

# Rheticus™ Marine Downstream Services

**At Copernicus Marine Service, opportunities for italian  
sector of Blue Growth workshop**

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Since 1994...



Bari



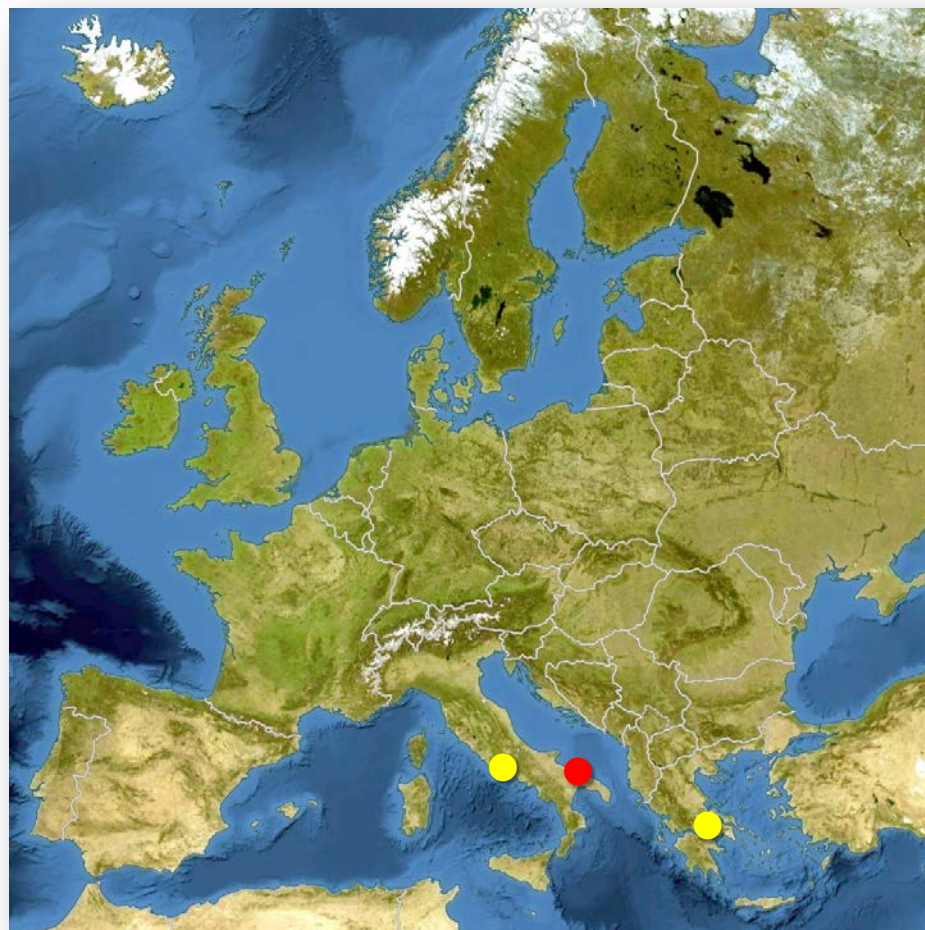
Athens



Roma



Bari



Earth Observation



Spatial Data  
Infrastructure & GIS



Location Based  
Systems



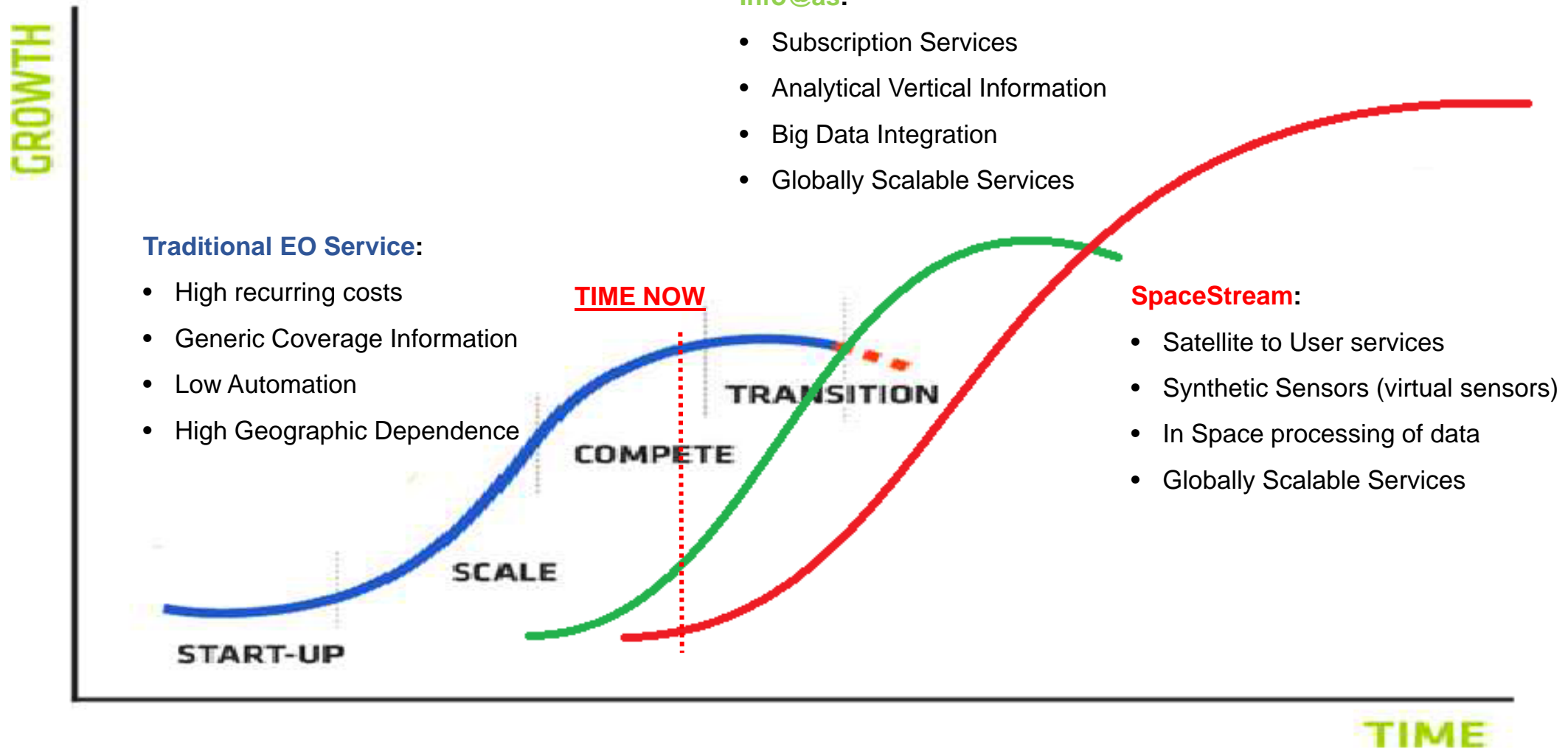
Space Software





- Cloud-Based
- Subscription-Based
- Satellite Data
- (Geo) Open Data
- Continual Updates
- Analytics, Maps, Reports

# The 3 Horizons of innovation in Planetek



# From GEO Services to GEO-Analytics

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- Planetek Geoanalytics belongs to a long experience in development of Satellite Based Geoservices. These **bespoke** services where generally project based and with relevant recurring costs.
- Rheticus™ provides info@as services, **globally scalable**, with low recurrent costs.
- Rethicus™ will benefit from dat@as and s@as provided by DIAS

# Rheticus<sup>®</sup>: Data Processing Workflow

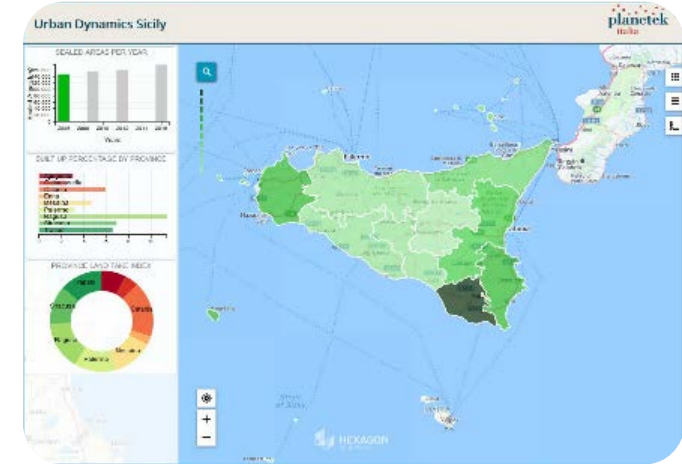
Satellite Data



Automatic Processing



Info as a Service



Rheticus<sup>®</sup> is an automatic cloud-based geo-information service platform for land, water and infrastructure monitoring

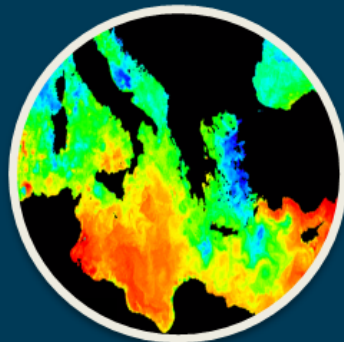


## Displacement

Landslides

Subsidence

Infrastructure Stability



## Marine

Water Quality

Algae Bloom

Aquaculture

Fishing



## Land

Land Cover

Wildfires



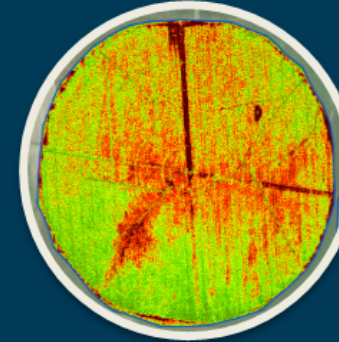
## Urban Dynamics

Urban Changes

Urban Heat Islands

Soil Sealing

Infrastructures



## Agriculture

Crop Monitoring

Vegetation Health

Yield Estimation

Illegal Crops

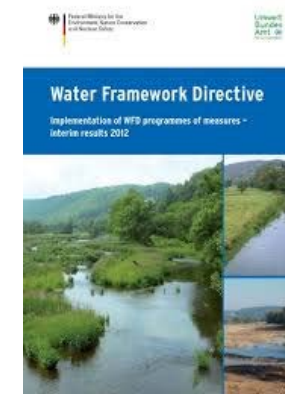
Rheticus Services

# European Directives on coastal areas

- ✓ **Water Framework Directive (WFD)**
- ✓ **Marine Strategy Framework Directive (MSFD)**
- ✓ **Recommendation on Integrated Coastal Zone Management**
- ✓ **Bathing Water, Habitats (Natura2000), ...**

**WFD: Good Status for all EU surface and groundwaters by 2015. 2027 final deadline for meeting objectives**

**MSFD: Good Environmental Status of EU marine waters by 2020**





# Use case for WFD and MSFD reporting

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- Definition of relevant zones
  - Using long-term historical CMEMS measurements (e.g. Chlorophyll, Derived transparency, Temperature, Salinity, etc.)
  - Using input information from user
- Extraction of geo-analytics and indicators over relevant zones and relevant time periods (e.g. monthly, yearly, etc.)
  - Water parameters made available by CMEMS as support of WFD indicators or e.g. MSFD descriptor 5 (eutrophication)
- Synthesis tables for reporting

# CMEMS useful products

- Measurements available in CMEMS:
  - Parameters from satellites at 1km spatial resolution: Chlorophyll, Temperature, optical properties
  - Other useful parameters from modelling + satellites at 4-16km spatial resolution: Salinity, Dissolved Oxygen, Primary production
- Historical maps: daily and monthly
- Ongoing mapping: daily, including hole-filled (L4) measurements

The image displays three overlapping screenshots of the CMEMS website interface, illustrating the product details for Mediterranean Sea surface chlorophyll concentration. The top screenshot shows the product title: "MEDITERRANEAN SEA MONTHLY, 8-DAYS AND DAILY INTERPOLATED SURFACE CHLOROPHYLL CONCENTRATION FROM MULTI SATELLITE OBSERVATIONS". The middle screenshot shows a similar view with a different title: "MEDITERRANEAN SEA SURFACE CHLOROPHYLL CONCENTRATION FROM MULTI SATELLITE OBSERVATIONS". The bottom screenshot provides a detailed overview of the product, including a "Short description" and a "Detailed description".

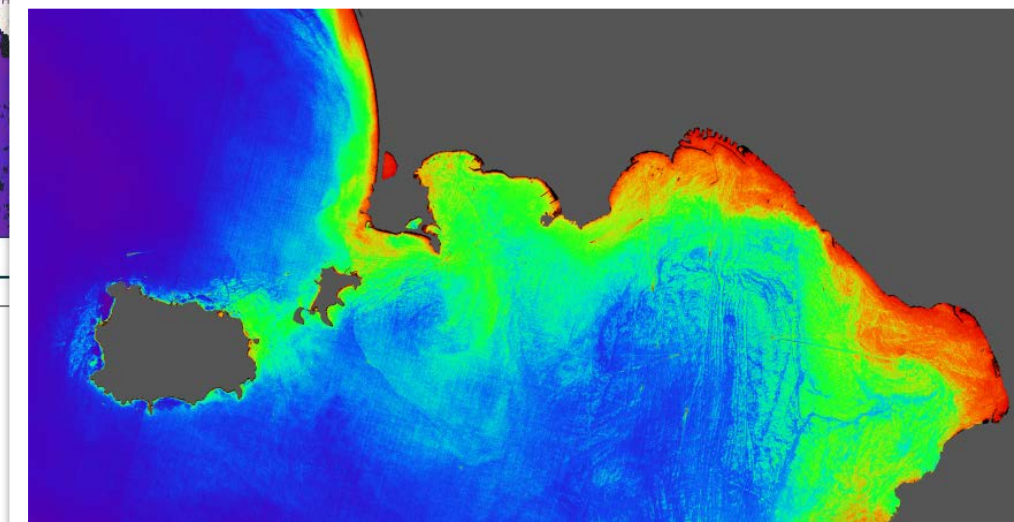
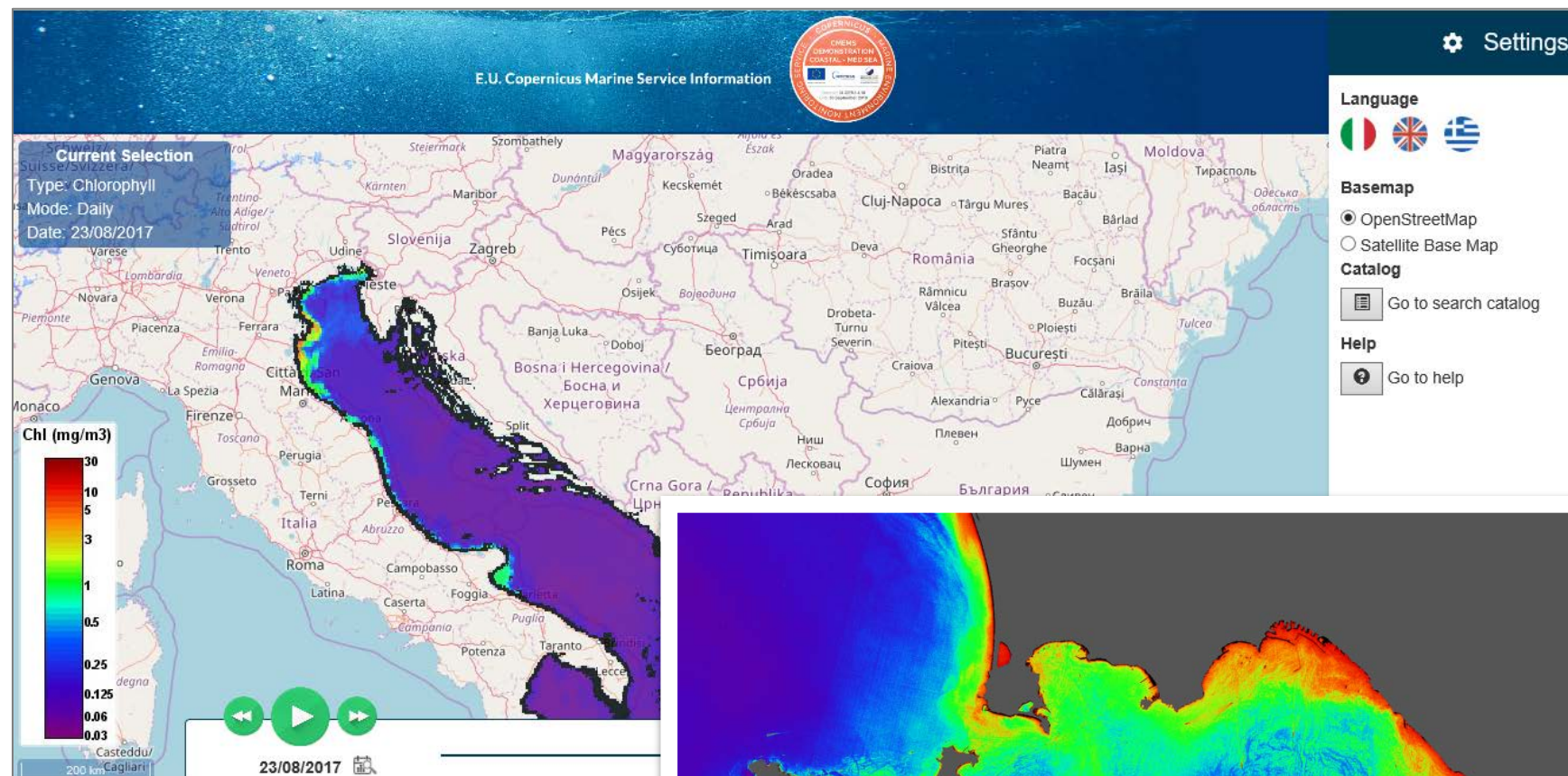
**Short description:**  
Surface chlorophyll concentration (mg m<sup>-3</sup>, 1 km resolution) is estimated via the MedOC4 (Case 1 water: Vobbe et al., 2007) and the AD4 (Case 2 water: DAImonte and Zibordi, 2003) algorithms. These algorithms are applied over the Rrs spectra provided by the Plymouth Marine Laboratory using an ad-hoc configuration of the ESA-CCI processor for CMEMS. These Rrs spectra are the result of state-of-the-art algorithms for multi-sensor merging. The two ocean colour algorithms are used by the Group for Satellite Oceanography (GOS-SAC) of the Italian National Research Council (CNR), in Rome, for data reprocessing over the Mediterranean Sea.

**Detailed description:**  
The dataset belonging to this product is obtained by means of the Mediterranean Ocean Colour algorithms. These are empirical ocean colour algorithms for chlorophyll retrieval for the Mediterranean Case 1 or Case 2 waters. Units are expressed in mg m<sup>-3</sup>. They use the blue-to-green Maximum Reflectance ratio. In particular, they use three Remote Sensing Reflectances in the blue part of the spectrum (443, 490 and 510 nm) and the Remote Sensing Reflectances at 555 nm for the green. These merged Case1-Case2 datasets are obtained using the an update version of the empirical Mediterranean algorithm (MedOC4, Vobbe et al. 2007) for Case 1 waters and the AD4 algorithm for Case 2 waters type (DAImonte and Zibordi, 2003). Discrimination between the two water types is performed by comparing the satellite spectrum at pixel-by-pixel level with the average water type spectral signature from in situ measurements for both water types. These are computed from the MedOC4 In situ dataset (Vobbe et al., 2007) for Case 1 waters and from the CoASTS In situ dataset (Berthon et al., 2002) for Case 2. Merging of Case 1 and Case 2 information is performed following DAImonte et al. (2003). This product identifies the average chlorophyll content of the surface layer as defined by the first optical depth (roughly one fifth of the euphotic depth). Rrs input data are estimated for Copernicus using the ESA-CCI processor at high spatial resolution.

# Rheticus Marine

Users can access the web interface based on Rheticus™ Marine, search and browse products metadata, display them on a map and download them as well.

Users can also request statistical calculations on demand over pre-set temporal periods within a pre-defined selection window.





Chlorophyll-a

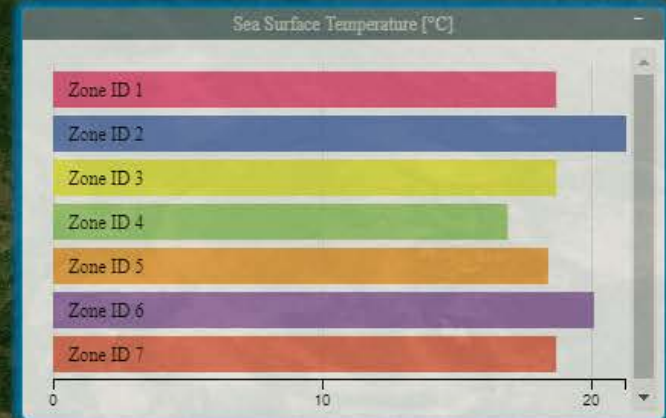
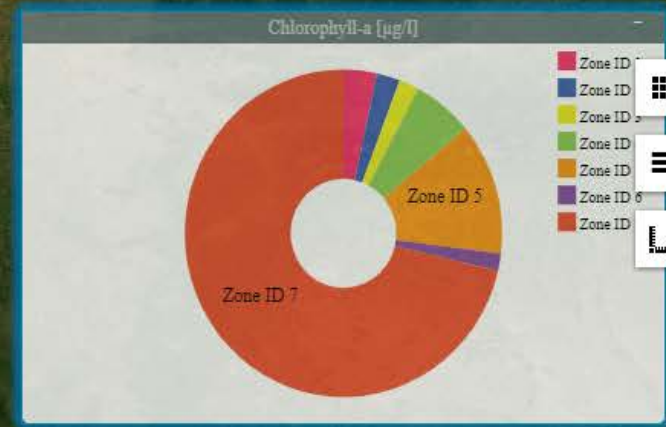


Summary

Chl_GM...	WT_Gmea	SST	Zone ID
2011			
0.2	24.15	18.7	Zone ID 1
0.14	29.48	21.3	Zone ID 2
0.12	32.83	18.7	Zone ID 3
0.36	10.29	16.9	Zone ID 4
0.77	6.4	18.4	Zone ID 5
0.1	34.44	20.1	Zone ID 6
4.2	1.7	18.7	Zone ID 7

First Previous 1 Next Last

Zone ID: 1  
 Chlorophyll-a:  
 0 µ/l  
 Water  
 Transparency:  
 24  
 Sea Surface  
 Temperature:  
 19 °C



FRANCE

SWITZERLAND

AUSTRIA

HUNGARY

SLOVENIA

ROMANIA

pikm106-XX-1.0 Rheticus® Aquaculture – Report N. XXXXXX-XXX-2018-XX



Satellite Support for Smart Aquaculture

Parameter	Acronym	Value	Units	State
1-year average Chlorophyll-a concentration	Chl-a	0.14	mg/m <sup>3</sup>	●
1-year average Water Transparency	WT	10.00	m	●
1-year average Sea Surface Temperature	SST	20	°C	●
1-year average Dissolved Oxygen	O <sub>2</sub>	8.40	mg/l	●
1-year average Salinity	S	34.00	PSU ‰	●
1-year average Sea Surface Waves	SSW	0.20	m	●
1-year average Current Velocity	UV	0.05	m/s	●

Outlook for a Potential Aquaculture Farm:

Gulf of  
TarantoTyrrhenian  
Sea

Ionian Sea

Sicilian  
Channel

GREECE

Aegean Sea

BOSNIA AND  
HERZEGOVINA

SERBIA

MONTENEGRO

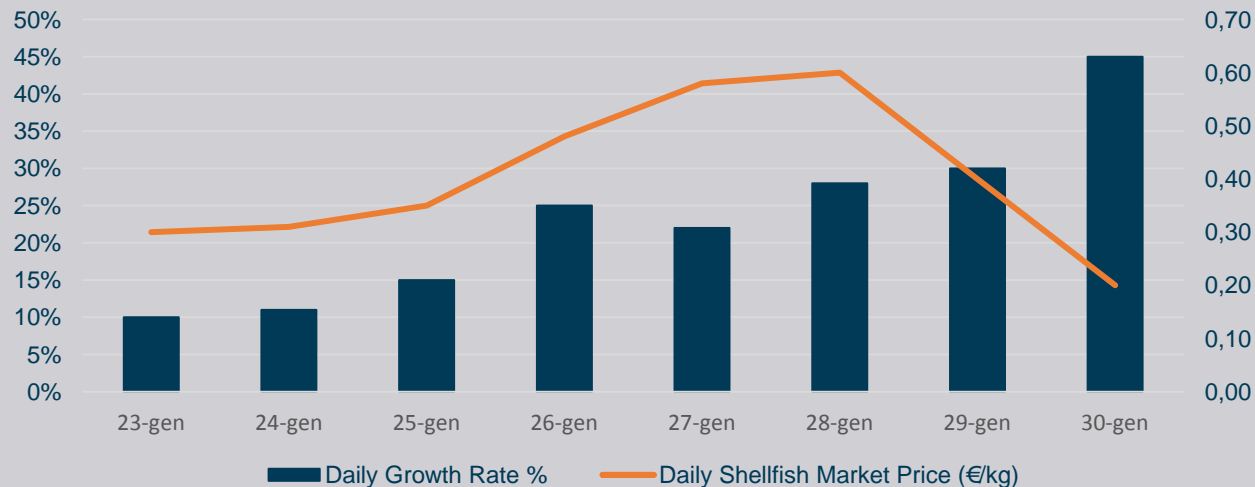
THE FORMER YUGOSLAV  
REPUBLIC OF  
MACEDONIA

ALBANIA



### Daily Growth Rate vs Market Prices

as of 23/01/2018 at 10:00 UTM



Ancona 

Parameter	Acronym	Value	Units	State
Chlorophyll-a	Chl-a	0.14	mg/m <sup>3</sup>	●
Water Transparency	WT	10.00	m	●
Sea Surface Temperature	SST	20	°C	●
Dissolved Oxygen	O <sub>2</sub>	3.00	mg/l	●
Salinity	S	34.00	PSU ‰	●
Sea Surface Waves	SSW	0.20	m	●
Current Velocity	UV	0.25	m/s	●
Product Growth Rate		22	%	●
Days to Market Size		10	day(s)	●
Storm Surge Alert		--		●
Average Weekly Shellfish Market Price		0.58	€/kg	▲
Source: ISMEA Mercati				
Outlook for Risky Situations		Low		●



Storm



Biz



Survey

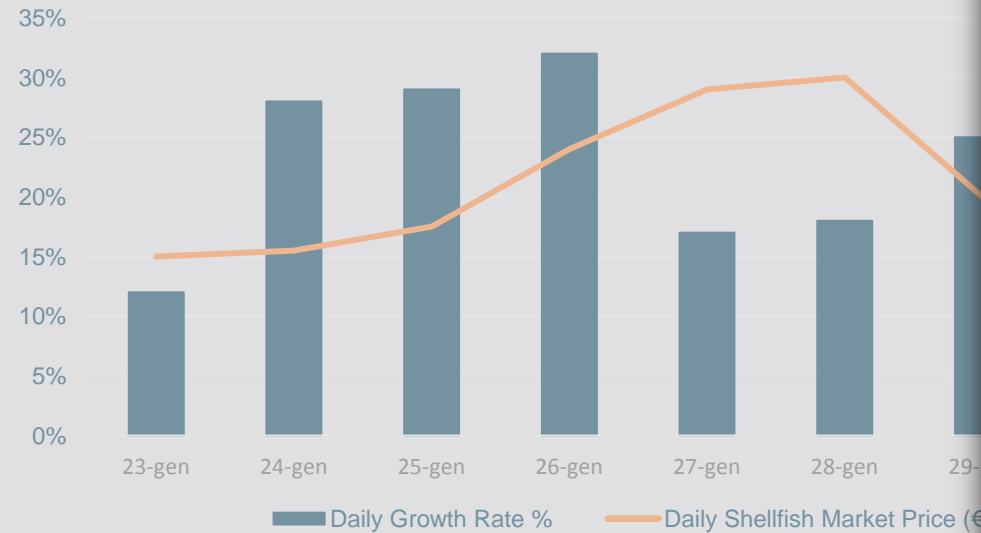


Antib.





Daily Growth Rate vs Market Prices



Ancona

Parameter	Acronym	Value
Chlorophyll-a	Chl-a	0.14
Water Transparency	WT	10.00
Sea Surface Temperature	SST	20
Dissolved Oxygen	O <sub>2</sub>	3.00
Salinity	S	34.00
Sea Surface Waves	SSW	0.20
Current Velocity	UV	0.25
Product Growth Rate		22
Days to Market Size		10
Storm Surge Alert		--
Average Weekly Shellfish Market Price		0.58
Source: ISMEA Mercati		
Outlook for Risky Situations		Low

- PDF Report 12 43 46
- PDF Report 13 57 49
- PDF Report 17 50 39
- PDF Report 17 50 39
- PDF Report 12 13 46
- PDF Report 12 43 46
- PDF Report 13 57 49
- PDF Report 17 50 39
- PDF Report 17 50 39



- Core data not available near the coast (usually within a distance of 2km from the shoreline)
- Spatial resolution required <1km
- A more seamless M2M interface to generate downstream services on the cloud



# The evolution: The algal bloom service

A new service will be distributed by Rheticus, based on the results of the **HABRisk** project.

This project will start soon this year as result of a proposal awarded in the frame of 67-UU-DO-CMEMS-DEM4 tender from a consortium led by I-Sea.



# Analysis of the coastal soil sealing

