

An Interoperable Climate Service for Drought Monitoring

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THE CONTEXT

Drought is a creeping and complex phenomenon with different types of impacts. Drought dynamics reveals a time gap between the onset of a drought event and the management of the drought emergency, but often this gap is too wide to effectively reduce the impacts. Drought information is frequently scattered and not enough integrated to support diverse users' needs. Therefore, there is a need to increase preparedness through proactive solutions providing timely and simple information. In other words, an integrated Drought Climate Service can fill the gap, as drought monitoring is key to increase a better resilience. An effective Climate Service responds to different priorities and users' needs and have a set of main requirements: information continuously updated and timely delivered, expandable platform and on-demand services, products adequate to the diverse users' competencies and technical skills. Following this approach, the IBE-CNR developed a system to provide a semi-automatic, detailed, timely and comprehensive operational service. This service supports decision-makers, Water Authorities, researchers and stakeholders.

INTEGRATION OF GROUND-BASED AND SATELLITE DATA

Key features of this Open Source and interoperable SDI (Spatial Data Infrastructure) are the integration of ground-based, satellite data and models to monitor and forecast drought occurrences and trends. The system produces vegetation and precipitation indices able to track the occurrence and the evolution of a drought event.

THE INDICES: DROUGHT OCCURRENCES AND TRENDS

The system is based on a monitoring component and on a forecasting ones, and uses two types of indices:

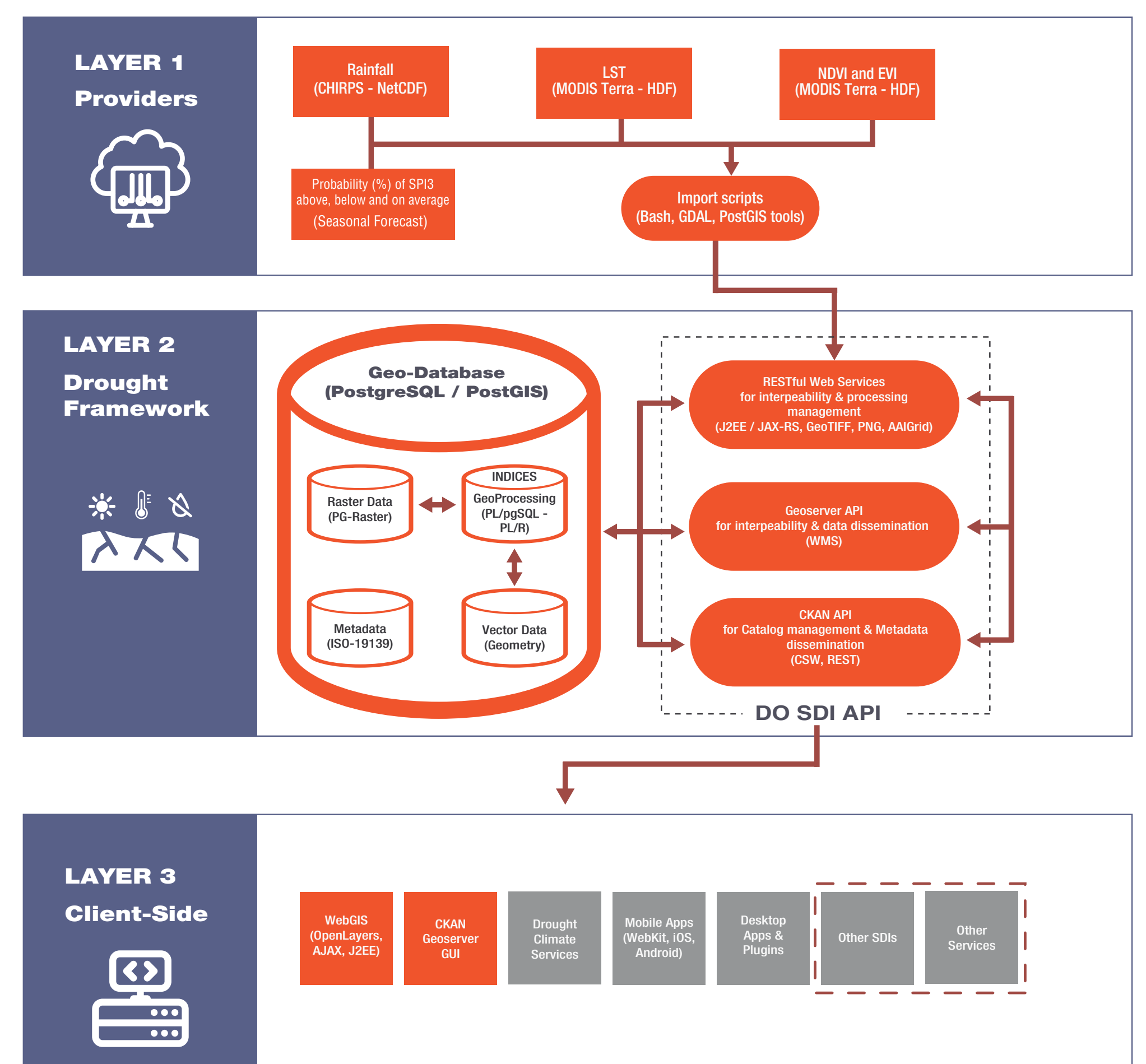
- direct climate-based indices - SPI, EDI
- indirect vegetation-based indices - TCI, VCI, VHI, E-VCI, E-VHI

The forecasting system is based on an empirical approach to predict meteorological drought using the SPI 3.

References in R. Magno, T. De Filippis, E. Di Giuseppe, M. Pasqui, L. Rocchi, B. Gozzini. (2018) Semi-automatic Operational Service for Drought Monitoring and Forecasting in the Tuscany Region. *Geosciences*. 8(2), 48: 1-25. doi: 10.3390/geosciences8020049

THE SYSTEM ARCHITECTURE

The technological infrastructure proposes an innovative approach of the geographic data flows (from the download of remote sensing and climatic data to the storage of final indices), and the related geoprocessing functions are integrated into a single environment. The Service-Oriented Architecture is based on Open Geospatial Consortium standards. It is a database-centered architecture, with PostgreSQL as DataBase Management System. Advanced statistical procedures integrate R Procedural Language into PostgreSQL (PL/pgSQL) through PL/R wrapper. The architecture, designed for the Drought Observatory (DO) monitoring framework optimization, is composed of three layers: (1) Providers Layer for retrieving input data; (2) Drought Framework Layer for managing metadata and processing stored data; (3) Client-side Layer for results dissemination. The three layers communicate through specific Representational State Transfer (REST) web services following the SOA paradigm.



THE WEBSITE: DROUGHT.CLIMATESERVICES.IT

The Drought Observatory website is structured to offer drought information, data and services responding to different users' needs.

MONTHLY BULLETIN
The Bulletin is a custom service providing monthly updates on Italy drought current and future conditions and local impacts.

WEB GIS
A customized Open Source WebGIS application to integrate different datasets and share maps of drought indices.

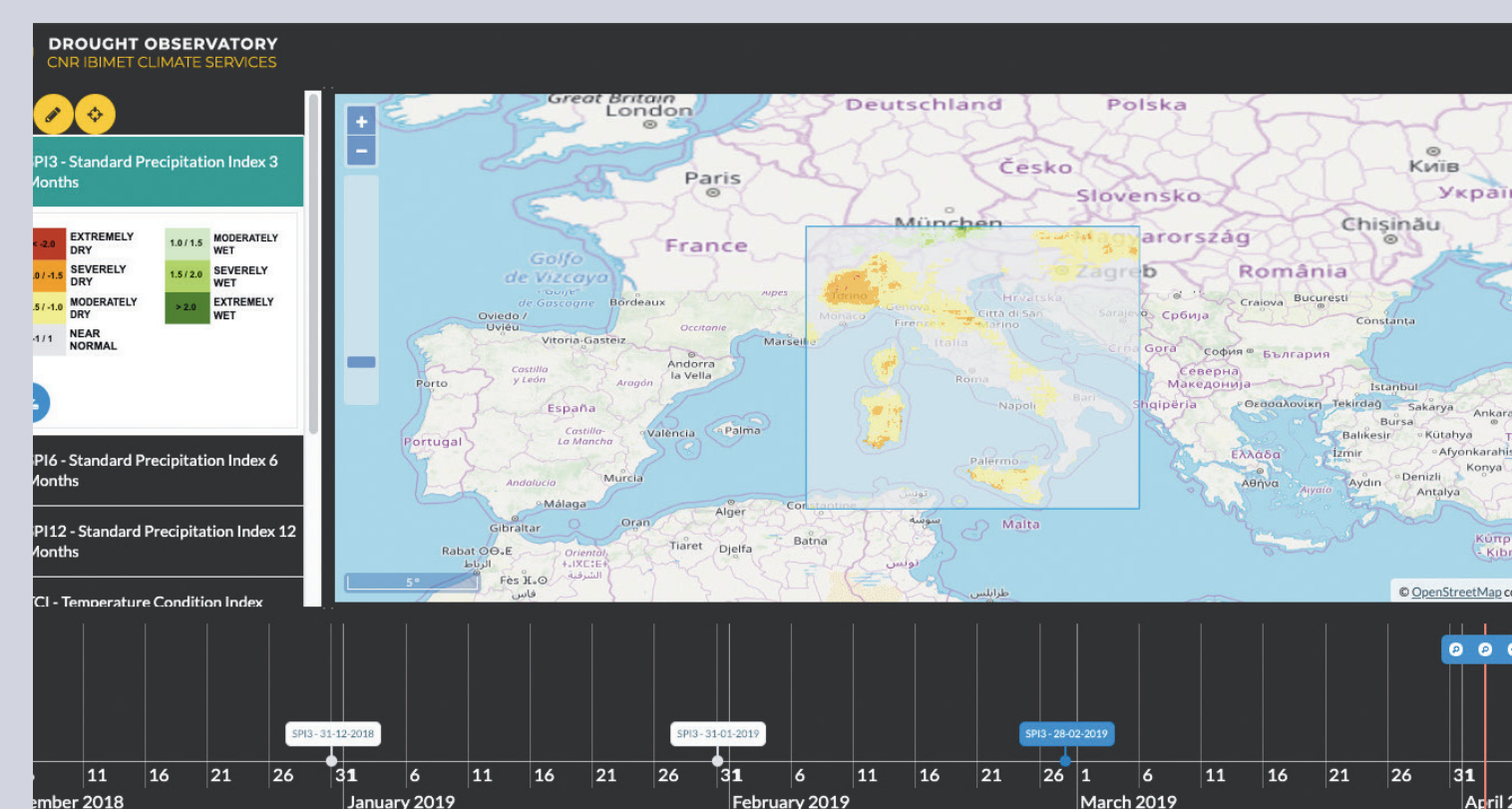
OPEN DATA
A Catalogue (CKAN, GeoServer and PostgreSQL) with data and metadata in different formats and standard protocols. Any third-party client applications can easily reuse the spatial data.

RESTFUL API
The Drought Observatory RESTFUL APIs for data download and clipping ensure a complete interoperability.

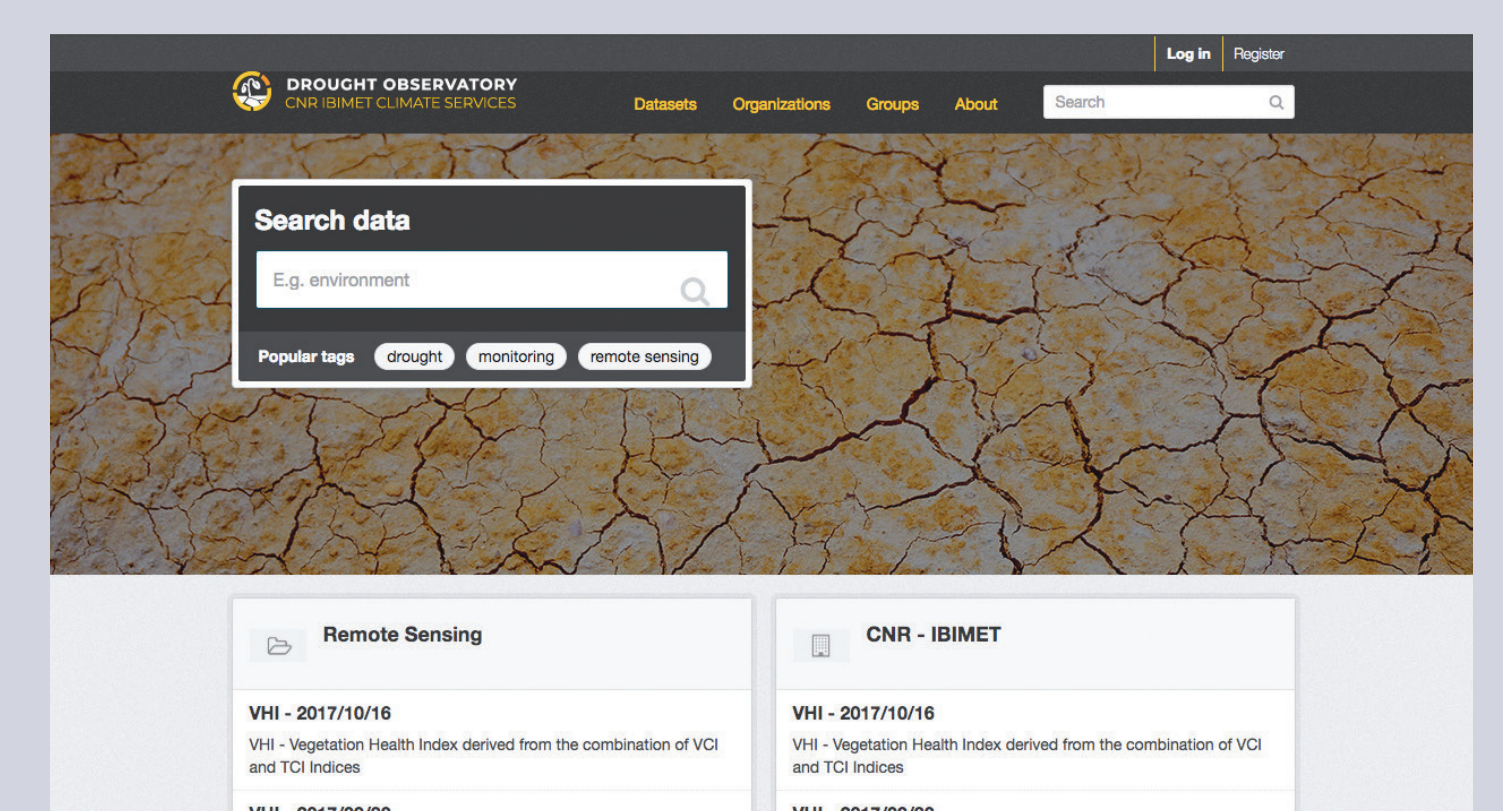
GLOSSARY
A selected list of drought related keywords. Sources: EarthLabs, Intergovernmental Panel on Climate Change (IPCC), National Drought Mitigation Center (NDMC). [only in english]



drought.climateservices.it - Home Page



Web GIS - Home Page



Drought Observatory CKan OpenData