Land degradation estimation by SDG 15.3.1 computed at the local scale: the case of the six Mediterranean study sites of the NewLife4Drylands project

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NewLife4Drylands LIFE20 PRE/IT/000007

Session SSS2.1
Poster EGU23-12400

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1. Overview

In 2015, during the 12th Conference of the Parties (COP) a new overall vision objective of the United Nations Convention to Combat Desertification (UNCCD) and the Sustainable Development Goals (SDGs) for 2030 called "Achieving Land Degradation Neutrality (LDN)" was incorporated.

1st January 2021 – 30th June 2024: LIFE20 PRE/IT/000007 – Preparatory project

Remote sensing - oriented nature - based solutions towards a NEW LIFE FOR DRYLANDS (NL4DL)

focuses on the use of ***remote sensing data and techniques*** for the identification of a framework for the mid and long-term monitoring of:

1. land degradation status;
2. nature-based restoration interventions effectiveness for achieving LDN.

2. Study Sites

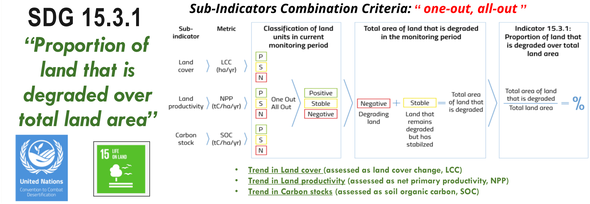
https://www.newlife4drylands.eu/

3. Main Challenges addressed

- Using free available open satellite data as much as possible (Landsat / Sentinel constellation for area > 50 ha)
- Indices, Indicators and/or their proxies extracted from satellite data at local scale ➡ meet the needs of local decision-makers

SDG 15.3.1
"Proportion of land that is degraded over total land area"

Sub-Indicators Combination Criteria: "one-out, all-out"

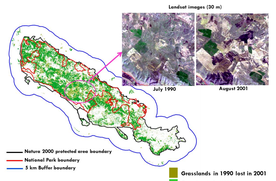


+ **local sub-indicators (based on pressures and threats)**

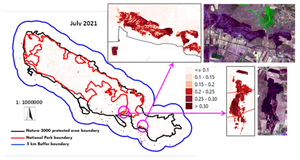
- Trend in Land cover (assessed as land cover change, LCC)
- Trend in Land productivity (assessed as net primary productivity, NPP)
- Trend in Carbon stocks (assessed as soil organic carbon, SOC)

4. Some Results

NATURAL GRASSLAND COVER MAPPING

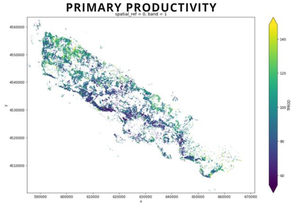


NATURAL GRASSLAND BURN SEVERITY MAPPING

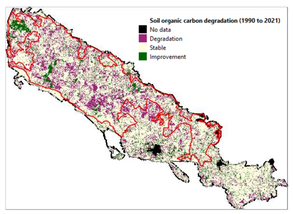


ALTA MURGIA			DRYLAND ECOSYSTEM	
Sub-indicators	**Sensor**	**Spatial resolution (m)**	**Spatial frame**	**Temporal frame**
NATURAL GRASSLAND COVER MAP:	Landsat	30	N2K +5 km buffer	1990; 2001; 2004; 2011
BURN SEVERITY MAP	Sentinel-2	10		2018; 2021
VEGETATION PHENOLOGY INDEX (MSAVI2)	Landsat	30		2000-2018
PLANT PHENOLOGY INDEX (PPI)	Sentinel-2	10		2017-2020
STANDARDIZED PRECIPITATION EVAPOTRANSPIRATION INDEX (SPEI)	3 meteo stations	----------		2011-2020
SOC*	Sentinel-2; PRISMA	10; 30	Only LC classes with ground data	2020

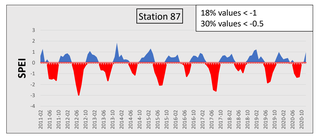
NATURAL GRASSLAND PRIMARY PRODUCTIVITY



SOC MAPPING

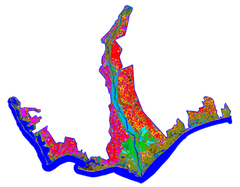


CLIMATIC ANALYSIS



LAND COVER MAPPING

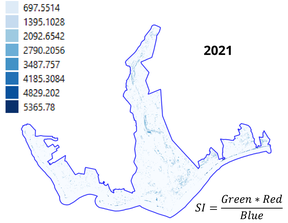
2021



- ARTIFICIAL_AREAS
- ARTIFICIAL_POPLAR_PLANTATIONS
- BARE_AREAS
- CULT1_DMARCH_DMAY_DJUNE_GJULY_GSEPT_asparagus
- CULT2_DMARCH_DMAY_GJUNE_GJULY_DSEPT_corn
- CULT3_DMARCH_GMAY_GJUNE_GJULY_GSEPT_alfalfa
- CULT4_GMARCH_GMAY_DJUNE_GJULY_DSEPT_wheat_soft
- CULT5_BMARCH_BMAY_VJUNE_VJULY_VSEPT
- NATURAL_AQUATIC_VEGETATION_SHRUBS_DECIDUOUS
- NATURAL_TERRESTRIAL_VEGETATION_HERBACEOUS-GRASSLAND
- NATURAL_TERRESTRIAL_VEGETATION_TREES-SHRUBS_DECIDUOUS
- NATURAL_TERRESTRIAL_VEGETATION_TREES-SHRUBS_EVERGREEN
- NATURAL_WATERBODIES
- SANDY_SOIL
- UNCLASSIFIED
- ARTIFICIAL_91ED_PLANTATIONS

NESTOS			WETLAND ECOSYSTEM	
Sub-indicators	**Sensor**	**Spatial resolution (m)**	**Spatial frame**	**Temporal frame**
LAND COVER MAP*	Landsat	30	N2K	2000; 2005; 2010
	Sentinel-2	10		2017; 2021
VEGETATION PHENOLOGY INDEX (MSAVI2)*	Landsat	30		2000-2018
PLANT PHENOLOGY INDEX (PPI)*	Sentinel-2	10		2017-2020
LEAF AREA INDEX (LAI)*				2017-2020
HYDRO-PERIOD MAP				Oct. 2017 – Sept. 2018; Oct. 2019 – Sept. 2020; Oct. 2020 – Sept. 2021
SOIL SALINITY INDICES*				2017; 2021
STANDARDIZED PRECIPITATION EVAPOTRANSPIRATION INDEX (SPEI)*	3 meteo stations	----------		2011-2020
SOC*	Sentinel-2; PRISMA	10; 30	Only LC classes with ground data	2020

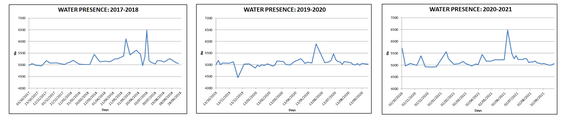
SOIL SALINITY MAPPING



$$SI = \frac{Green * Red}{Blue}$$

WATER COVER MAPPING

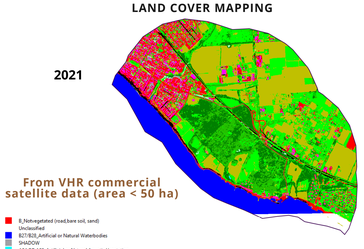
June 9th, 2021



LAND COVER MAPPING

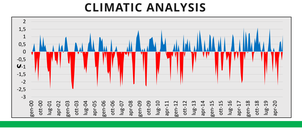
2021

From VHR commercial satellite data (area < 50 ha)

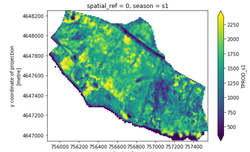


PALO LAZIALE			WETLAND ECOSYSTEM	
Sub-indicators	**Sensor**	**Spatial resolution (m)**	**Spatial frame**	**Temporal frame**
LAND COVER MAP	Pleiades	2	N2K +1 km buffer	2020; 2021
VEGETATION PHENOLOGY INDEX (NDVI/MSAVI2)	Quickbird	2.4		2002-2009
	Pleiades	2		2014-2021
PLANT PHENOLOGY INDEX (PPI)	Sentinel-2	10		2017-2020
LEAF AREA INDEX (LAI)*				
STANDARDIZED PRECIPITATION EVAPOTRANSPIRATION INDEX (SPEI)	1 meteo station	----------		2000-2020
SOC*	Sentinel-2; PRISMA	10; 30	Only LC classes with ground data	2020

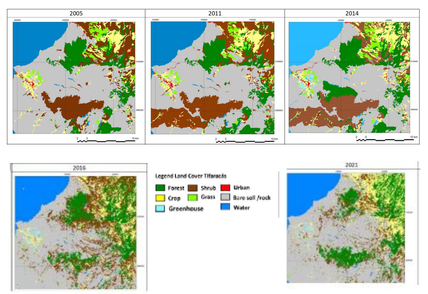
CLIMATIC ANALYSIS



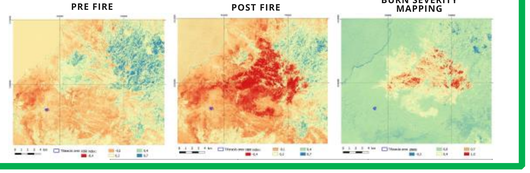
FOREST PRIMARY PRODUCTIVITY



LAND COVER MAPPING



TIFARACAS			DRYLAND ECOSYSTEM	
Sub-indicators	**Sensor**	**Spatial resolution (m)**	**Spatial frame**	**Temporal frame**
LAND COVER MAP	Landsat	30	N2K +5 km buffer	2000; 2005; 2010
	Sentinel-2	10		2017; 2021
VEGETATION PHENOLOGY INDEX (MSAVI2)	Landsat	30		2000-2018
PLANT PHENOLOGY INDEX (PPI)	Sentinel-2	10		2017-2020
BURN SEVERITY MAP				2017-2020
SOC*	Sentinel-2; PRISMA	10; 30	Only LC classes with ground data	2020

BURN SEVERITY MAPPING

BURN SEVERITY MAPPING