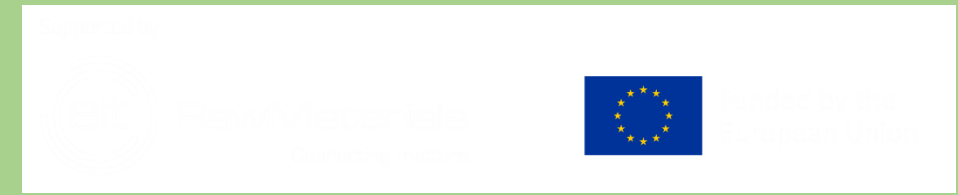
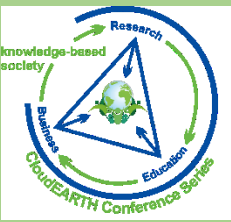


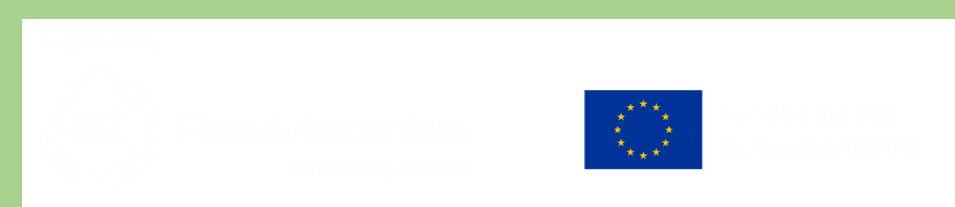
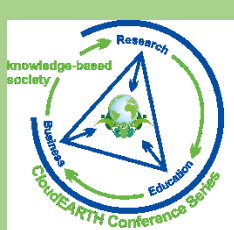
Environmental analysis of Varna Lake based on satellite imagery

Valentina Markova, Todor Ganchev, Angel Marinov & Tamer Abu-Alam



Introduction

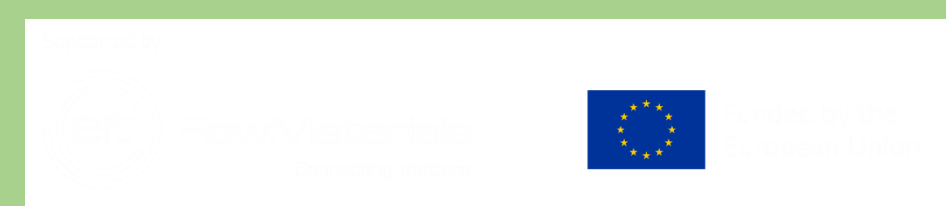
- The presentation discusses in-depth analysis of Varna Lake, Bulgaria.
- The analysis is based on satellite imagery.
- The analysis is based on the estimation of several known indexes that can be extracted from the satellite imagery.
- The presented study is part of the KnowWAT project, coordinated by TU-Varna. The project aims to improve the knowledge available for Varna Lake.



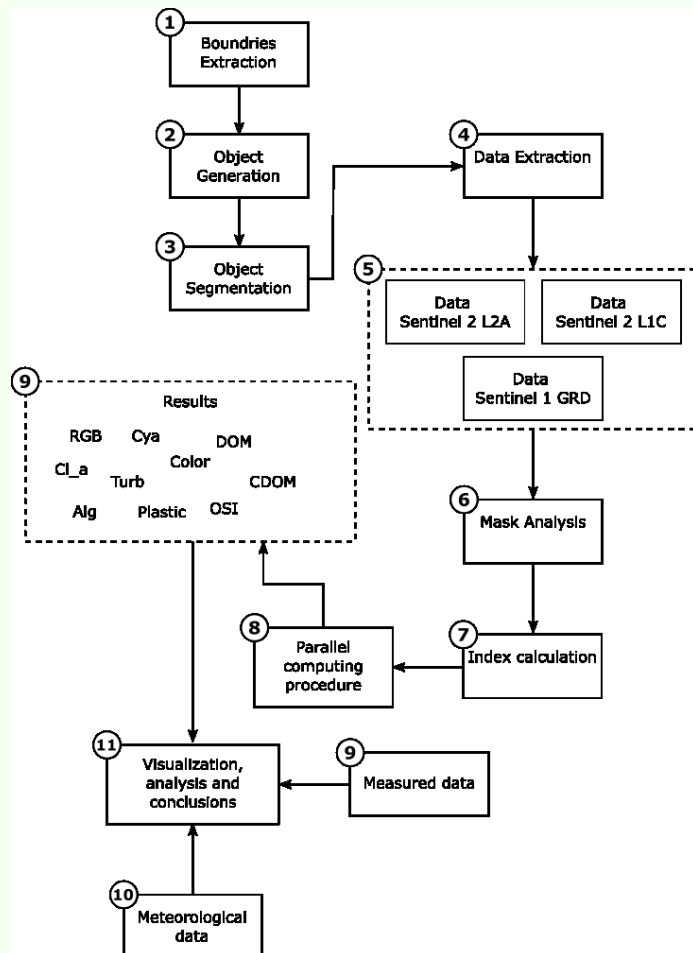
Varna Lake



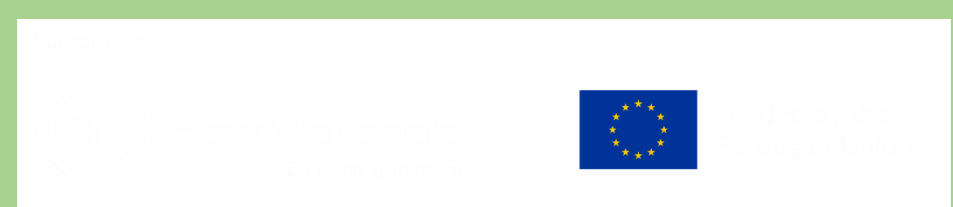
Varna Lake is an artificial body of water located in one of the biggest port cities in Bulgaria – Varna. The lake connects to the Black sea and has a major industrial and transportation significance to the city of Varna and Bulgaria in general. As the lake is surrounded by heavily urbanized and tourist-related areas its environmental and ecological properties have substantial importance.



Acquisition and analysis procedure



- (1) Boundries extraction;
- (2) Object generation;
- (3) Object segmentation;
- (4) Data Extraction;
- (5) Data;
- (6) Mask analysis;
- (7) Index calculation;
- (8) Parallel computing procedure;
- (9) Results and measured data;
- (10) Meteorological data;
- (11) Visualization, analysis and conclusions;



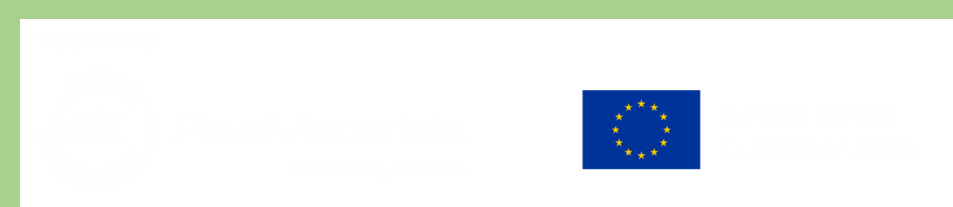
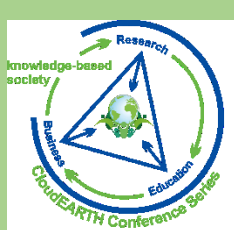
Boundaries extraction and object generation



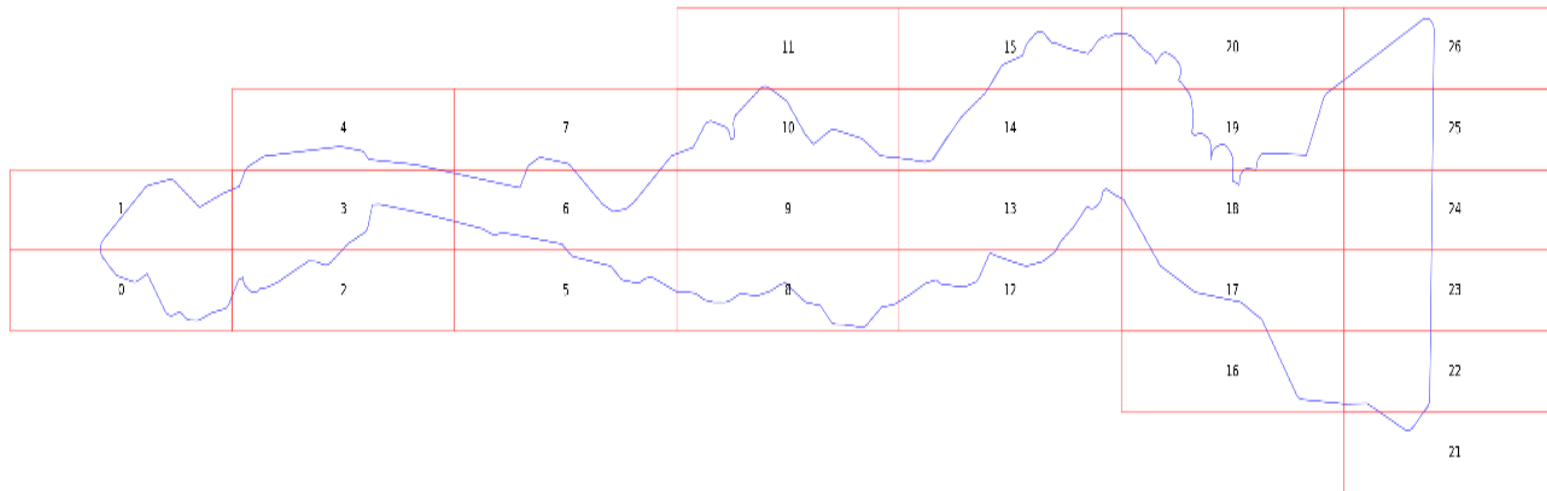
Boundaries selection of lake Varna

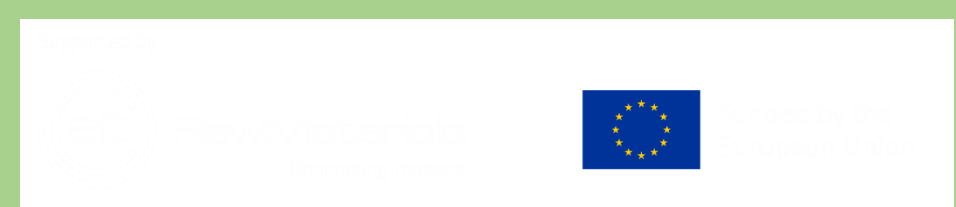


Boundaries expansion up to 200m



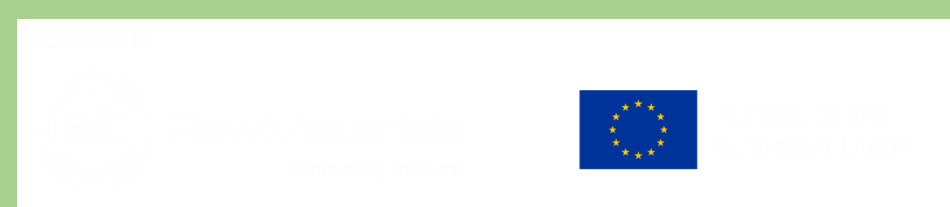
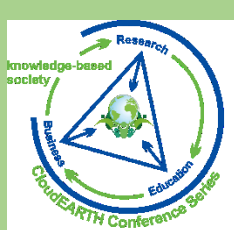
Segmentation





Indexes selection

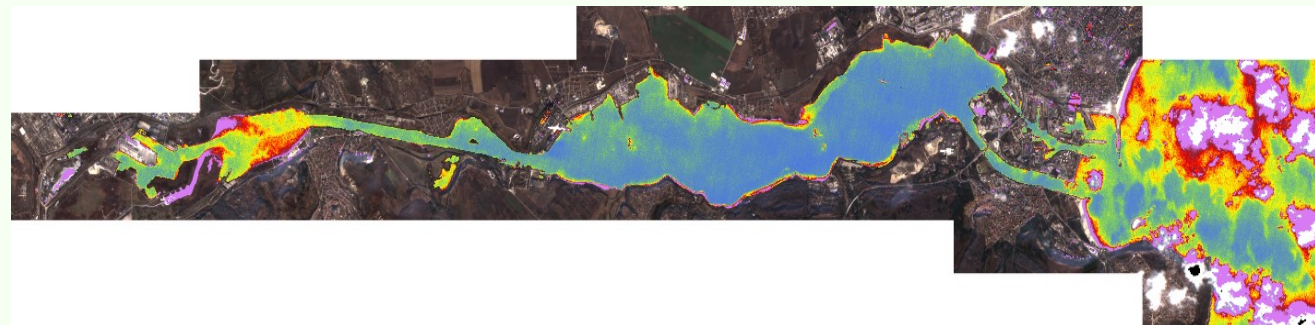
- RGB – true color imagery;
- Cya - the density of cyanobacteria;
- DOM - dissolved organic carbon;
- Cl_a - the concentration of Chlorophyll
- Turb - turbidity ;
- Color water color;
- Alg – algae density;
- Plastic –plastic detection;
- OSI – Oil slicks index ;



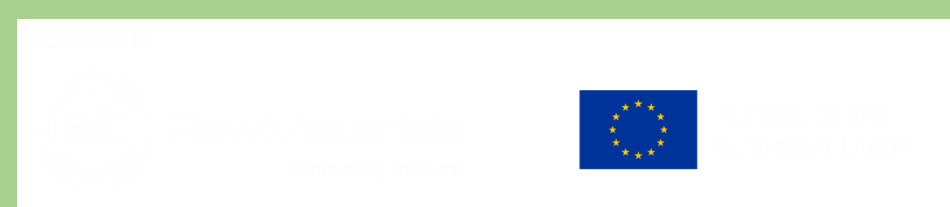
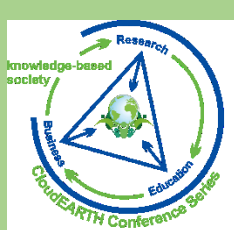
Sample results 1/2



Cl_a



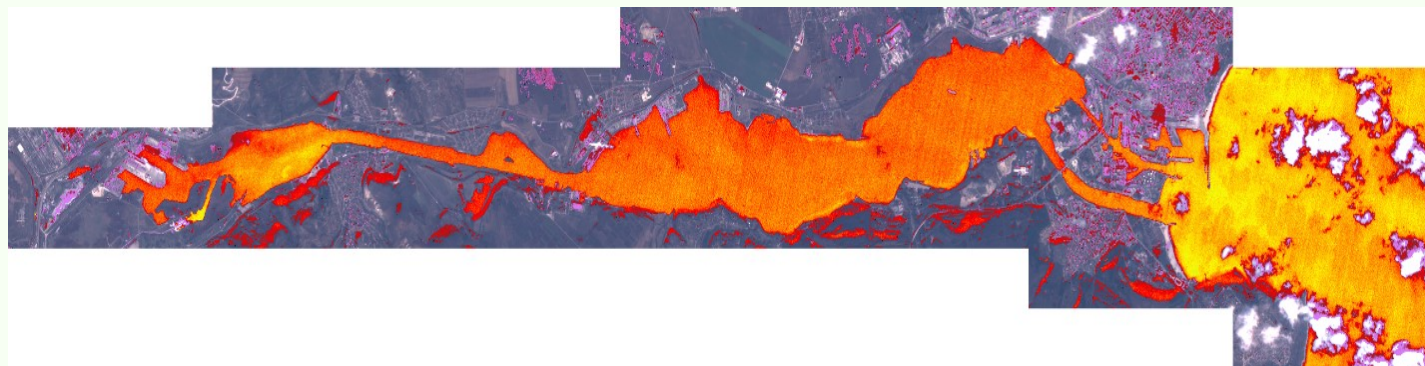
Cya



Sample results 2/2



Turb



DOC



Analysis and Conclusions

- ✓ Data for the different indexes was collected for the duration three years. A data base is being build;
- ✓ A study of various illegal or non-registered waste connections to the lake were identified – with their size and locations.
- ✓ Data received from the satellite imagery will be compared with the locations of the waste connections.
- ✓ The combination between measured and satellite data will allow to asses the effect of the different waste disposal connections.
- ✓ The satellite imagery and extracted data can be compared to performed chemical analysis.