Gozo

Insularity, Digitalisation and Energy Transition, Opportunities and Challenges

Professor Theocharis Tsoutsos
Director, Renewable & Sustainable Energy Lab



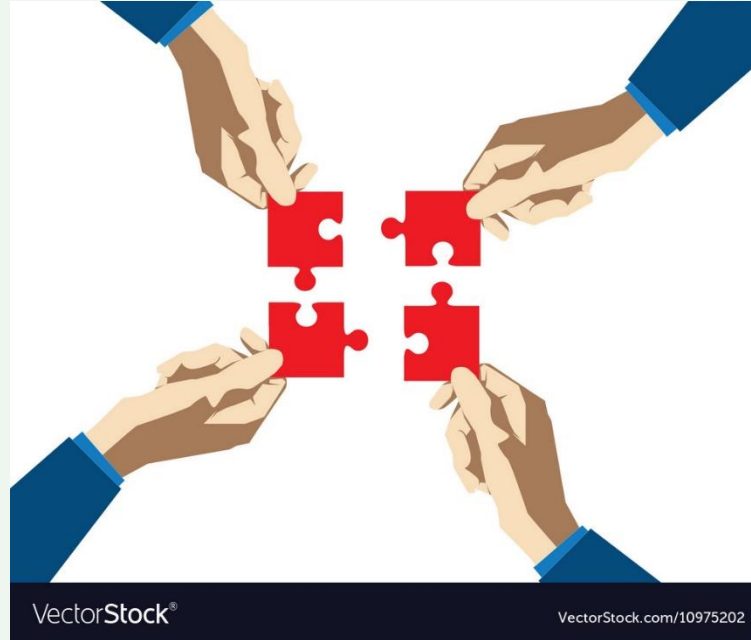
Critical Challenges of our islands

- Islands need high quality, **sustainable environments** desired by tourists
- The **seasonal fluctuation** (winter/summer), impacts to the design of their necessary **infrastructure** (ports, roads, energy supply systems)
- Energy use, space use, road safety, air quality and noise pollution
- To comply with the most recent directives of the Clean Energy Package, they are **missing capacity, resources and society preparation** for these changes.
- The tourism sector is composed of **SMEs and family businesses**, so the understanding and/or responding to sustainable mobility and energy directives is rather complex.



ENERGY TRANSITION

DIGITILISATION



ECONOMY

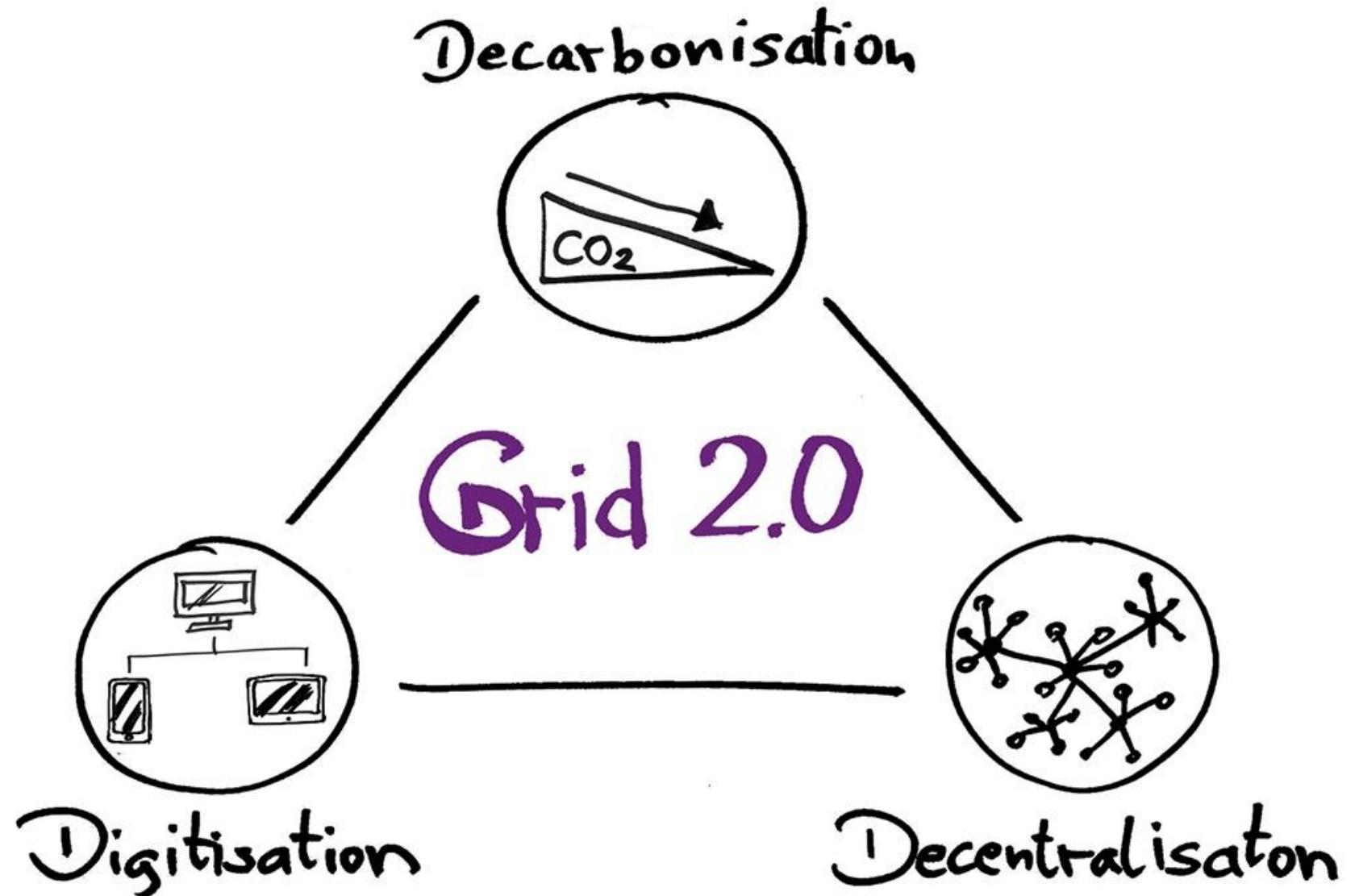
ENVIRONMENT

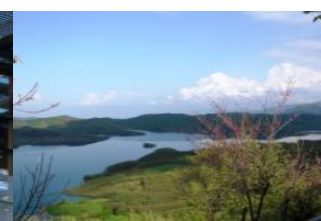
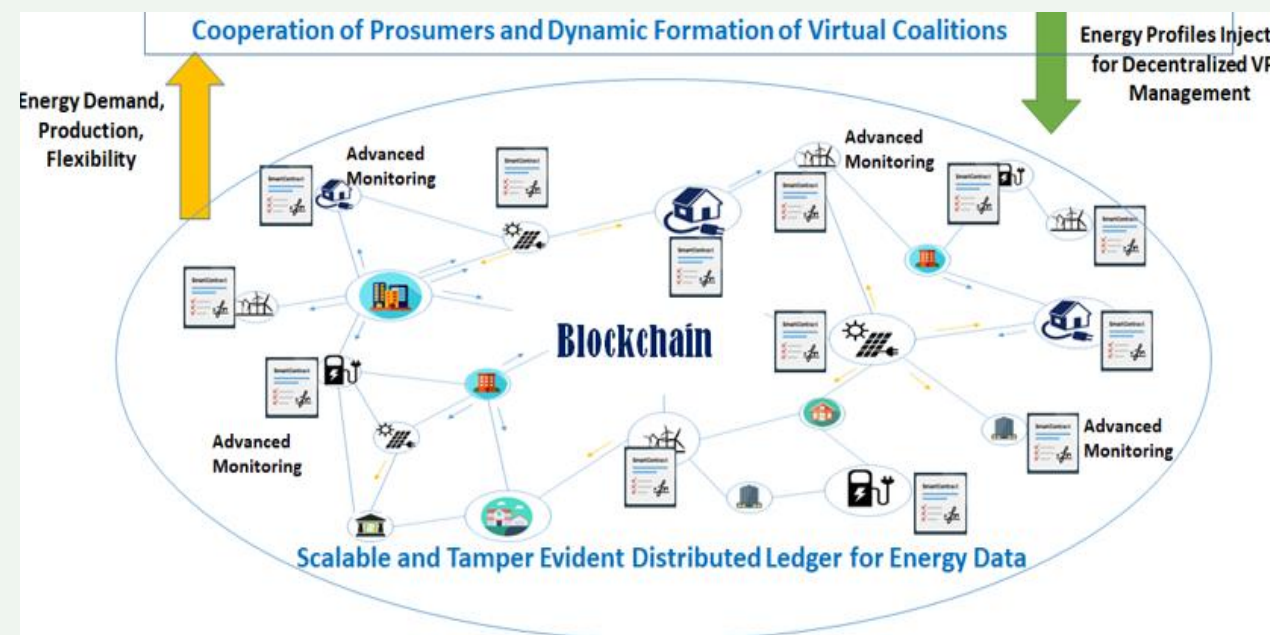
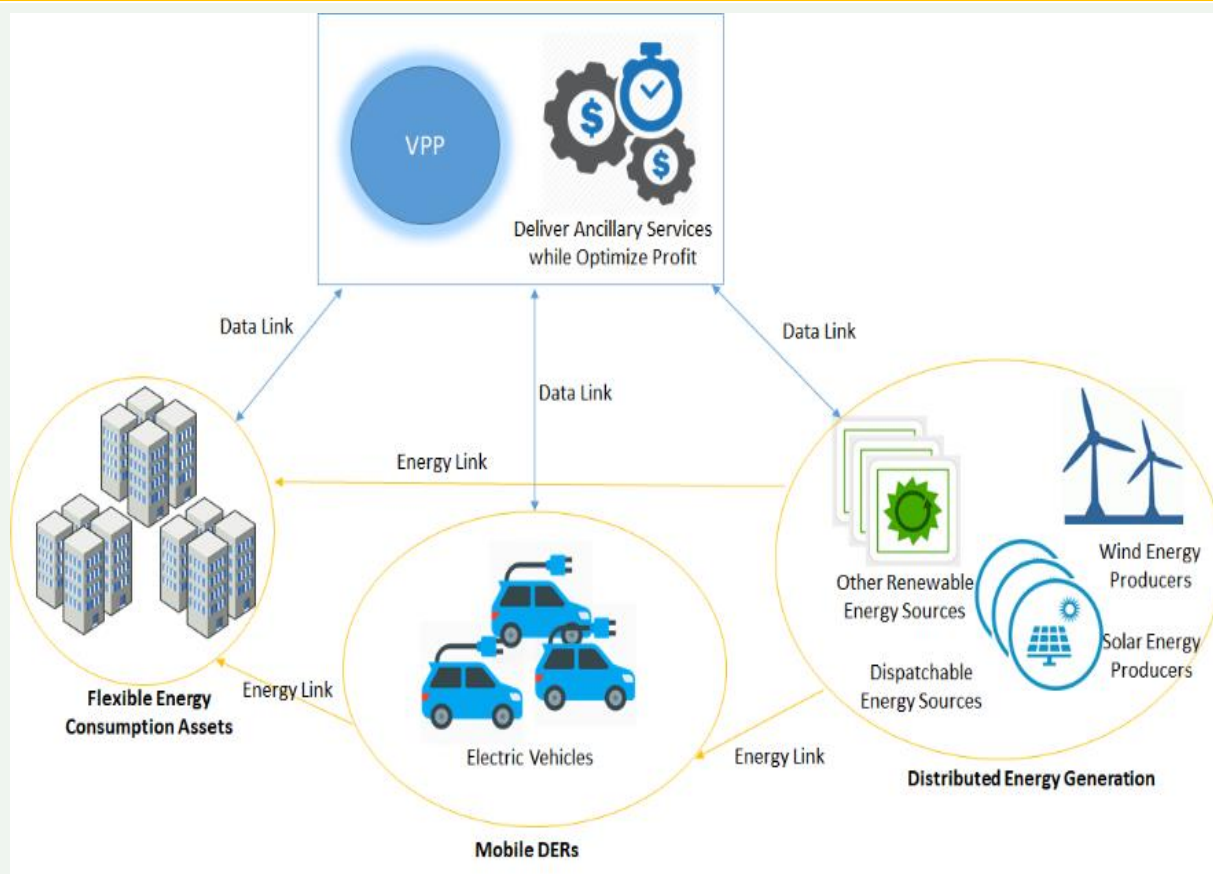


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Credits:
<https://www.energy-storage.news>







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Summertime expectations



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ISLANDS CANNOT IGNORE DIGITILIZATION

- Digitalization “happens” **everywhere** with positive and negative effects
- **Rejecting or denying** it may come at high costs
- Digital technologies offer **new tools and answers** to address insular issues;
- Digital technologies bring a lot of **new and unpredictable challenges**;
- Digital technologies raise several **new ethical questions** regarding privacy, safety and security;
- legal and institutional systems are not prepared for the digital age (i.e. “grey areas” like AirBnB or Uber).





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Examples from ReSEL experience



RESEL-TUC Policy & Research Areas



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Sustainable Energy Policy & Planning

- Regional/local energy planning
- Renewables and environment
- Life Cycle Assessment
- Technology Transfer

RES Technologies

- Sustainable siting
- Design & Testing
- Environmental Impact Assessment
- Sustainability Analysis

Sustainable Mobility

- Urban environmental monitoring
- E-mobility EIA
- School Campaigns

Sustainable Building

- Sustainable Building Design
- Energy audits
- RES Integration
- Phase Changing Materials

Biomass – Biofuels

- Exploitation of agrofood residues
- Production of liquid biofuels
- Biofuel heating of buildings
- Potential assessment

Capacity Building & Training

- Development of Professional Training courses
- Defining professional frameworks, developing training methodologies



CIVITAS DESTINATIONS

29 συνεργαζόμενοι φορείς

- 6 insular areas
- 1,2 million citizens
- 6 million tourists



Follower cities (China):

**Beijing, Shenzhen,
Xiamen, Zhangjiakou**



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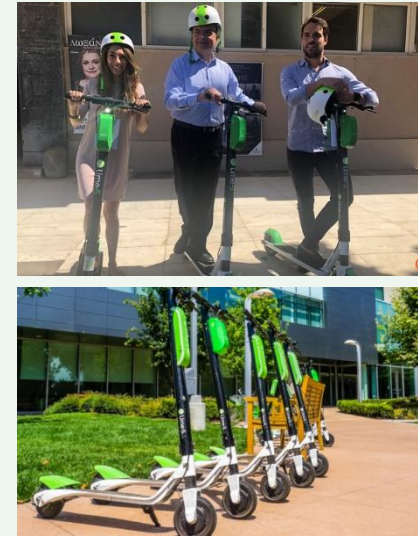
Electric Bikes and Scooters

Las Palmas, Gran Canaria



- ✓ 375 smart bikes, 2 for physical impaired, 20 e-bikes
- ✓ New tariffs available, software, security systems
- ✓ Service accessible through integrated smart card or App – digital kiosks and Mobility App
- ✓ 16.000 registered users
- ✓ 176.000 trips in 1 year, 22 min average bike trip
- ✓ 170.000 kg CO₂ saving

Rethymno, Crete



- ✓ First dockless e-Scooters sharing system in island
- ✓ 300 e-scooters
- ✓ Cooperation between public/private sector
- ✓ Promotional campaign and events



Electric Bikes

Limassol, Cyprus



- Bike rental companies introduce 20 new e-bikes
- New bike stations in historical centre – designated circular routes visiting landmarks with e-bikes.
- Audio guide app for landmarks information in 5 languages
- E-mobility campaigns, advertorials, electronic advertisements, competitions, promotional material

Malta

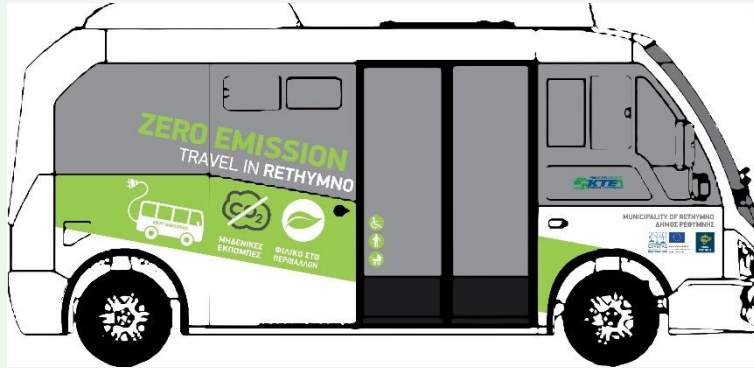


- Information and Awareness Bike and Car sharing Campaign;
- Events at University and primary schools;
- Promotion and interviews at national television, radio and billboards.



Electric vehicles in public fleets

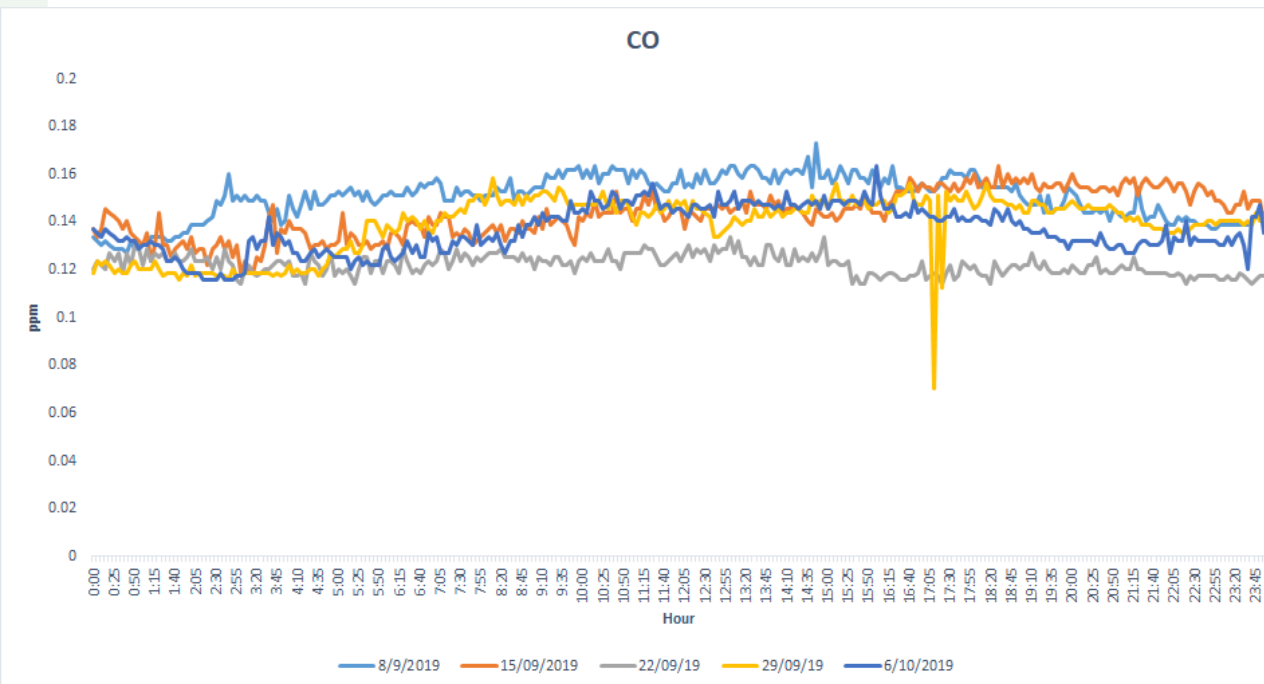
Rethymno, Crete



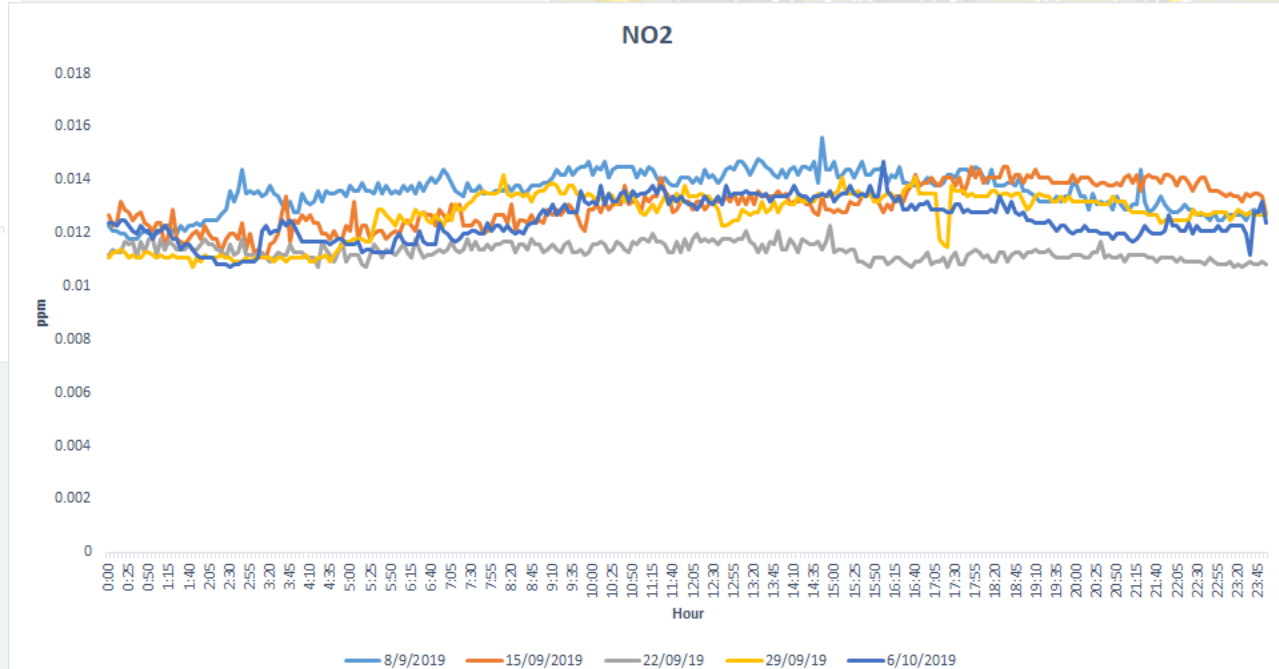
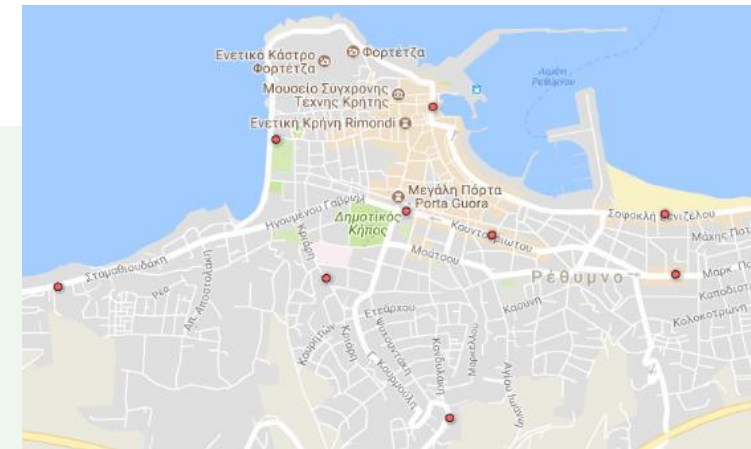
- First clean vehicles in municipal and PT fleets
- e-car used in the Municipal Technical Services fleet
- e-bus, accessible to all, is serving a new pilot route across to the city beach (3.5 km)
- Dedicated signage on the e-vehicles and bus stops
- Promotional campaign to promote e-mobility to residents and visitors



Environmental Monitoring System, Rethymno, Crete



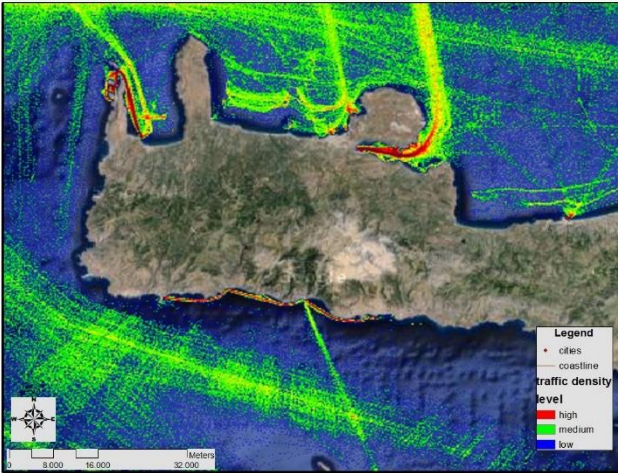
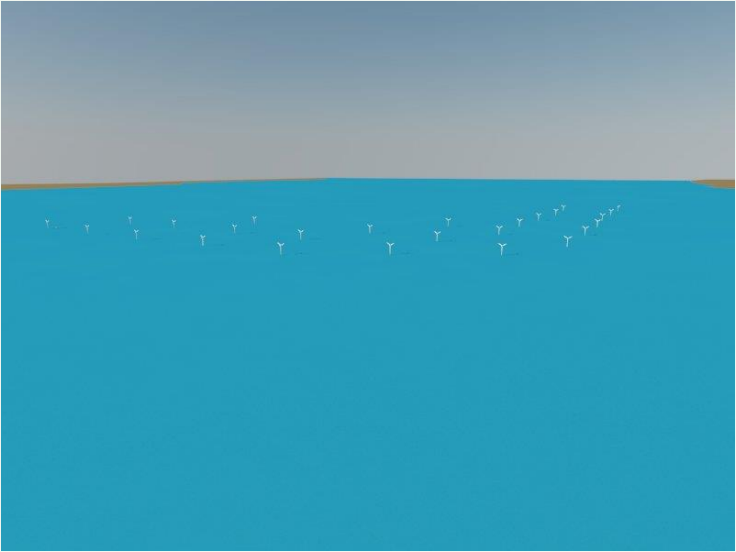
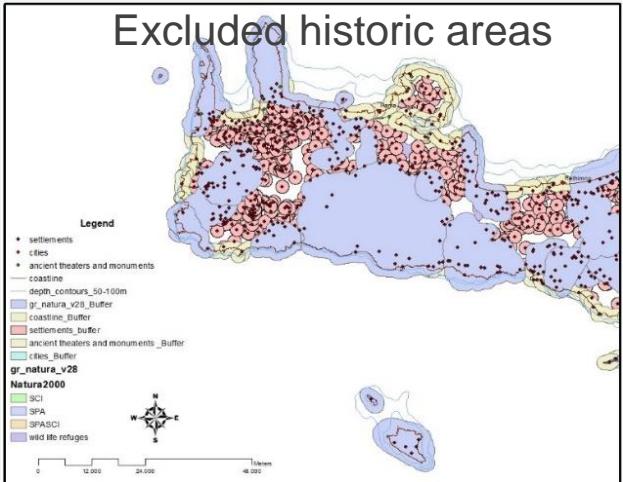
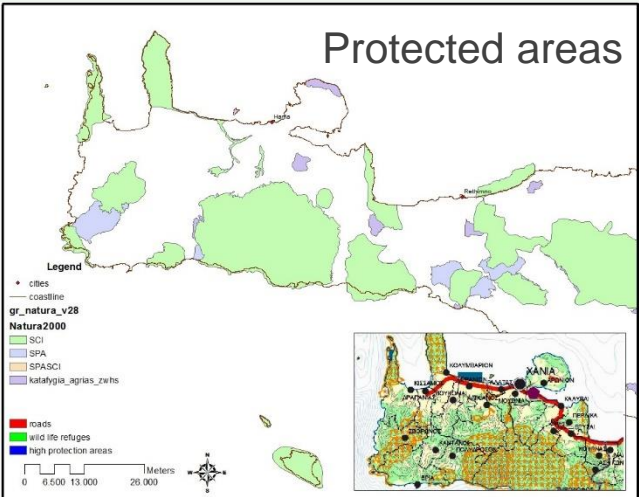
Car free day, Rethymno



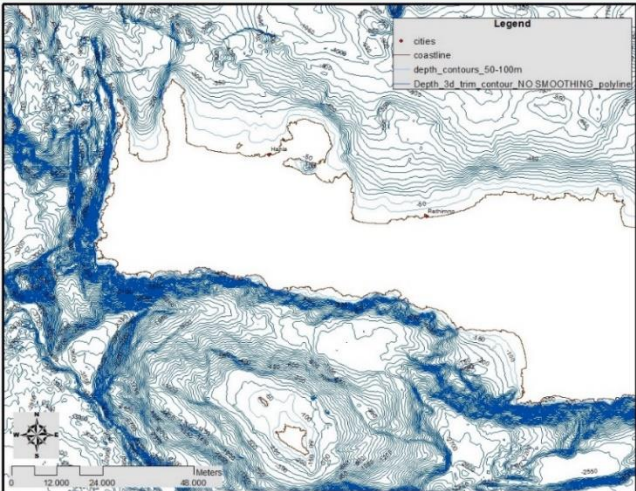
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Sustainable siting of off-shore Wind Park in Crete



Sea transport



Isobath

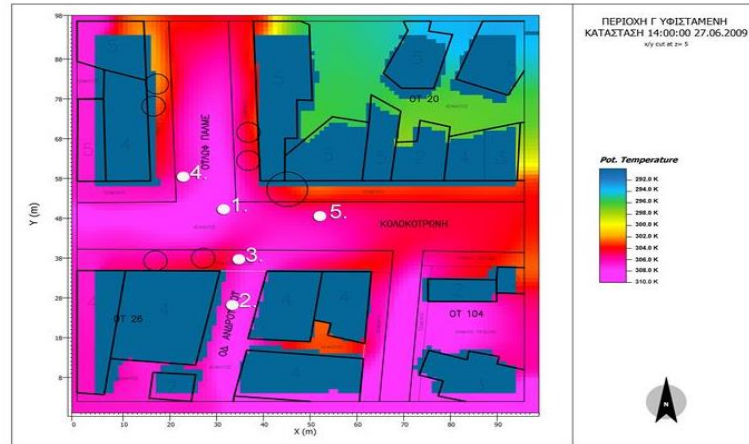


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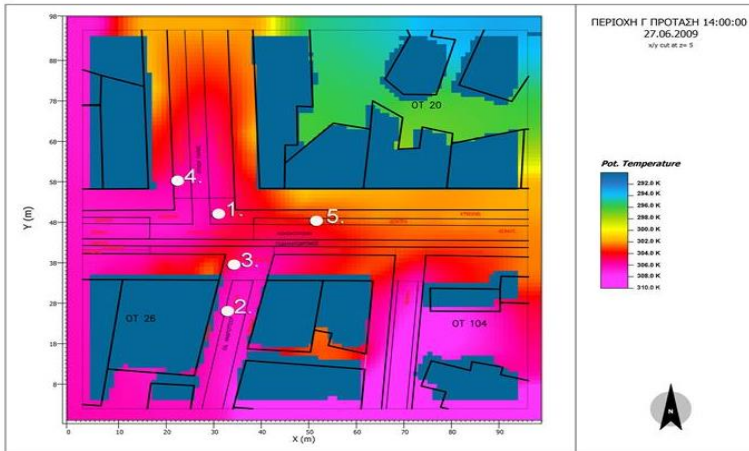


Bioclimatic design of open spaces

ΘΕΡΜΟΚΡΑΣΙΑ ΥΦΙΣΤΑΜΕΝΗΣ ΚΑΤΑΣΤΑΣΗΣ



ΘΕΡΜΟΚΡΑΣΙΑ ΠΡΟΤΑΣΗΣ



ΠΕΡΙΟΧΗ Γ (14:00)

ΣΥΓΚΡΙΣΗ ΑΠΟΤΕΛΕΣΜΑΤΩΝ ΠΡΟΣΟΜΟΙΩΣΕΩΝ

ΗΛΙΑΣΜΟΣ

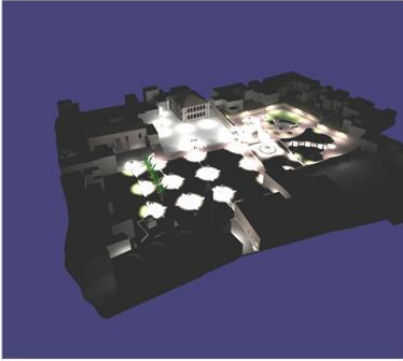


14:00		ΥΦΙΣΤΑΜΕΝΗ ΚΑΤΑΣΤΑΣΗ			ΠΡΟΤΑΣΗ		
ΣΗΜΕΙΟ	ΗΛΙΑΣΜΟΣ	ΥΛΙΚΟ	ΘΕΡΜΟΚΤΑΣΙΑ ΠΕΡΙΒΑΛ. (Pot Temperature)	ΘΕΡΜΙΚΗ ΑΝΕΣΗ (PMV)	ΥΛΙΚΟ	ΘΕΡΜΟΚΤΑΣΙΑ ΠΕΡΙΒΑΛ. (Pot Temperature)	ΘΕΡΜΙΚΗ ΑΝΕΣΗ (PMV)
1.	ΝΑΙ	ΑΣΦΑΛΤΟΣ	35 οC	5,5	ΚΥΒΟΛΙΘΟΣ	31οC	5
2.	ΌΧΙ	ΑΣΦΑΛΤΟΣ	34οC	4	ΚΥΒΟΛΙΘΟΣ	33,5οC	3,5
3.	ΌΧΙ	ΤΣΙΜΕΝΤΟ	32οC	4	ΨΥΧΡΟΣ ΚΥΒΟΛΙΘΟΣ	30οC	3,5
4.	ΝΑΙ	ΑΣΦΑΛΤΟΣ	33οC	5,5	ΓΡΑΝΙΤΗΣ	32οC	5,5
5.	ΝΑΙ	ΑΣΦΑΛΤΟΣ	31οC	5,5	ΠΡΑΣΙΝΟ-ΔΕΝΤΡΑ	30οC	3

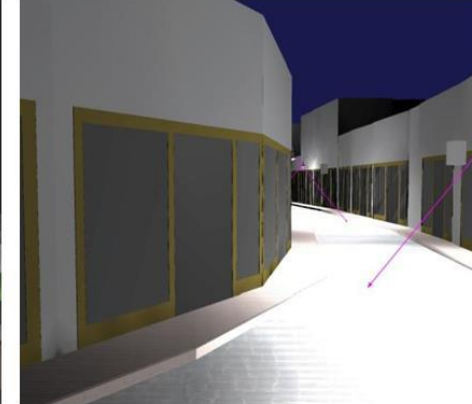
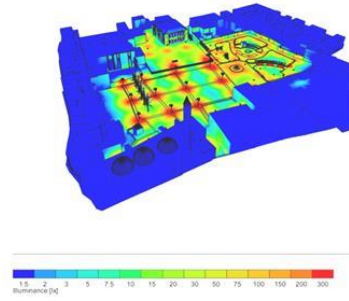


Energy improvement of public lighting in the historic centre, Rethymno

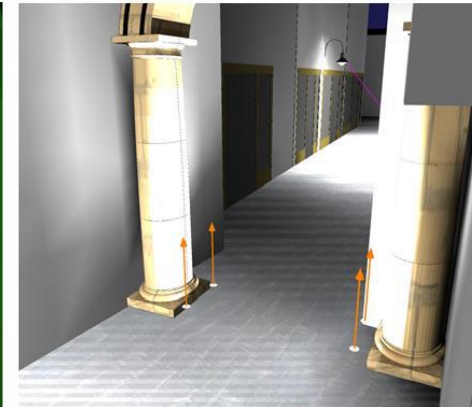
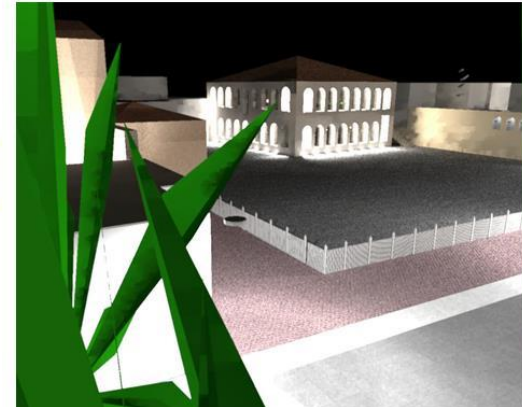
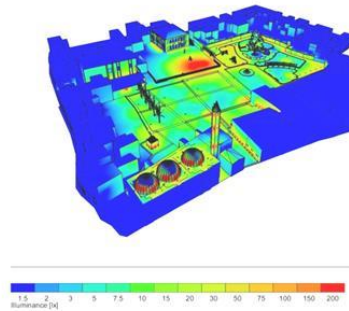
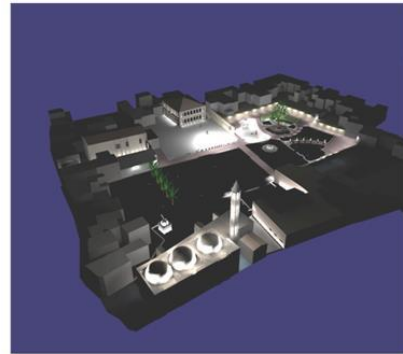
Mikrasiaton square



Current situation



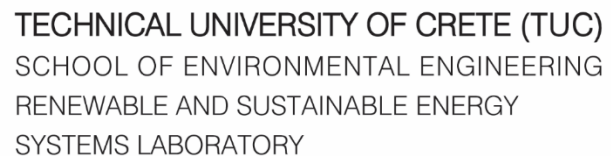
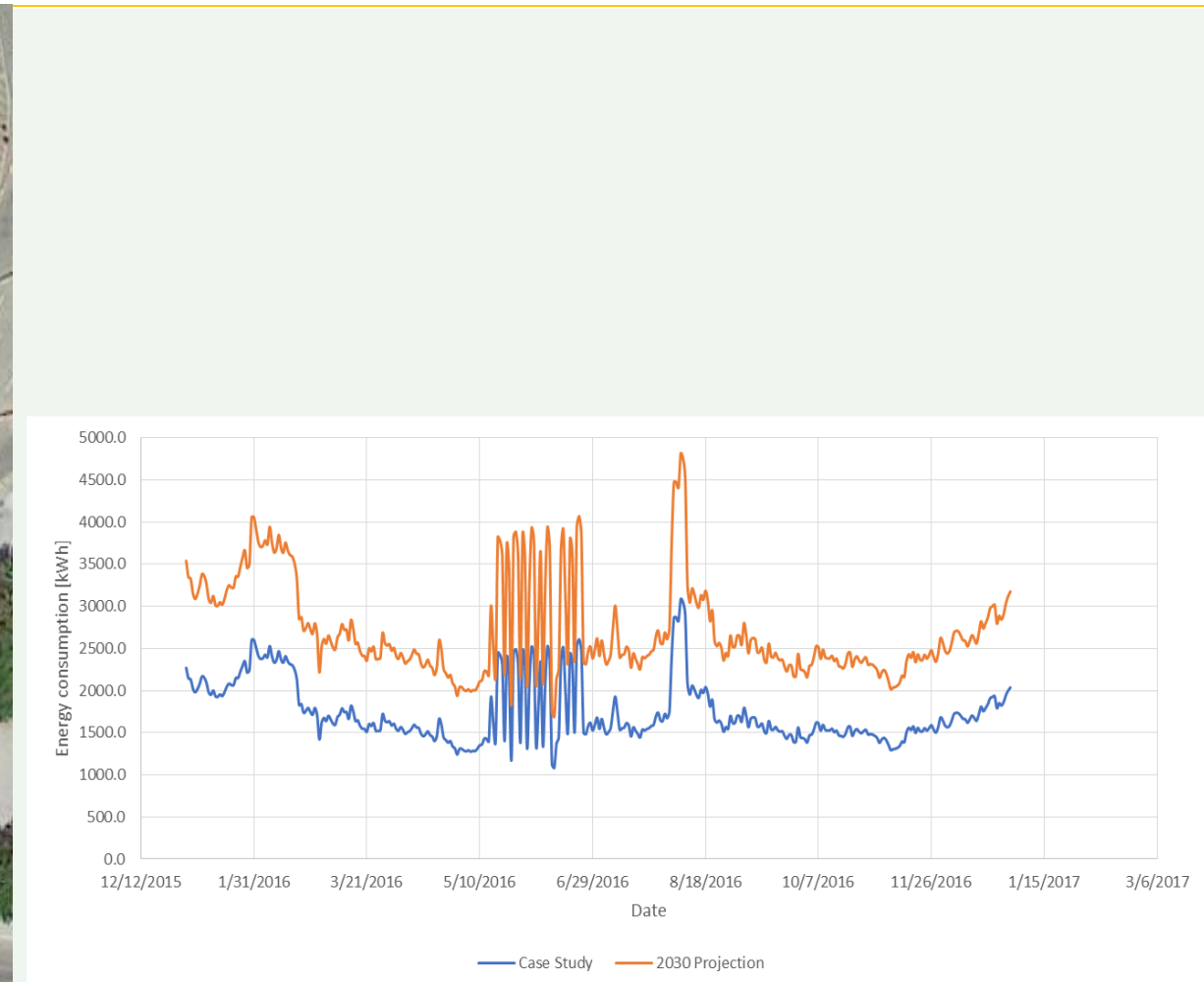
Proposal



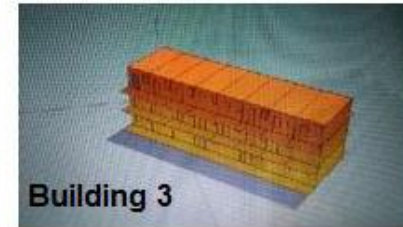
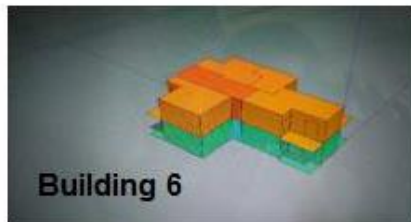
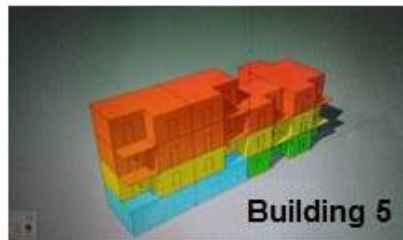
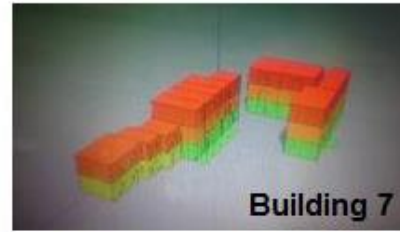
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An aerial photograph of a parking lot layout, overlaid with a 3D perspective rendering of the parking spaces. The parking spaces are colored in a light blue/purple hue. The layout is irregular, following the shape of the lot. Numerous dimensions are labeled in black boxes with white text, indicating the length and width of various sections and aisles. The dimensions include: 7.4 m, 5.6 m, 53.5 m, 65.1 m, 53.9 m, 64.8 m, 67.8 m, 36.8 m, 37.9 m, 37.6 m, 22.6 m, 57 m, 37.2 m, 11.7 m, 53.2 m, 31.0 m, 8.2 m, 6.5 m, 33.3 m, 41.7 m, 47.5 m, 11.6 m, 15.1 m, and 11.9 m. The parking lot is bordered by a dark green area (possibly a field or forest) on the left and a paved road with some vehicles on the right. There are also some trees and a small building visible in the bottom right corner.



DYNAMIC THERMAL SIMULATION



GREPCon TOOL THE APPROACH

*Identification of standardised energy
efficiency measures scenarios*



*Feasibility assessment
Profitability projection
Risk assessment*





SUSTAINABLE ENERGY PLANNING TOOLBOX

Interactive methodology graphic to access each step



1. Choosing a problem



Introduction

Local communities often struggle to implement Renewable Energy Sources (RES) or Energy Efficiency (EE) projects in a holistic way, considering not only technological aspects, but also their socio-economic impact in the local environment, and therefore they miss on important development opportunities. Bottom-up approaches, connecting stakeholders, who co-develop the project and can provide know-how and experiences, can assist in successful planning, implementation and wider acceptance of an energy related project, in the local environment.

This step aims to identify the priority RES and EE projects, which will contribute most to the local community's socio-economic and technological development. Fundamental actions to identify the most suitable projects for the local conditions and priorities, include:

- ✓ this will help to assess the areas and opportunities of minimising an existing environmental burden;
- ✓ estimation of the expected impact on the local economy and on the wider adoption of energy efficiency and RES solutions, through dissemination to the habitants and local stakeholders;
- ✓ recognition of potential challenges, synergies and opportunities for efficient implementation.
- ✓ preliminary analysis of the local community's energy needs;
- ✓ identification of the current state of the local environment,
- ✓ including the estimation of the local RES or EE potential;

Find more on how to [identify the local energy needs](#) and to [estimate the local RES or EE potential](#).

Local energy planning steps

1. Choosing a problem	▼
➤ Identifying the local energy needs	
➤ Estimating the local RES or EE potential	
2. Creating Local Action Group	▼
➤ Identifying potential actors	
➤ Engaging local stakeholders	
3. Local Action Plan	▼
➤ RES or EE measures planning	
4. Creating Local Partnerships	▼
➤ Developing a detailed financial plan	
5. Implementation procedures	▼
➤ Turning ideas into reality	
6. Monitoring & Evaluation	▼
➤ Choosing the appropriate set of impact indicators	
➤ Environment indicators	
➤ Energy indicators	
➤ Economy indicators	
➤ Social capital indicators	

Community empowerment horizontal steps

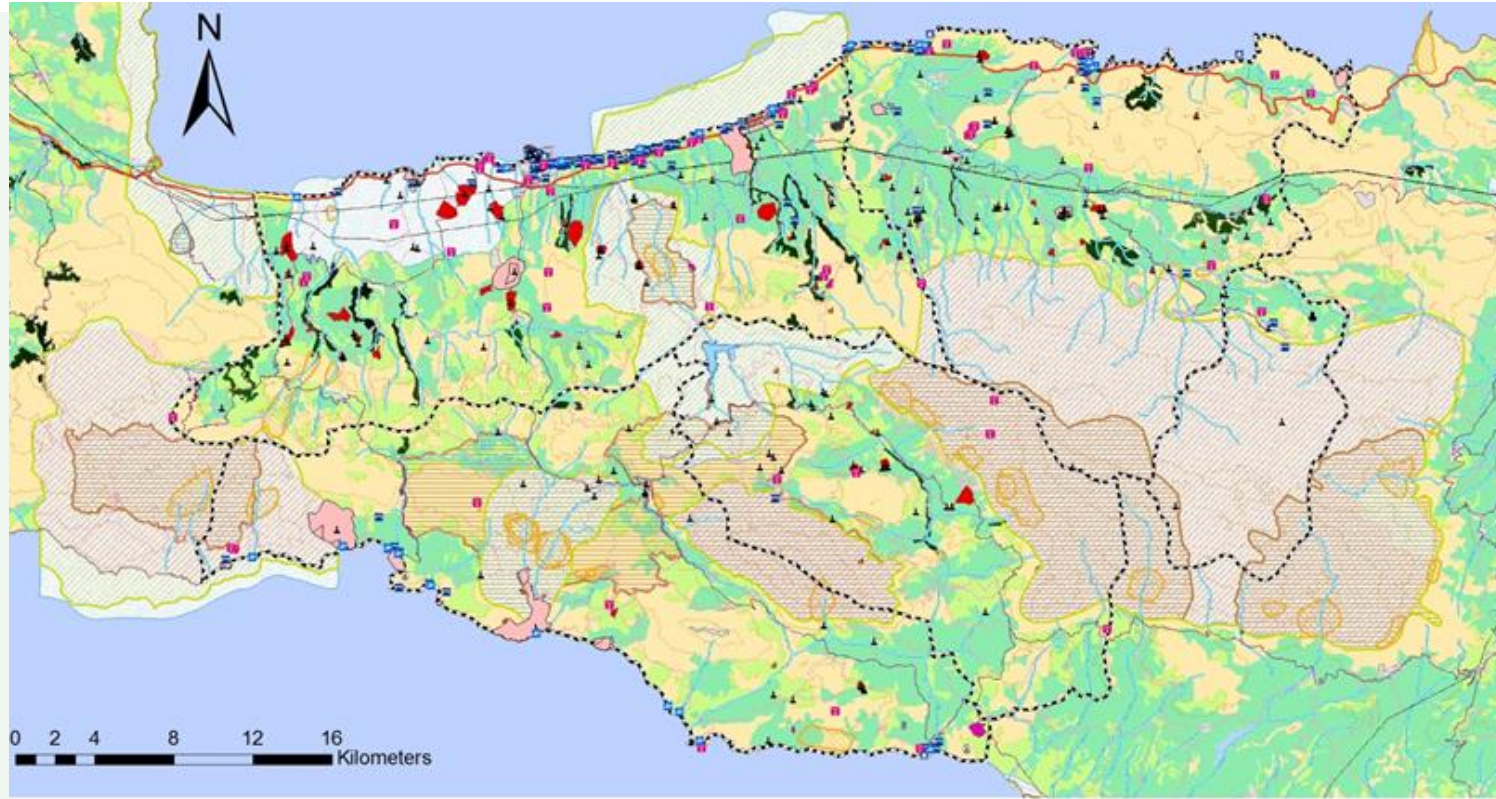
A. Empowering local skills and policies	▼
➤ Training workshops and materials	
B. Awareness raising	▼
➤ Implementing awareness raising campaigns	

Side navigation menu to browse steps



Fostering local investments of small scale RES

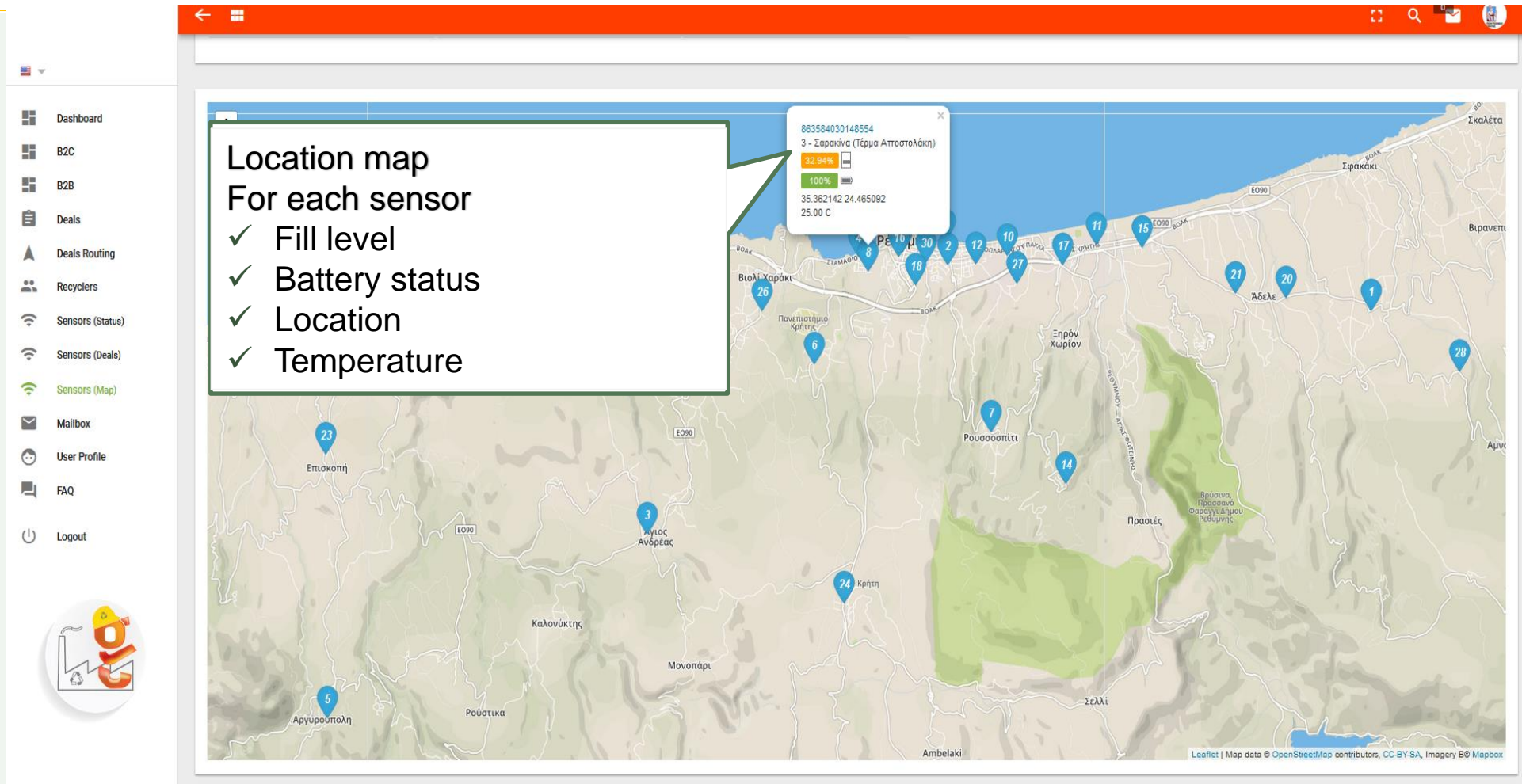
RES Sustainable Siting Toolbox



- Replicable methodology using GIS & multi-criteria analysis to identify and access the optimum areas for RES applications siting.



Smart UCO bins locations monitored through a web platform - Sensors' map



- Smart Used Cooking Oil system (UCO to biodiesel)-Rethymno



- Dashboard
- B2C
- B2B
- Deals
- Deals Routing
- Recyclers
- Sensors (Status)
- Sensors (Deals)
- Sensors (Map)
- Mailbox
- User Profile
- FAQ

IMEI	Sensor Name	Recycler	Fullness	Battery Level	Value	Material
860719027628654	20 - Λούτρα	20 - Λούτρα	80.00%	100%	34	Τηγανέλαιο
865691035514454	15 - Παρκινγκ Συνατσάκη	15 - Παρκινγκ Συνατσάκη	37.27%	100%	81	Τηγανέλαιο
865691035544956	23 - Γωνιά (Αθάνατος Δημαρχείο)	23 - Γωνιά (Αθάνατος Δημαρχείο)	77.27%	43%	37	Τηγανέλαιο
865691033278631	02 - Κουμπές	2 - Κουμπές	80.91%	100%	33	Τηγανέλαιο
865691033279209	26 - Αργυρούπολη	26 - Αργυρούπολη	39.09%	100%	79	Τηγανέλαιο
865691035554781	18 - Γάλλου	18 - Γάλλου	51.82%	100%	65	Τηγανέλαιο
865691035512789	28 - Ρουσοσπίτι	28 - Ρουσοσπίτι	37.27%	100%	81	Τηγανέλαιο
860719026982482	03 - Σαρακίνα (Τέρμα Αποστολάκη)	3 - Σαρακίνα (Τέρμα Αποστολάκη)	61.82%	100%	54	Τηγανέλαιο
865691035512086	01 - Μαρίνα	1 - Μαρίνα	78.18%	100%	36	Τηγανέλαιο
860719027649783	rethimno_10	sensorEnvg_10	78.18%	100%	36	Τηγανέλαιο
865691036066520	13 - Α. Μάχης Κρήτης (Μισίρια)	13 - Α. Μάχης Κρήτης (Μισίρια)	77.27%	100%	37	Τηγανέλαιο
865992034777211	09 - Κολοκοτρώνη (Τέρμα)	9 - Κολοκοτρώνη (Τέρμα)	78.18%	93%	36	Τηγανέλαιο
866029038288470	7 - Περιφερειακός (Ηλιοβασιλέματα)	7 - Περιφερειακός (Ηλιοβασιλέματα)	50.00%	100%	67	Τηγανέλαιο
865691035676741	29 - Χρωμοναστήρι	29 - Χρωμοναστήρι	80.00%	100%	34	Τηγανέλαιο
865691032833840	14 - Πλατανιάς (LIDL)	14 - Πλατανιάς (LIDL)	80.00%	100%	34	Τηγανέλαιο



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Πίνακας Ελέγχου

B2C

B2B

Συναλλαγές

Δρομολόγηση

Ανακυκλωτές

Αισθητήρες (Κατάσταση)

Αισθητήρες (Συναλλαγές)

Αισθητήρες (Χάρτης)

Μηνύματα

Προφίλ Χρήστη

Συχνές Ερωτήσεις



Αισθητήρες - Εμφάνιση

Ανακυκλωτής

20 - Λούτρα

IMEI

864764033767936

Τιμή

84

Μπαταρία

100%

Χρήση σε

Υπέργειος

Κατάσταση

Ενεργό

Τοποθεσία

35.355659 24.584978

Αρχική τοποθεσία

35.355550 24.584910

Θερμοκρασία

19.00 C

Δημιουργήθηκε

2018-07-02 19:40:29

Ενημερώθηκε

2019-10-02 23:01:21

ΕΠΙΣΤΡΟΦΗ ΣΤΗΝ ΛΙΣΤΑ

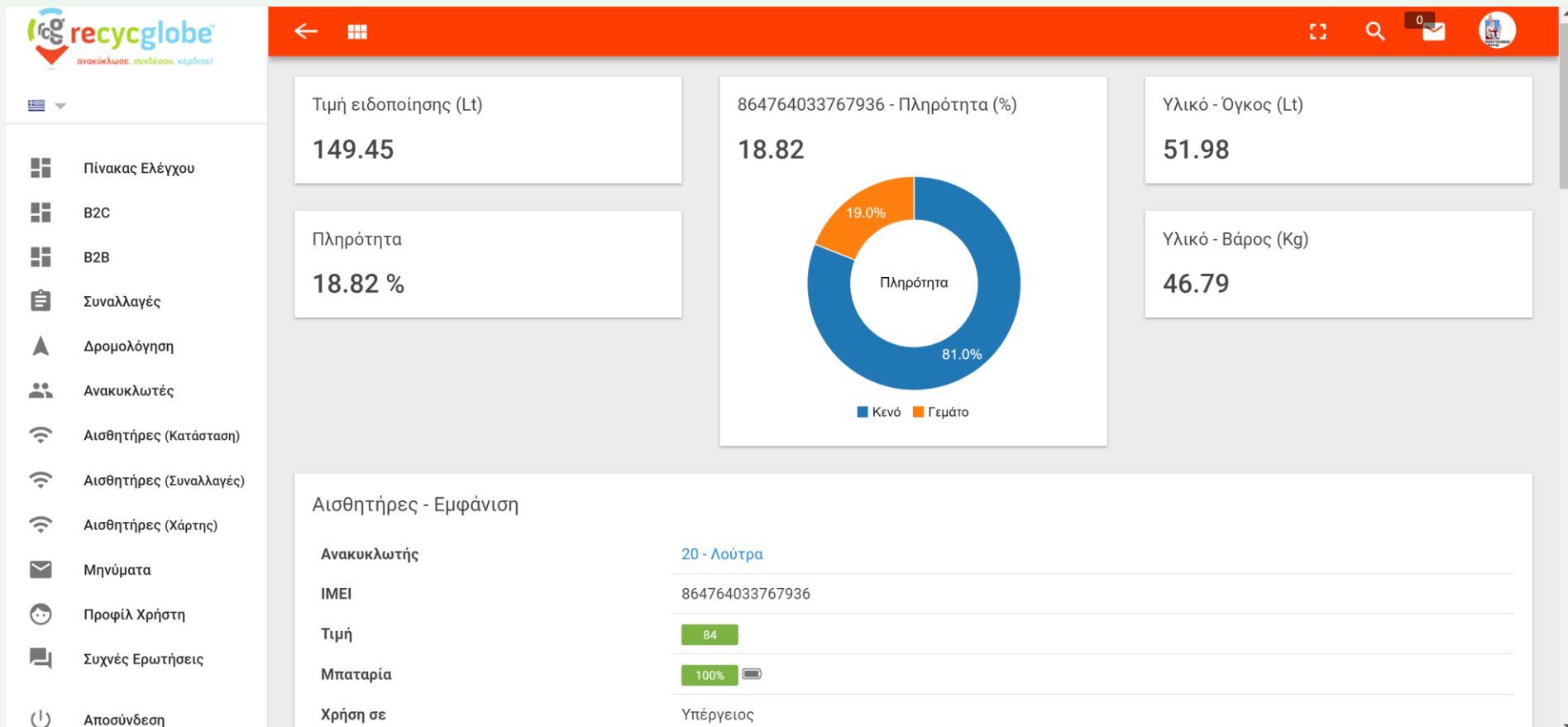
ΕΠΕΞΕΡΓΑΣΙΑ



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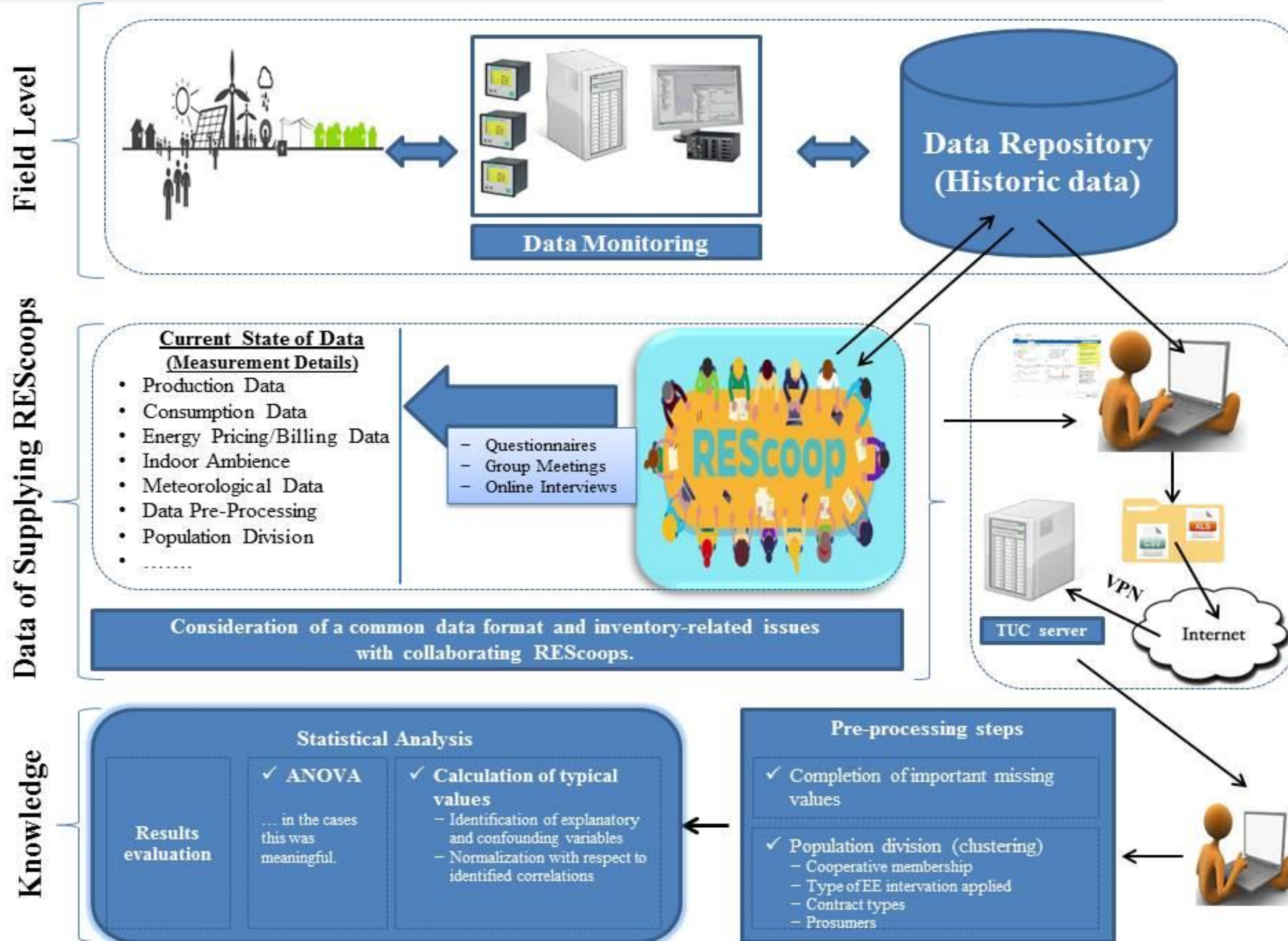




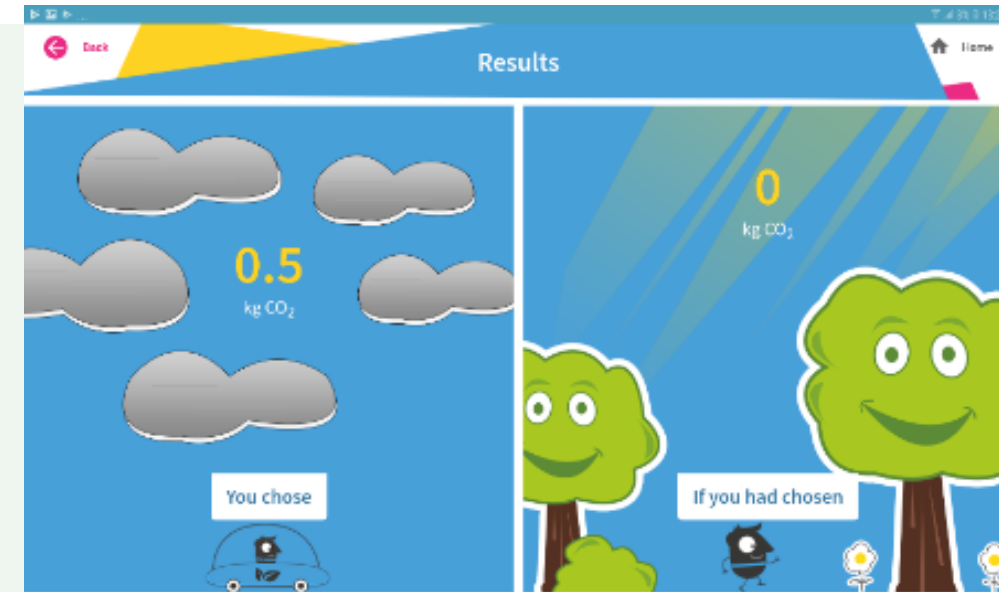
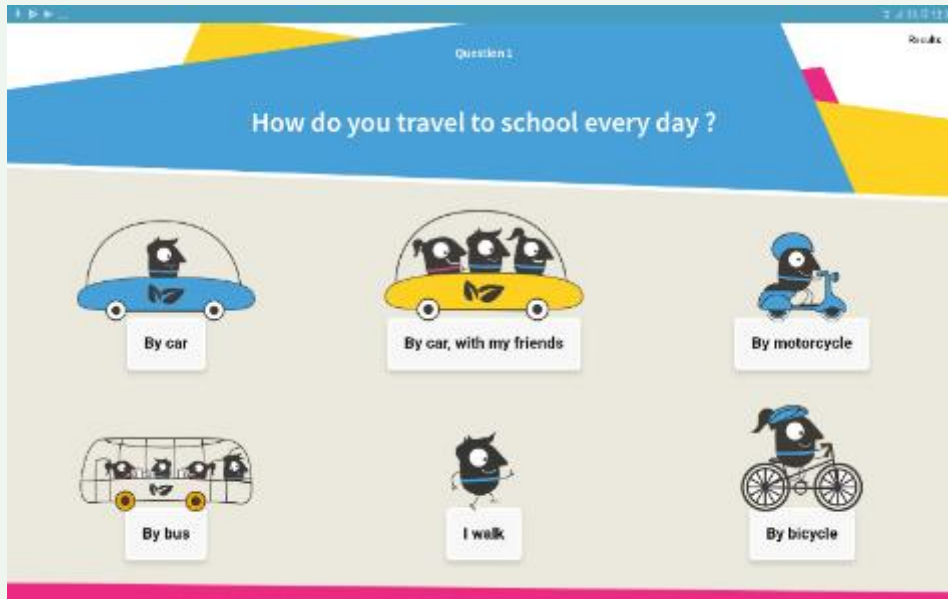
Energy Communities methodology for 6 EU Countries



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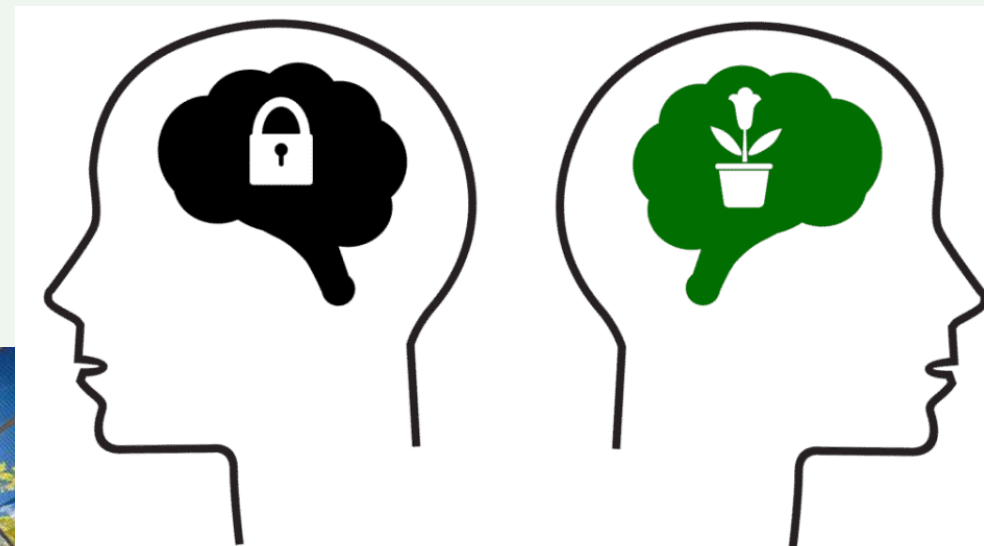


Ecological assessment of transport to school/work, app



CONCLUSION

- **digitalisation is not the same as automation**
- digitalisation is **not about reducing headcount or destroying jobs**
- islands and businesses need to adapt or die
- Islands and the business community should adapt. If not SMEs will go out of business and jobs will be lost
- Digitalisation creates business opportunities



Thank you!

Grazzi

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