#### **Mapping and Assessing Ecosystem Services in Cyprus**



I.N. Vogiatzakis, S. Zotos, V. Litskas, P. Manolaki, D. Sarris, M. Stavrinides









#### Where on earth is Cyprus?





#### Cyprus: short profile

- 1610 plants (6.7% endemics, 328 threatened)
- 182 nesting birds (380 recorded)
- 19 bat species
- 8 terrestrial mammals
- 53 butterflies
- 22 reptiles (including 11 lizards, 8 snakes, 3 turtles)
- 50 habitat types (14 priority at the EU level e.g. 1520, 5220, 9560, 3170)
- 104 landscape types
- 40 SCIs & 30 SPAs (Natura 2000)



Ovis gmelini ophion





# Past and present ES attempts in Cyprus (not an exhaustive list)

- 2015 Road Map on MAES in Cyprus
- 2015-2019 LIFE + Projects (Rizoelia, Agrolife I-Life Troodos)
- 2017 DoE Study on ES Mapping and Assessment in Cyprus
- 2018 DoE Case Study on Salt Lakes
- 2018 DoE Case study on Rivers

# Train: Areas of importance for the provision of drinking Water



OPEN

CYPRUS

UNIVERSITY OF



#### **Erosion Risk Map**



#### Cultural Ecosystem Services (ESTIMAP)





#### Services provision potential (senso Burkhard et al.)



#### Ministry commissioned study on MAES in Cyprus (2017)



- 1. Collation and evaluation of existing datasets for mapping and assessment of terrestrial ecosystem services in Cyprus.
- 2. Report on the design and determination of methodology ES mapping and assessment ES of terrestrial ecosystems in Cyprus.
- 3. Define / suggest indicators for the monitoring and assessment of ecosystem services as well as status indicators for ecosystem assessment
- 4. Next steps and gaps identification in the harmonization of national environmental policy with other EU Member States (design, implementation, integration)



# Methodology





#### Evaluation of indicators (as in MAES traffic light system)





**Green:** Available indicator & spatial data easily perceived by policy makers

**Orange:** Available indicator... but spatial data limitation

**Red:** Available indicator; No spatial data...



### Evaluation of indicators (numbers)

- 266 indicators (over the three broad CICES categories):
- forest and maquis (89).
- agroecosystems (87).
- freshwater (90).

# Data Evaluation



**1. General usability** – based on inherent data properties i.e. (i) spatial (& temporal) resolution, (ii) reliability and (iii) easiness of understanding by the users.

**2. Current practice** – based on the data properties which reflect the easiness of use in the short term (I) ownership/accessibility (ii) year of production/update iii) cover extent

- Data which meet the criteria of use and can be employed for indicator mapping.
- Data which meet partially the criteria of use and can be employed for indicator mapping following some form of preparatory analysis.
- Data which do not meet the criteria of use and cannot be employed for indicator mapping

Evaluation of the potential use of indicators for ES assessment at the national level (NUTS2)



| Indicator Suitability | Green  | Medium   | High             | Very high |
|-----------------------|--------|----------|------------------|-----------|
|                       | Orange | High     | Medium           | High      |
|                       | Red    | Very low | Łow              | Medium    |
|                       |        | Red      | Orange           | Green     |
|                       |        |          | Data Suitability |           |

 $\alpha$ ) indicator suitability – appropriate methodologically with available data at EU level  $\beta$ ) data suitability – available at appropriate thematic and spatial resolution at national level

#### Evaluation of the potential use of indicators for ES assessment at the national level (NUTS2)



 $\alpha$ ) indicator suitability – appropriate methodologically with available data at EU level  $\beta$ ) data suitability – available at appropriate thematic and spatial resolution at national level

#### Green Indicators (indicative)



|   | Agricultural<br>& pasture land |   | Forests & shrublands              |   | Freshwater                  |  |  |  |  |
|---|--------------------------------|---|-----------------------------------|---|-----------------------------|--|--|--|--|
|   | Provisioning                   |   |                                   |   |                             |  |  |  |  |
| • | Agricultural area [E]          |   |                                   |   |                             |  |  |  |  |
| • | Hunting areas and seasons      |   |                                   |   |                             |  |  |  |  |
|   | <b>[E]</b>                     |   |                                   |   |                             |  |  |  |  |
| • | Areas important for            | • | Hunting areas and seasons [A]     | • | Number and area of the dams |  |  |  |  |
|   | groundwater abstraction in     | • | Important areas for groundwater   |   | that fishing is allowed [E] |  |  |  |  |
|   | agro-ecosystems [A]            |   | abstraction [E]                   | • | Number and production (per  |  |  |  |  |
| • | Areas with access to treated   | • | Forest biomass stock [E]          |   | species) of fish farms [E]  |  |  |  |  |
|   | municipal wastewater for       | • | Forest biomass increment [A]      | • | Freshwater aquaculture      |  |  |  |  |
|   | irrigation [A]                 | • | Forest for timber, pulp wood,     |   | production (e.g. trout      |  |  |  |  |
| • | Agricultural areas equipped    |   | etc. production [A]               |   | production) [A]             |  |  |  |  |
|   | with irrigation facilities [E] | • | Commercial forest tree volume     | • | Water consumption for       |  |  |  |  |
| • | Groundwater bodies             |   | & harvesting rates [A]            |   | drinking [A]                |  |  |  |  |
|   | location in the island [E]     | • | Trees (presence): pines for resin | 5 | Number and capacity of dams |  |  |  |  |
| • | Yields of feed or food         |   | [A]                               |   | [E]                         |  |  |  |  |
|   | crops (ton/ha; ton dry         | • | Tree species (timber trees) [A]   | • | Number of boreholes in      |  |  |  |  |
|   | matter/ha; MJ/ha) [A]          | • | Wood consumption (industrial      |   | watersheds [E]              |  |  |  |  |
| • | Area of energy crops (ha)      |   | roundwood, fuelwood) [A]          | • | Volume of water bodies [A]  |  |  |  |  |
|   | [A]                            |   |                                   |   |                             |  |  |  |  |
| • | Biofuel, biodiesel,            |   |                                   |   |                             |  |  |  |  |
|   | bioethanol (kToe) [A]          |   |                                   |   |                             |  |  |  |  |

# ES Mapping Methodologies

- (a) Direct mapping with remote sensing techniques or censuses which provide a complete picture of the distribution of spatial data. In the absence of spatial data, ES can be modelled based on socio-economic data.
- (b) Use of empirical models of ES which were developed based on point measurements of these services.
- (c) Application of decision-based rules when ES data are not available.
- (d) projection of data, particularly for land cover classes which can be parameterized in terms of ES provision based on spatial values
- (e) Use of data resulting from studies which compile existing spatial 'products' for the derivation of ES maps with certain rules

### From Numbers to Substance



- The "Green" indicators regarding the provisioning services include:
- the production potential (agricultural land) and
- forest biomass, wood consumption and hunting and groundwater abstraction areas.
- Microclimate regulation (e.g. peri-urban forests)
- Energy crop production although a Green indicator, it is not important presently for Cyprus.

### From Numbers to Substance



- The Green indicators for the regulating services include:
- proxy indicators for pollination (e.g. HNVFs) and
- N uptake from the atmosphere (e.g. legumes crops).

#### ... Red indicators

- CH<sub>4</sub> production from manures,
- pollinator species distribution,
- pollution in soils,
- C sequestration



## From Numbers to Substance



- The Green indicators for the cultural services include:
- Natura 2000 sites; landscape structure.
- Number and capacity of hotels/ motels in forest or rural areas.
- PDO products, bicycle/running/walking trails etc.

++ Additional indicators (consultation with public departments)

- groundwater abstractions areas,
- dams and
- groundwater bodies recharge.









# Key messages (case study specific)

- There is a good representation of indicators for all main services
- These indicators can be already mapped (Data and methods are already there)
- https://www.data.gov.cy
- Being Green does not make you relevant
- Even Green and Relevant might be redundant
- With minimal effort Orange can become Green
- We have enough Green to use as state indicators
- Relevant (and important) indicators might be outside the list (consult stakeholders)

# What does the future hold?

- A full scale 'national' exercise
- LIFE+ PROJECT IP-PHYSIS (2019-2029)



- Increase consultations with the competent authorities through targeted thematic workshops bringing together all the groups / services involved
- Determine demand indicators, for a more accurate assessment of the MAES in the island, to further support ecosystems management and decision making.
- Mapping of all the indicators for MAES, for all Green indicators that are presented in this research.
- Research on the relation of the ES with the ecosystem state (e.g. pollution) and characteristics (e.g. size, habitat type).





# Thank you





Terrestrial Ecosystem Management Lab Open University of Cyprus <u>ioannis.vogiatzakis@ouc.ac.cy</u> temlab.ouc.ac.cy







