

RE-EMPOWERED

Renewable **E**nergy **EMPOWERING** **E**uropean and **INDIAN** communities

“Renewable Energy EMPOWERING European and INDIAN communities”

*Integrated local energy systems (Energy islands):
International cooperation with India
LC-SC3-ES-13-2020*

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**European
Commission**

Horizon 2020
European Union funding
for Research & Innovation



Consortium

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European and **InDian** communities

Partners				
European			Indian	
1	ICCS-NTUA (Coordinator)	Greece	8	Indian Institute of Technology Kharagpur (Indian Coordinator)
2	Imperial College London	United Kingdom	9	Indian Institute of Technology Bhubaneswar
3	Danmarks Tekniske Universitet	Denmark	10	CSIR-Central Mechanical Engineering Research Institute
4	Bornholms Varme As	Denmark	11	Lab Concern Ltd. (India)
5	Protasis Sa	Greece	12	Visvesvaraya National Institute of Technology
6	Deloitte Advisory, S.L.	Spain	13	Indian Institute of Science
7	DAFNI	Greece		



Purpose

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The main goal of RE-EMPOWERED is to develop and demonstrate solutions for energy transition of local energy systems based on multi-energy Microgrids, interconnecting multiple energy vectors. The multi-energy structure will be used to optimize their joint operation. The benefits will be demonstrated leading to an increased share of renewable generation and higher energy efficiency of the wider local energy system.

RE-EMPOWERED will develop a **complete set of solutions for local energy systems** that will be demonstrated in four pilot sites, two European and two Indian, complementary in terms of size, organisational and technical maturity.

The solutions will range from **planning tools** for designing or upgrading energy systems, to **control and optimization tools** for the management of microgrids, **interoperable platforms** for the integration of the available energy carriers, the digitization of the system and **advanced hardware infrastructure** for upgrading the local systems.

- 1. ecoEMS:** will be the energy management system responsible for optimizing the performance of large isolated (e.g., non-interconnected islands) or weakly connected systems.
- 2. ecoMicrogrid:** will be responsible for the management and optimization of microgrids.
- 3. ecoPlanning:** will support the planning of rural isolated or weakly interconnected systems, to optimize the installation of a mix of energy technologies aiming to increase renewable generation.
- 4. ecoDR:** will support demand side management via load scheduling and incentive-based demand response with a dynamic pricing scheme.
- 5. ecoPlatform:** will be an interoperable platform for the integration of all developed solutions and will facilitate digitization and interoperability of the local energy systems.
- 6. ecoMonitor:** will include smart sensors that will monitor air and water quality to provide insights regarding possible corrective actions and impact of the RES integration.

- 7. ecoCommunity:** will be the platform dedicated to the energy communities' members and stakeholders aiming to facilitate their active involvement in the energy system.
- 8. ecoResilience:** will develop resilient PV and Wind Turbine assets able to withstand extreme weather conditions, such as cyclones and floods.
- 9. ecoConverter:** will be economically viable modular “plug and play” converter for dc/ac microgrids.
- 10. ecoVehicle:** will be used to electrify and upgrade small vehicles for transport, namely four-wheelers and small boats.

ecoTools – Maturity scale (TRL)

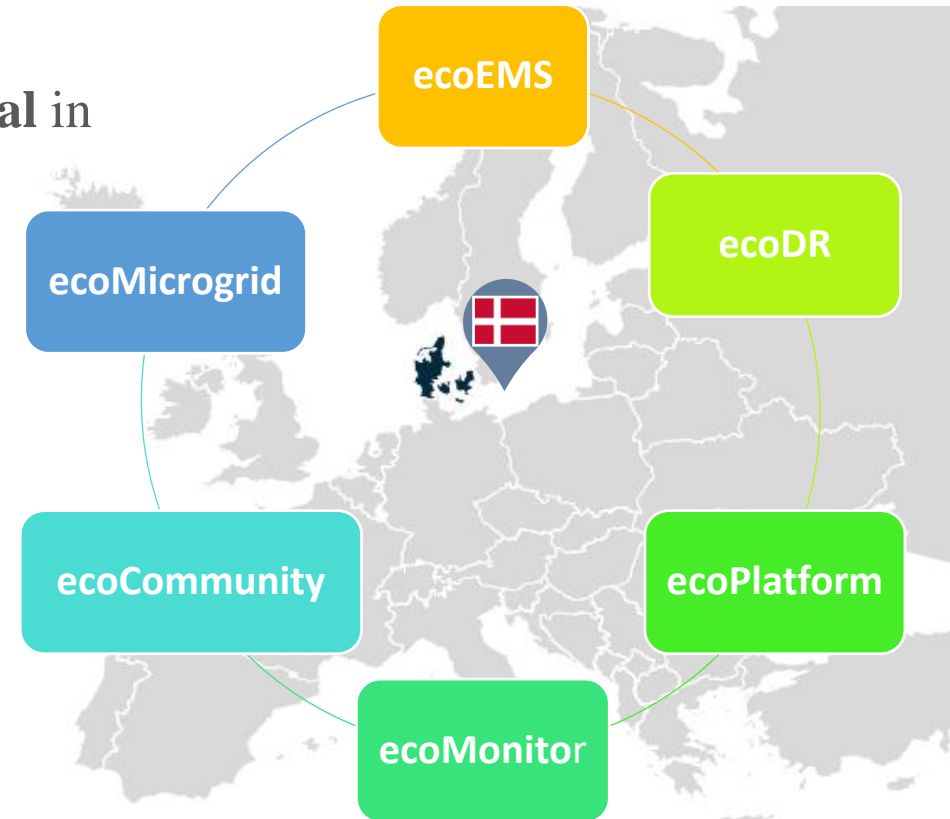
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Solutions	Development stage (TRL)									
	1	2	3	4	5	6	7	8	9	
ecoEMS						→				
ecoMicrogrid					→					
ecoPlanning										
ecoDR						→				
ecoPlatform					→					
ecoConverter					→					
ecoMonitor				→						
ecoCommunity			→							
ecoVehicle					→					
ecoResilience			→							

Demo Site: Bornholm Island, Denmark

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- Embracing green agenda for 30 years aims to become **CO2 neutral** in 2025, and a **zero-emissions** and **climate-friendly community** by 2035
- In 2019 received the RESponsible Island Prize for:
 - ✓ Share of RES produced by innovative energy technologies,
 - ✓ Environmental and socioeconomic sustainability and impact
 - ✓ Citizen and community involvement
 - ✓ Replicability of the solution
- An island experienced on synergies of electricity with other energy carriers, through **RE-EMPOWERED** aims to increase:



Energy efficiency

RES
penetration

Integration of
energy vectors

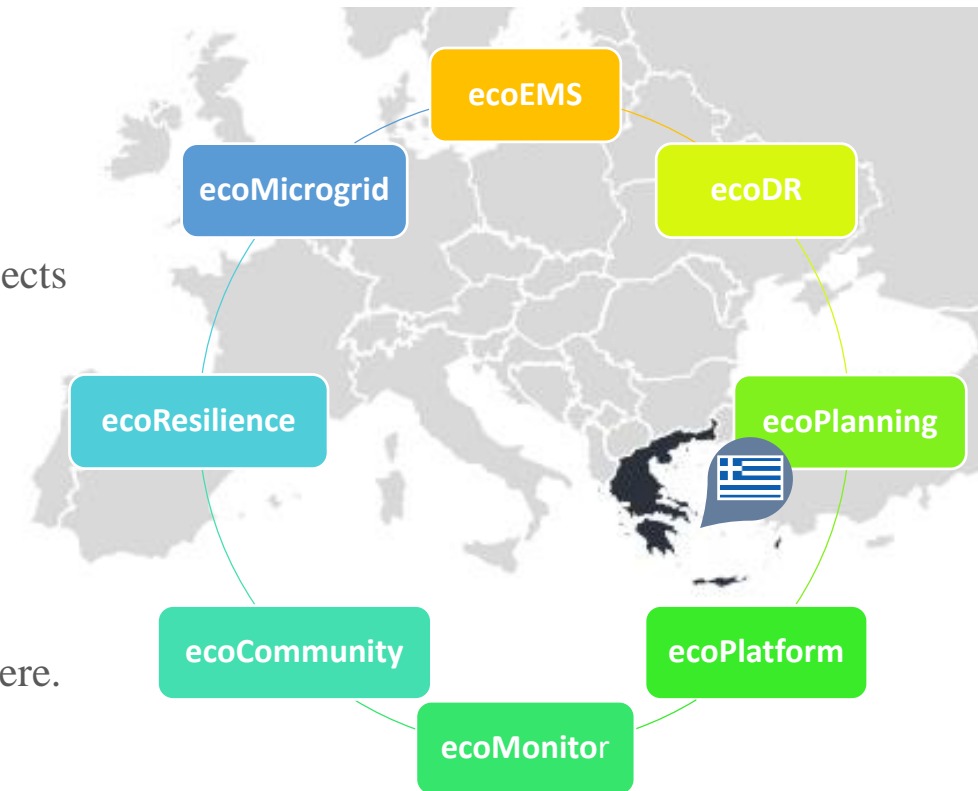
Population
awareness

Customer
engagement

Demo Site: Kythnos Island, Greece

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- Kythnos has a long history in sustainable energy installations.
 - ✓ First wind farm in Europe (1982)
 - ✓ First microgrid in Europe, called Gaidouromadra (2001)
 - ✓ Advanced decentralized DSM techniques demonstrated for first time
 - ✓ Live testbed for smart grid technologies, developed within several European projects
- Based on the past experience and since it is non-interconnected provides an ideal demonstration site.
- **RE-EMPOWERED** will:
 - Accelerate digitization and energy transition of Kythnos
 - Build an economically sustainable and attractive multi-layer architecture
 - Be the prototype, replicable for non-interconnected islands in Greece and elsewhere.



- The above-mentioned will facilitate the main goals, thus to increase:

Energy efficiency

RES penetration

Population awareness

Customer engagement

Demo Site: Ghoramara Island, India

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- Ghoramara is located 92 km south of Kolkata:
 - Residents live in very poor conditions
 - Affected by severe cyclonic storms every 5-10 years
- The area is isolated from the utility grid and the residents mostly use Kerosene-lamps, while some houses roof-top PV panel-based electricity
- Additionally, the area is lacking the supply of pure drinking water
- For transportation purposes, people use paddle-boats
- **RE-EMPOWERED** will:
 - Develop a local microgrid system to cater electricity in Ghoramara
 - Create a sustainable energy community for the island
 - Improve quality-of-life for the people



RES penetration

Quality-of-life

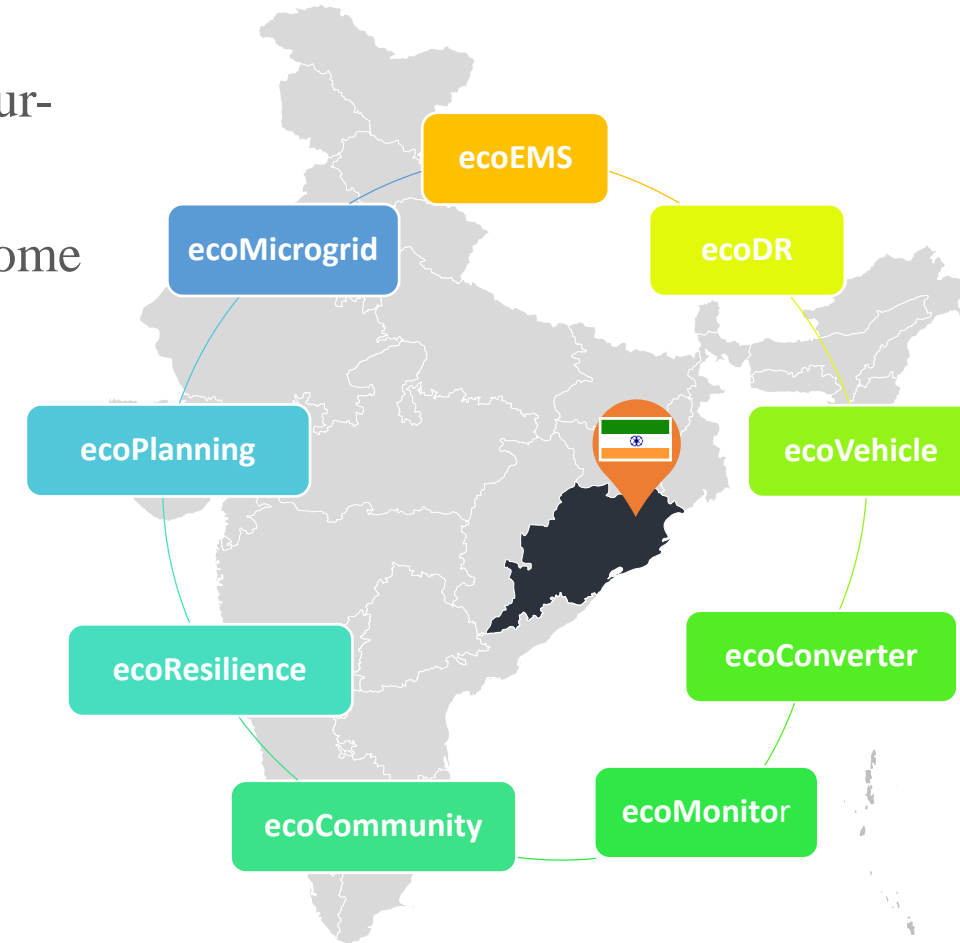
Energy Community

Resilience

Demo Site: Keonjhar, Odisha, India

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- Kanheigola, Nola and Ranipada are small villages in Harichadanpur-Tehsil reserve forest in Keonjhar District of Odisha State
- The villages are not interconnected to main utility grid, but have some basic renewable energy facilities (solar PV and battery backup)
- These will be upgraded and coupled with various available energy vectors
- Moreover, the villages are lacking facilities for water purification
- **RE-EMPOWERED** aims to:
 - Develop, demonstrate various energy vectors integrations
 - Promote off-grid systems for income-generating energy uses in agriculture and small businesses
 - Optimize and efficient operate the off-grid systems



RES penetration

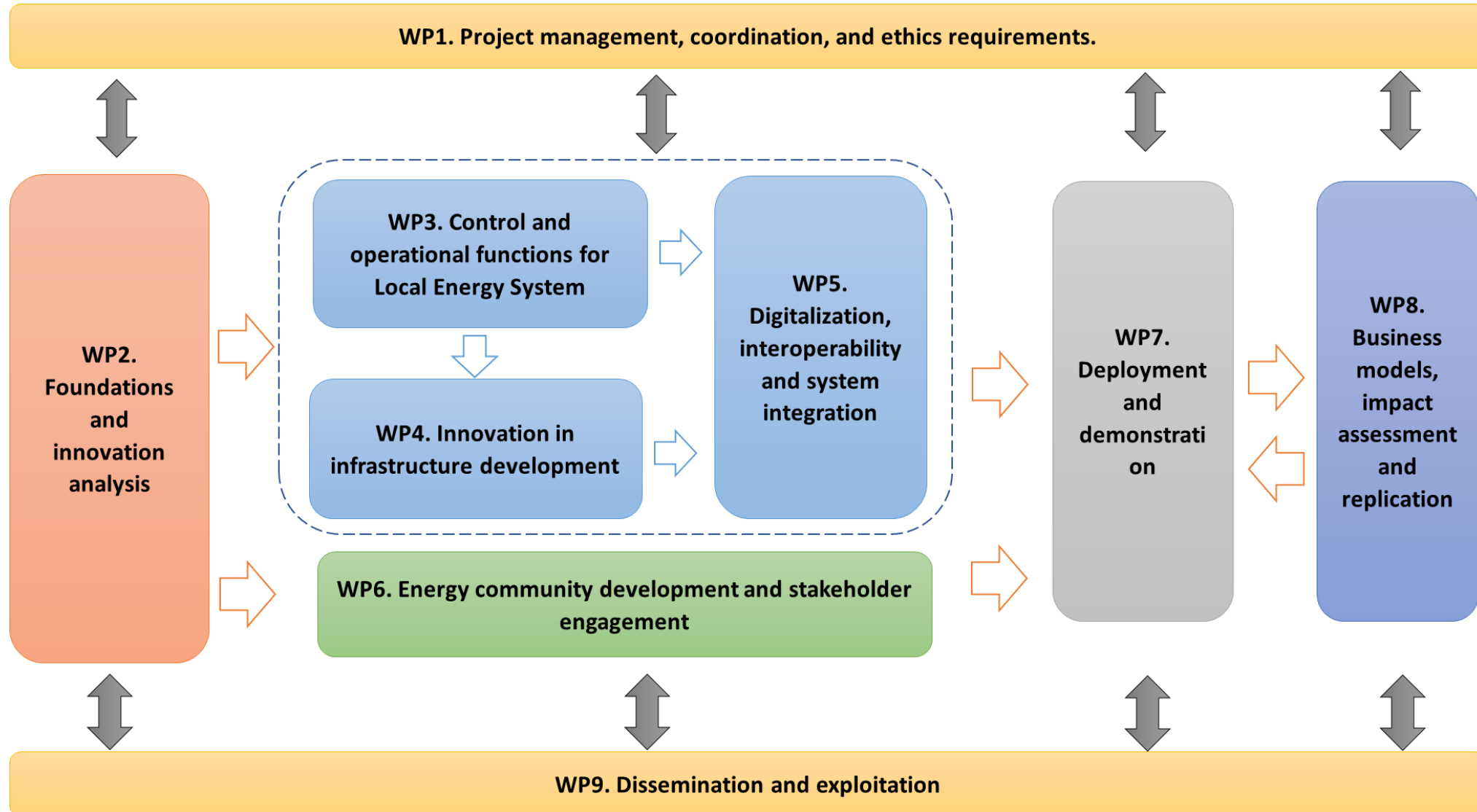
Energy Efficiency

Population awareness

Customer engagement

Work Plan

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Thank you for your attention!

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