DES2iRES: A web-GIS platform to support public authorities and investors in strategic planning of desalination plants powered by Renewable Energy Sources.

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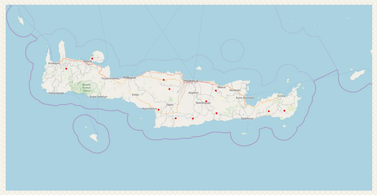
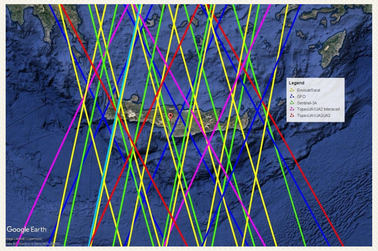
Abstract

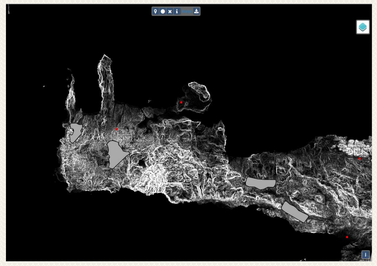
Drought constitutes one of the major impacts of global climate change in the **Mediterranean region**, leading to freshwater scarcity. This problem is more evident in eastern Med regions especially during the summertime when the population grows exponentially due to tourist activities. On the other hand, the Med region presents substantial renewable energy source potential to power critical infrastructure and secure energy efficiency. This work focuses on the **web_GIS module** of the DES²iRES platform that consists of three independent but interoperable modules (GIS, Geostatistical and Optimization). All modules collaborate to inform in minimum time the users about the optimal design of desalination plants powered by renewable energy sources based on their preferences. Solar, wind and wave energy sources are taken into consideration. DES2iRES platform incorporates advanced geostatistical tools and an optimization algorithm for **optimal design of the desalination plant**. The end-to-end process is entirely controlled and supervised by the web-GIS that relies upon cutting edge geospatial and non-geospatial technologies to share geospatial data and allow asynchronous tasks for processing and data dissemination. Developed under open geospatial standards of OGC, DES2iRES web-GIS module is easily expandable to include more renewable energy sources, diverse desalination technologies and meteorological data and models. We are confident that DES2iRES is a powerful tool for public authorities and investors to perform strategic planning in critical infrastructures that assure water and energy efficiency.



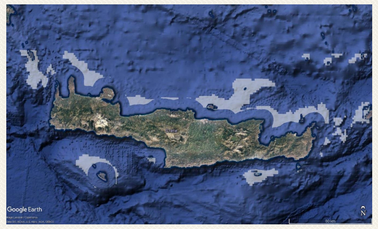
In-situ meteorological stations over Crete, Greece



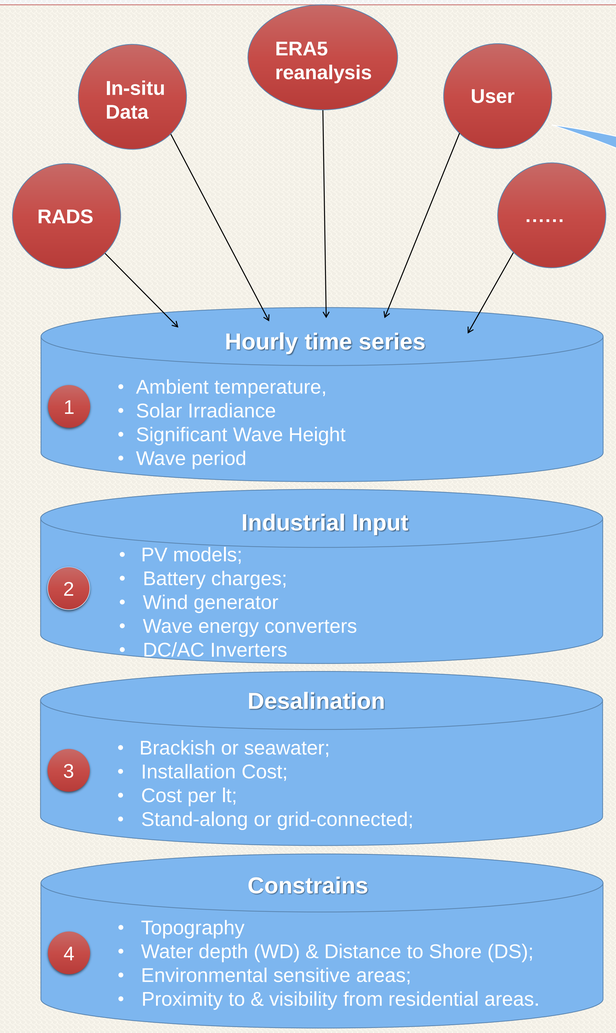
Multi-mission satellite altimetry ground-tacks



Slope map of Crete



Areas with WD<500m & DS>10km



GIS Module

Sequence of Operations

User Requests

- Up to 4 candidate locations on land + one offshore
- Select configuration or default
- Request s are made via web-GIS
- Save preferences for future requests

Case Studies

- Crete, Greece
- Tunisia

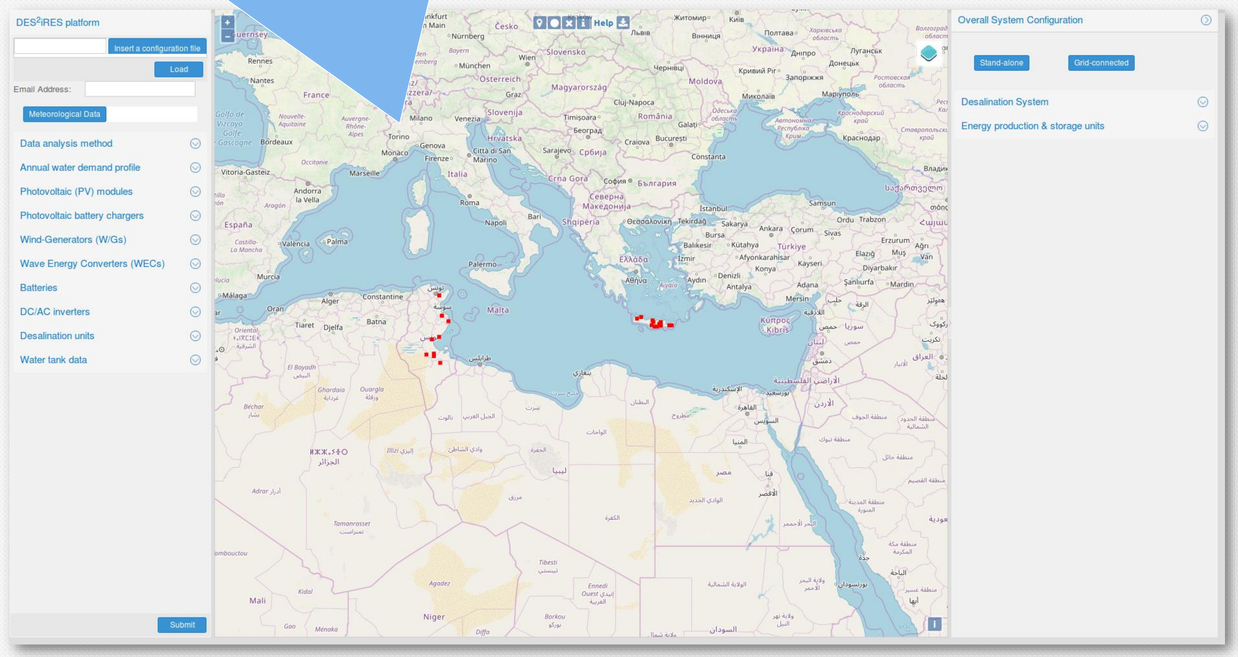
Optimization Algorithm

- Optimum configuration
- Based on user needs & available data

Geostatistical Module

- Missing Data
- Data validation
- Typical meteorological year

DES²iRES
http://147.27.31.219/gis_web_module/



Key Findings

- ❑ DES²iRES platform in fully operational for two study areas in Europe and North Africa;
- ❑ Sparse spatial coverage of meteorological stations in study areas;
- ❑ Commercial networks exist but with high cost for long-term (>decadal) analyses;
- ❑ Geostatistical analysis needed to cover missing data in meteo time series;
- ❑ Multi-mission satellite altimetry as operational tool for offshore energy assessment;
- ❑ Future DES²iRES upgrade includes multi-criteria analysis for onshore and offshore RES site selection;
- ❑ Update DES²iRES database with more in-situ data.

Acknowledgements

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