



40th EARSeL Symposium 2021

European Remote Sensing-New Solutions for Science and Practice

2nd EARSeL UAS Workshop

9th EARSeL Workshop on Remote Sensing of Coastal Zone

EO Education Workshop



Photo: Alicja Folbrier

UAV monitoring of cyanobacteria bloom and effects of failure in the sewage treatment plant: case studies

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Łukasiewicz - Institute of Aviation
Warsaw, Poland



→ THE EUROPEAN SPACE AGENCY

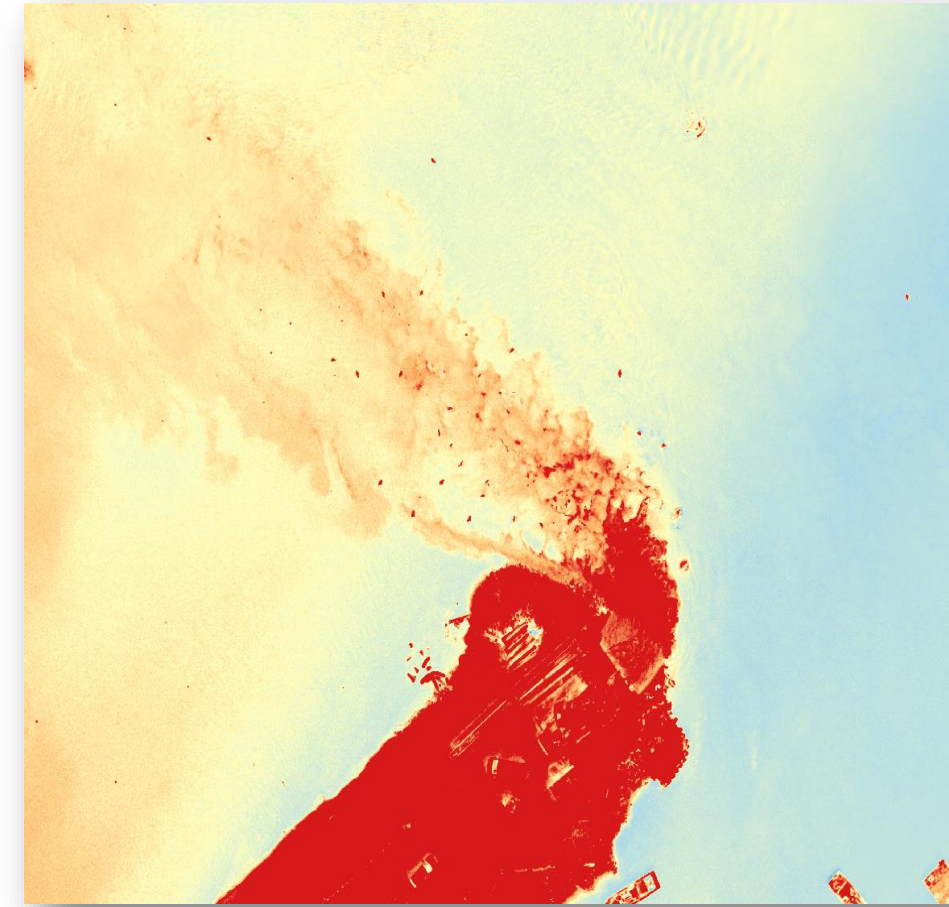
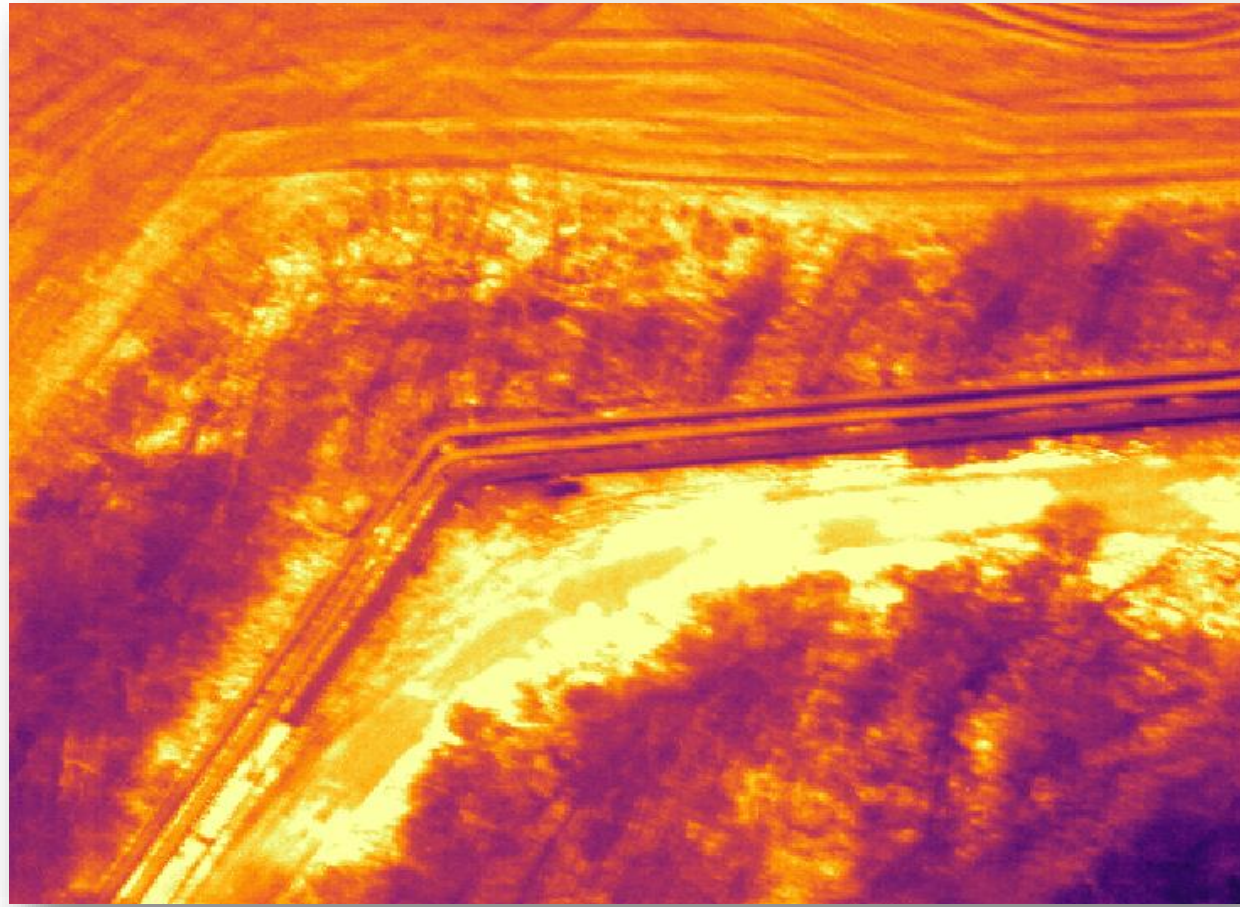
07 – 10 June 2021

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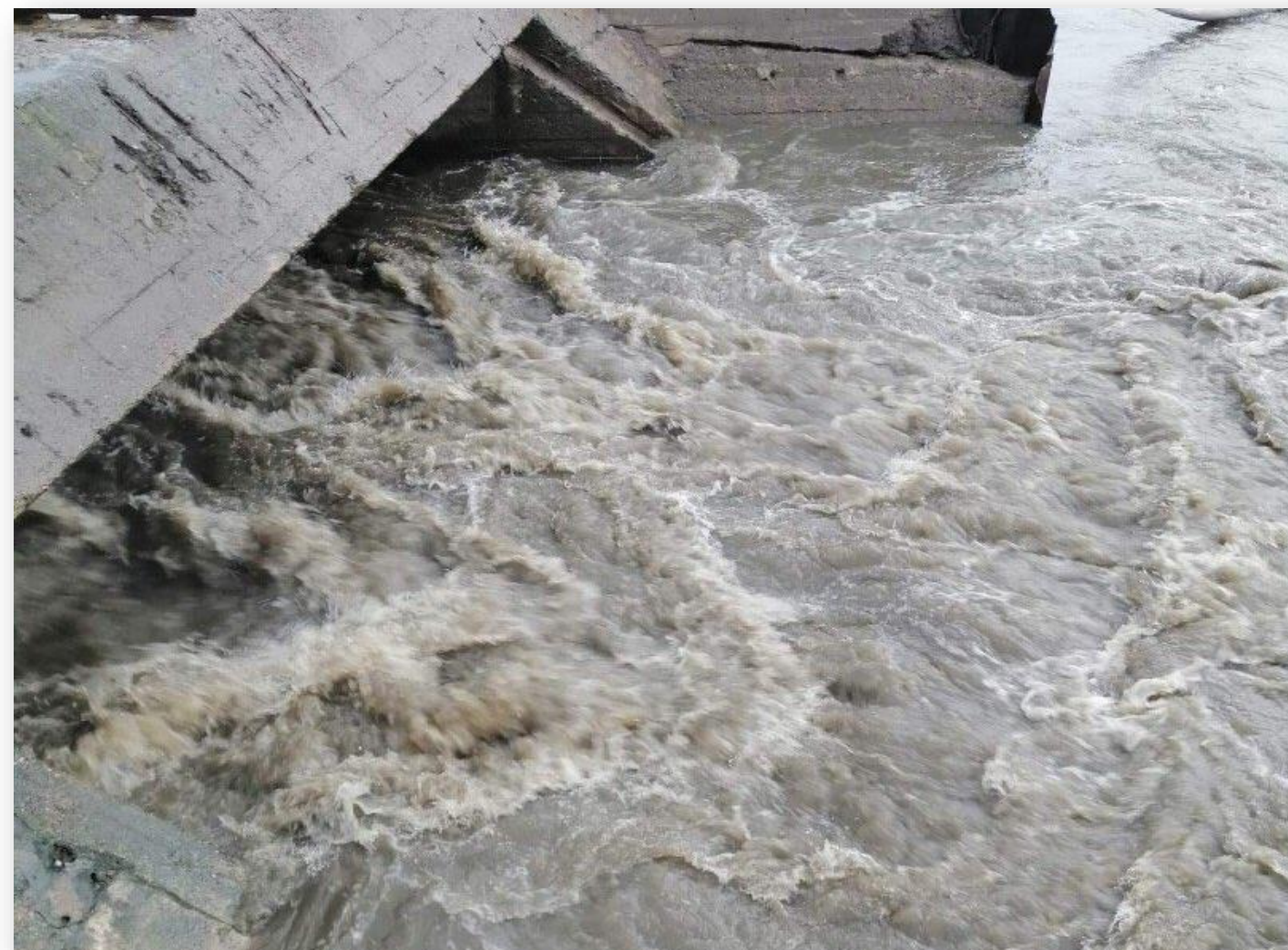
FACULTY OF GEOGRAPHY
AND REGIONAL STUDIES
UNIVERSITY OF WARSAW

Water monitoring with the use of multispectral data -examples of projects



Failure in sewage treatment plant

Czajka, Warsaw



Basic informaton:

Date: 28 August 2019

Sewage flow: 3000 l/s

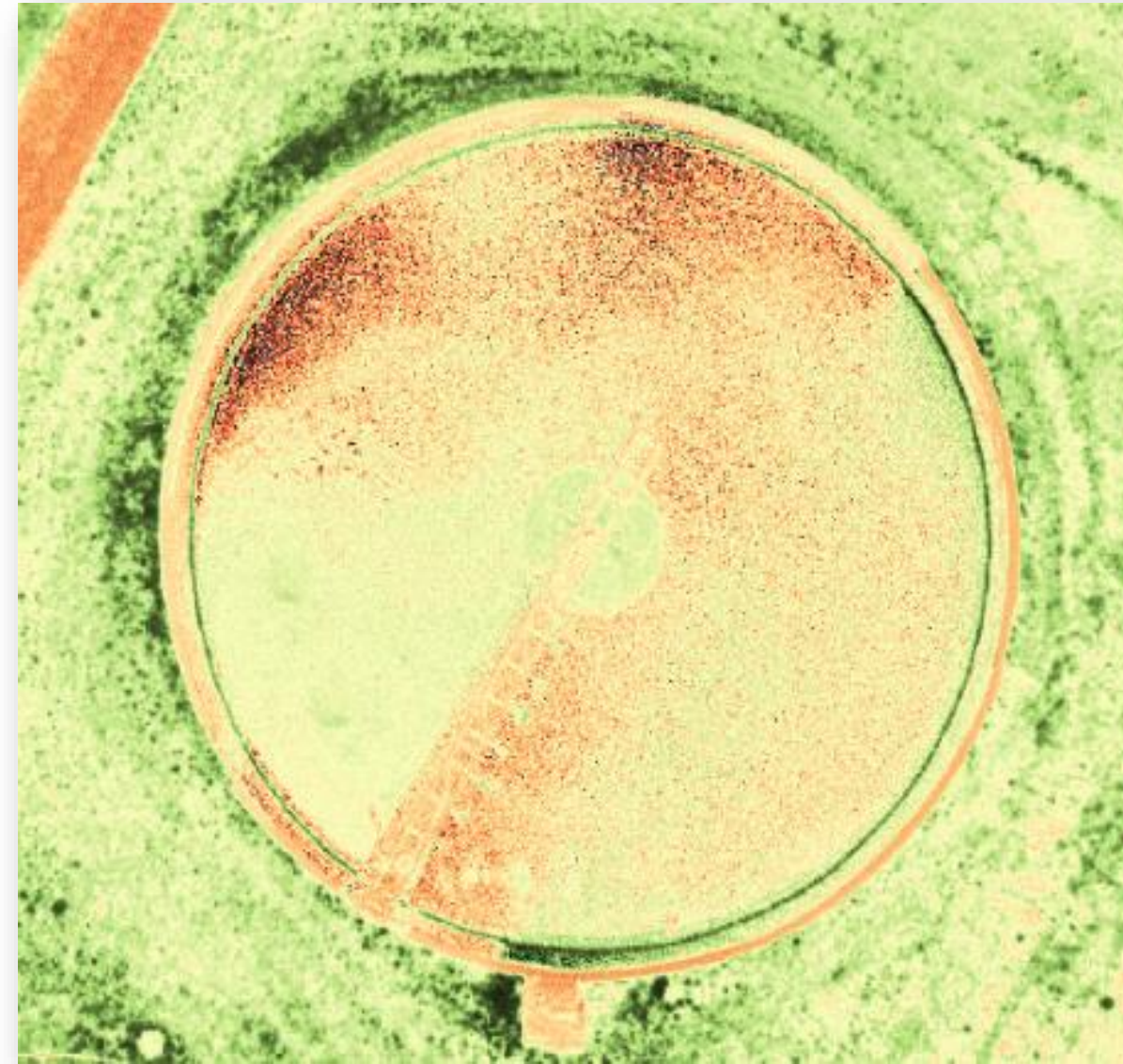
Duration: 80 days

Cause: failure of tunel under
Vistula River

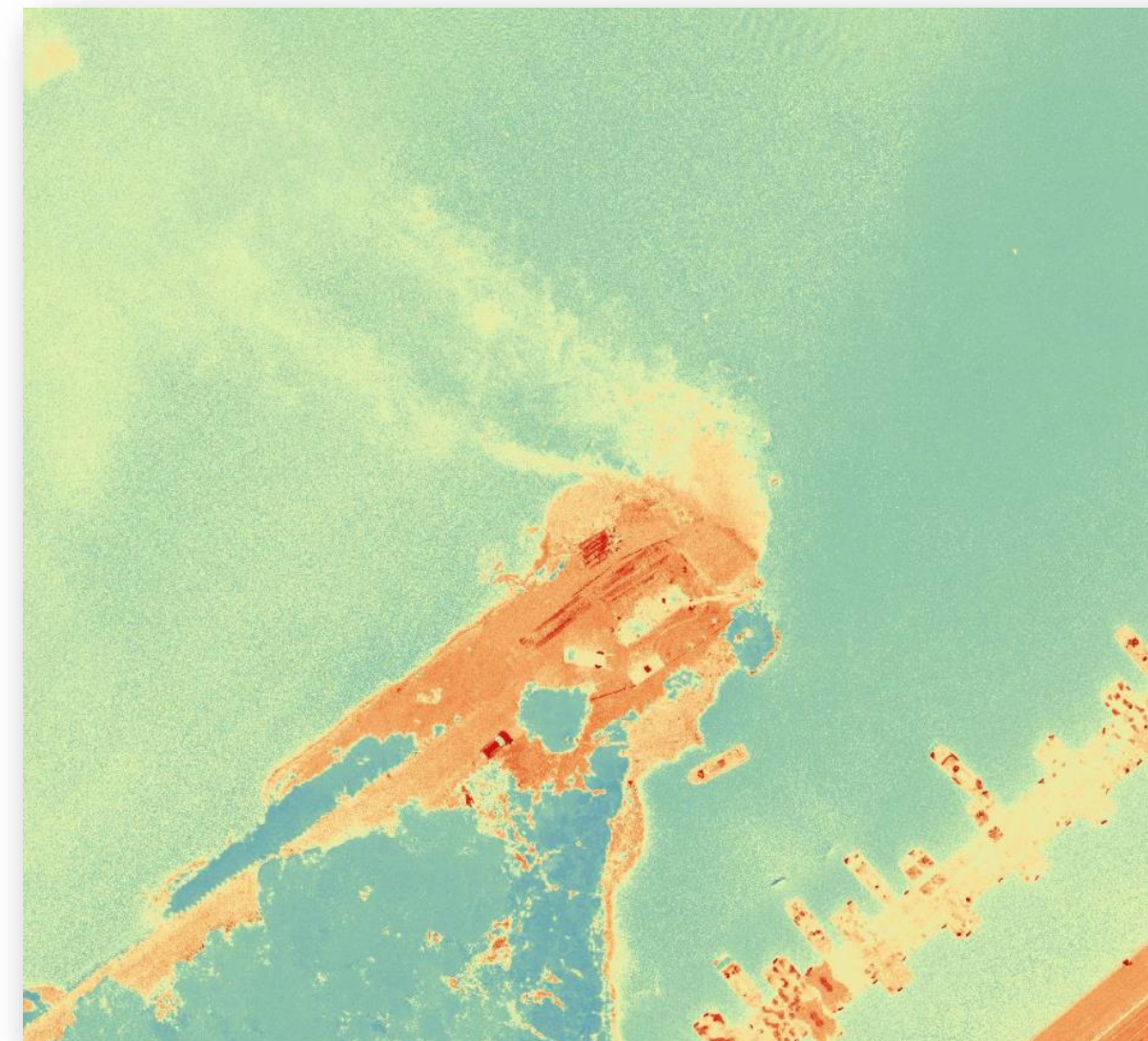
RS indexes used for sewage treatment plant monitoring

RS index	Equation	Monitored element
NDVI	$\frac{717nm - 668nm}{717nm + 668nm}$	Blooms, nitrogen
GNDVI	$\frac{717nm - 560nm}{717nm + 560nm}$	Biological reactions in plant
MSDR	$\frac{840nm / 668nm - 1}{\sqrt{(840nm / 668nm + 1)}}$	Chlorophyl
Red+NIR	$668nm + 840nm$	Turbidite
Red/NIR	$\frac{668nm}{840nm}$	Turbidite
MCARI2	$\frac{1.5[2.5(840nm - 668nm) - 1.3.(840nm - 560nm)]}{\sqrt{(2 * 840nm + 1)^2 - (6 * 840nm - 5 * \sqrt{668nm})}} - 0.5$	Chlorophyl
NDTI	$\frac{668nm - 560nm}{668nm + 560nm}$	Turbidite

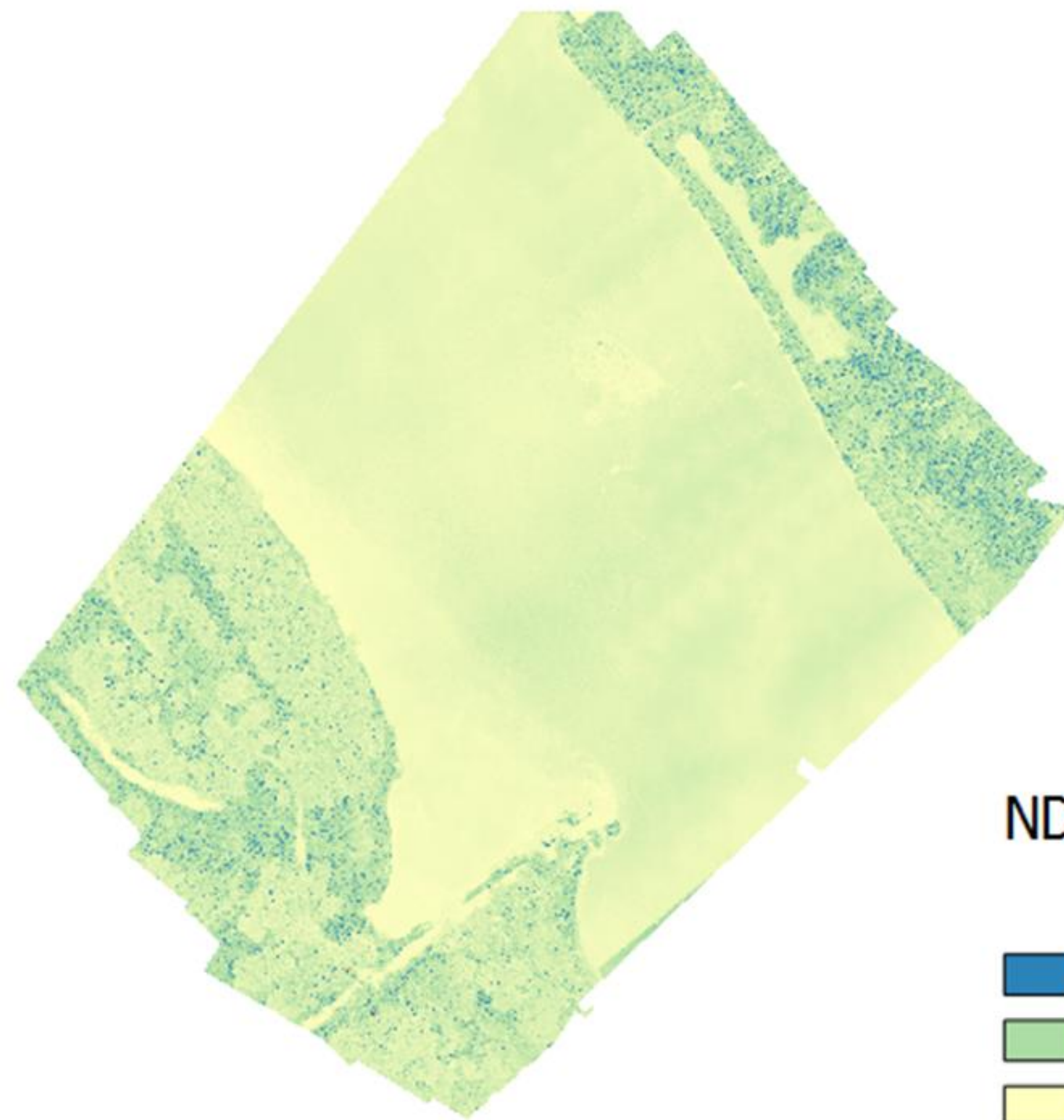
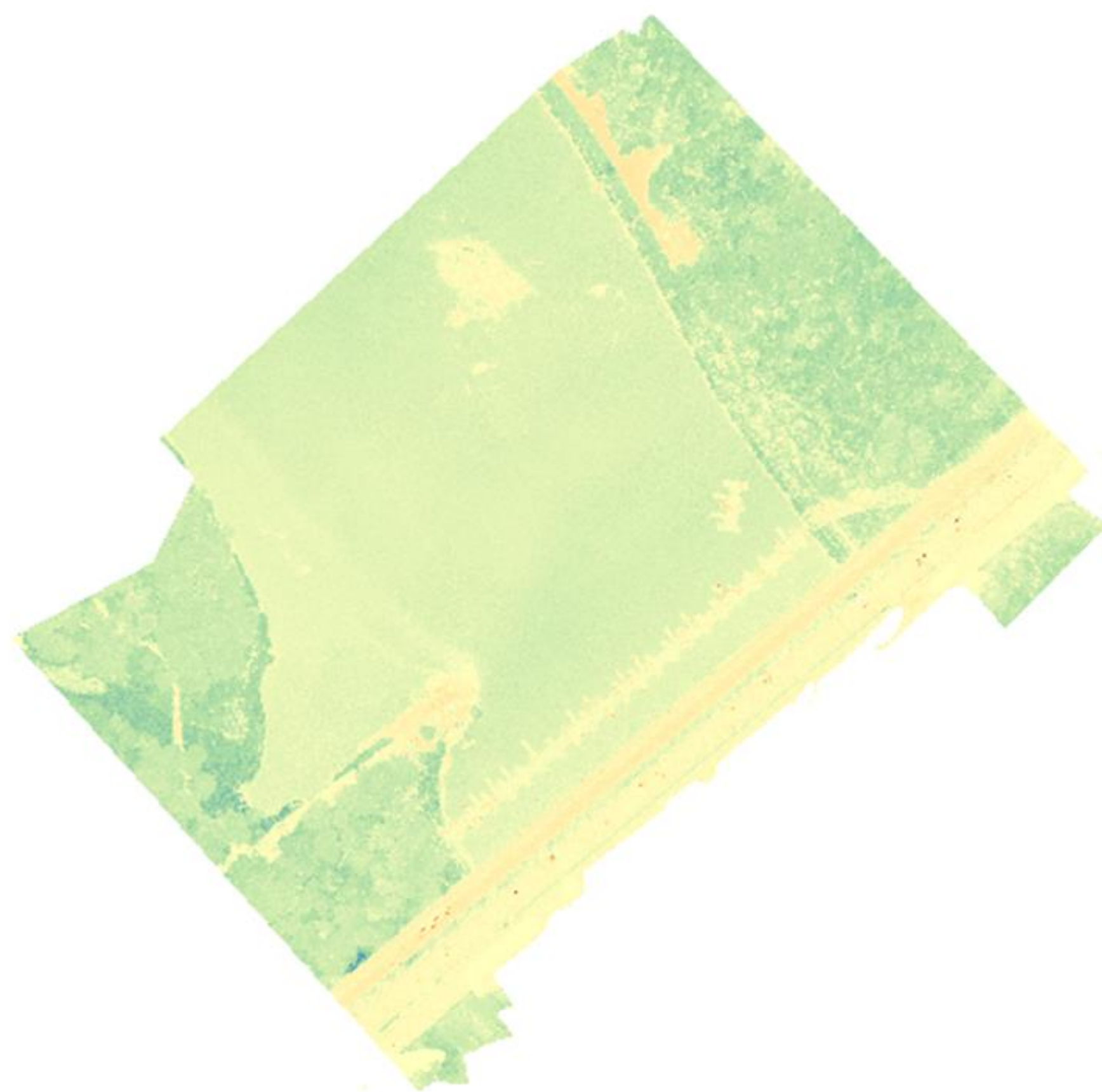
1. Step – sewage treatment plant



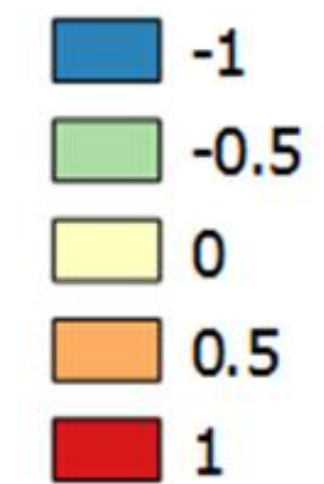
2. Step – in situ imagery




Multispectral camera vs. RGB

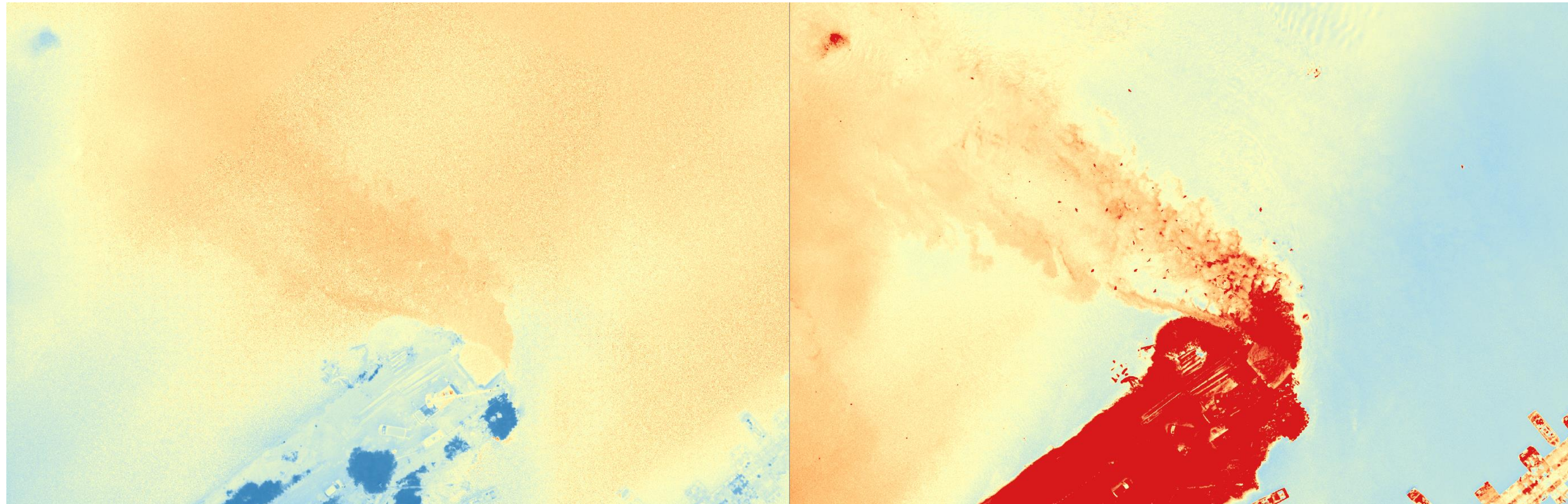


NDTI



0 50 100 150 m

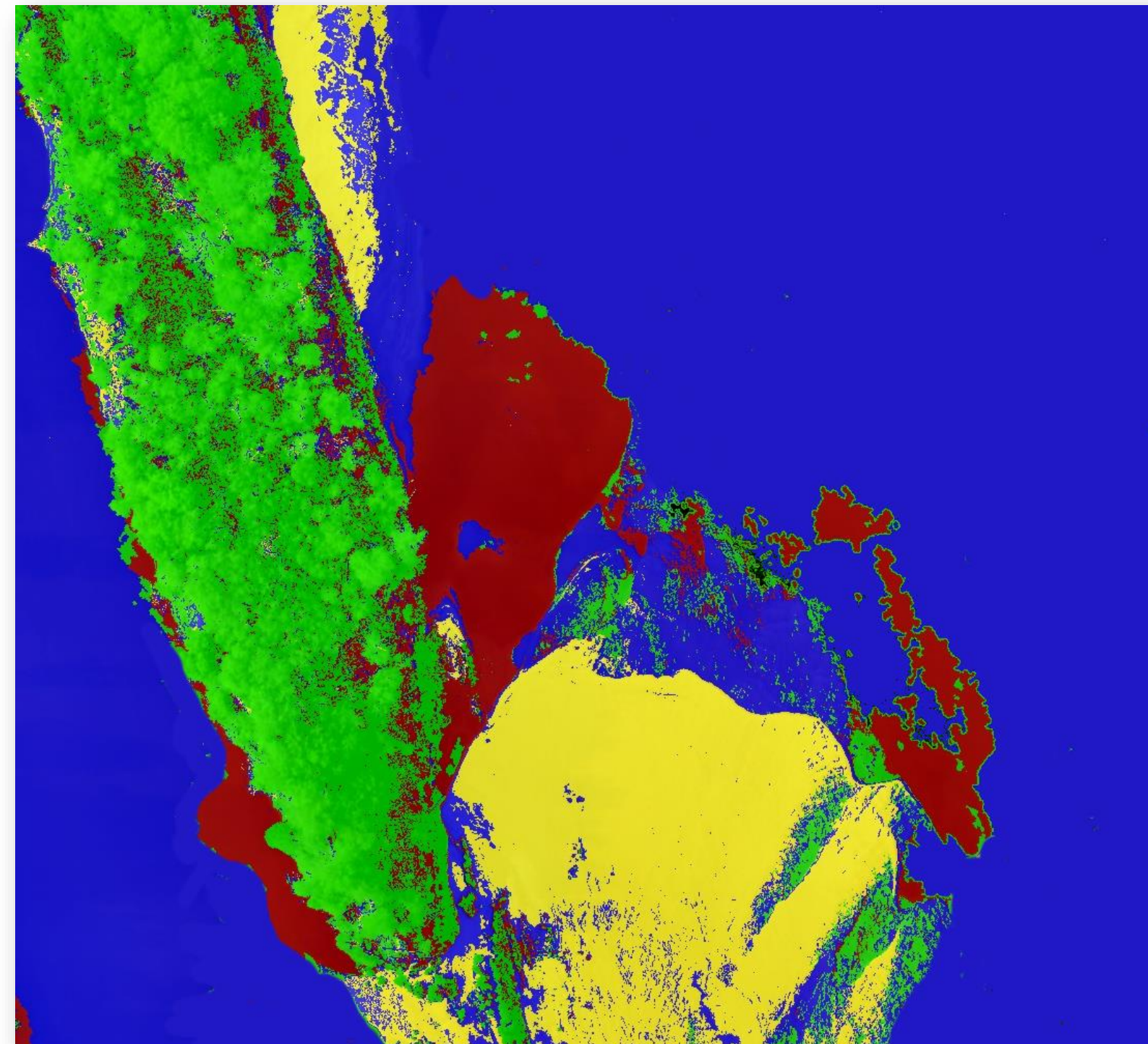
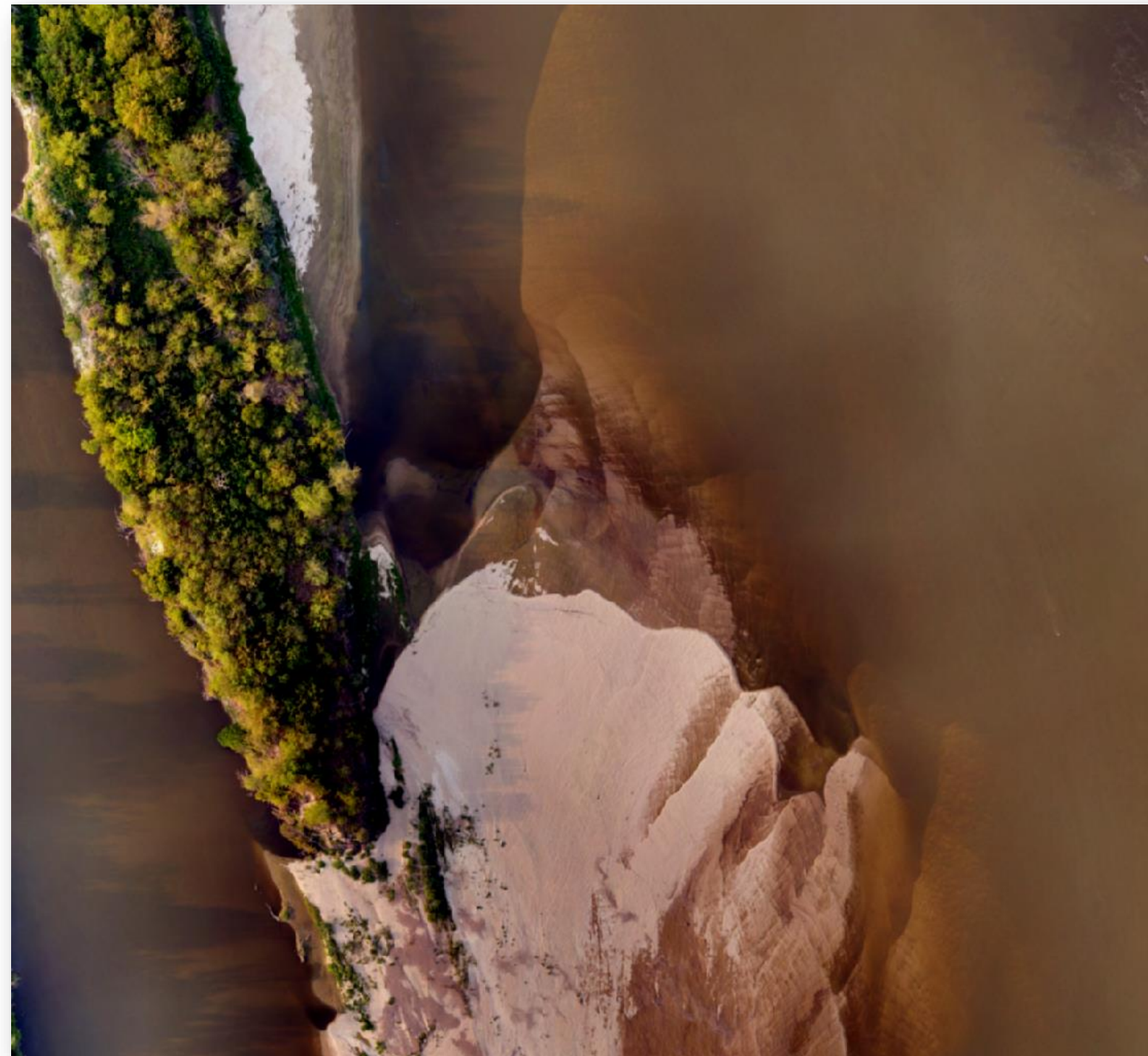




Red/NIR

Red+NIR

Monitoring of environmental effects – looking for sewage dump after-effects





AlgaeService for LIFE, No. LIFE17 ENV/LT/000407

The project AlgaeService for LIFE seeks to promote best practices in ecological service and the circular economics approach by implementing innovative complex system which has both demonstration and innovation character.

Objectives

- To demonstrate integrated efficient management of nutrients and algal nuisance blooms at the catchment scale by harvesting of cyanobacteria scums and macroalgae mats in various types of water bodies (rivers, lakes, the Curonian Lagoon).
- To test and demonstrate the redesigning of waste biomass of cyanobacteria and macroalgae into potential valuable products for sustainable management and recycling of environmental resources.
- To raise awareness to environmental, water quality and health hazard issues among the national governments, local authorities, the business community and society for the continuation and transfer of proposed measures application on a broader scale after the end of the Life project.

COORDINATING BENEFICIARY



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ASSOCIATED BENEFICIARIES



Baltic Environment

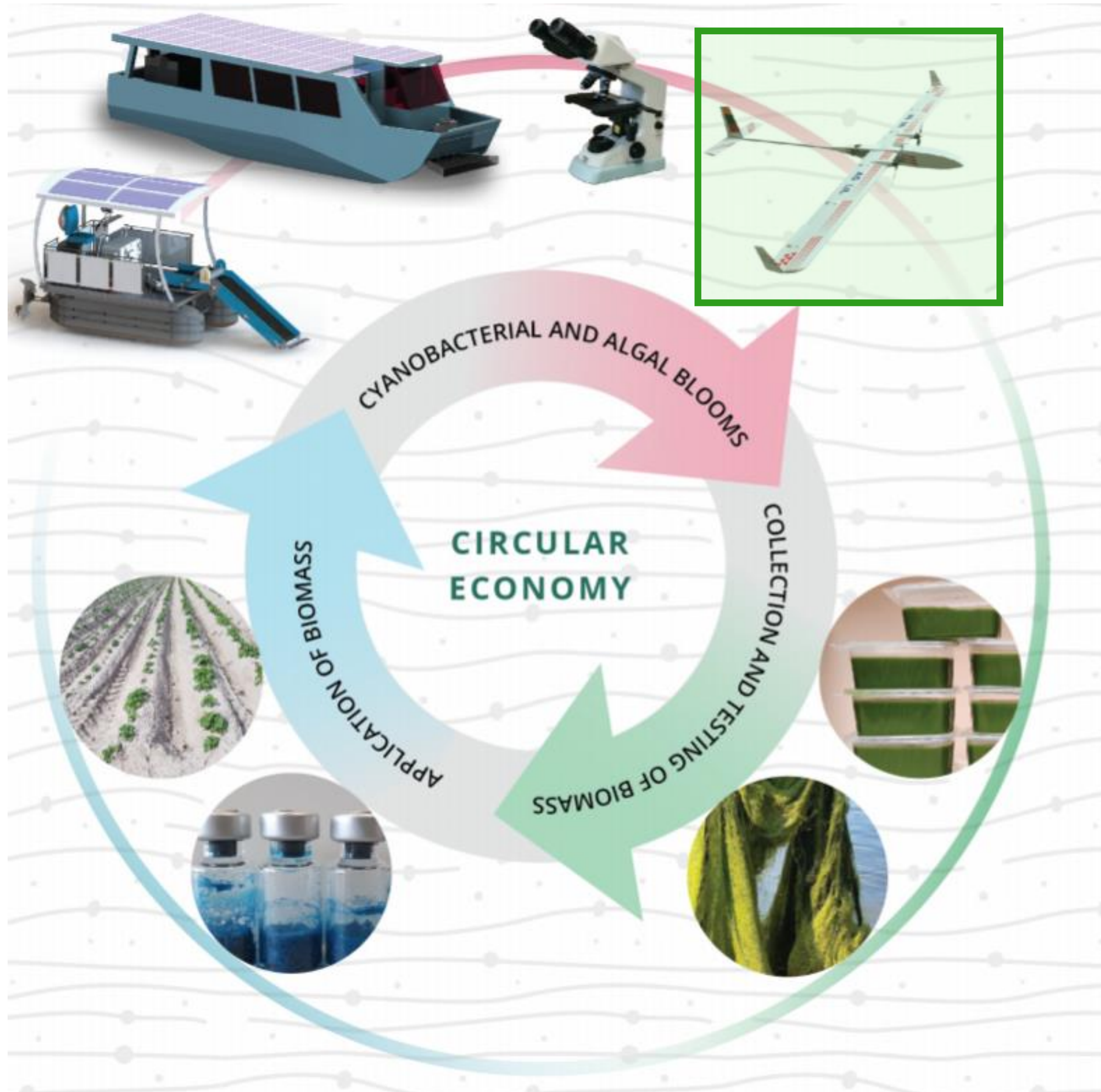


ADAM MICKIEWICZ
UNIVERSITY
POZNAŃ

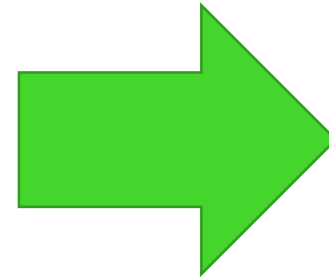


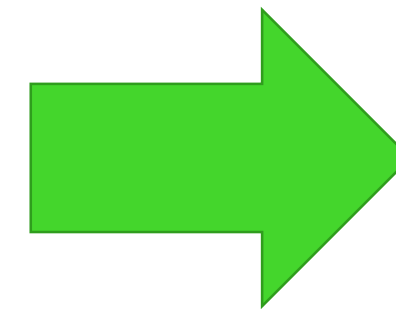
Spila



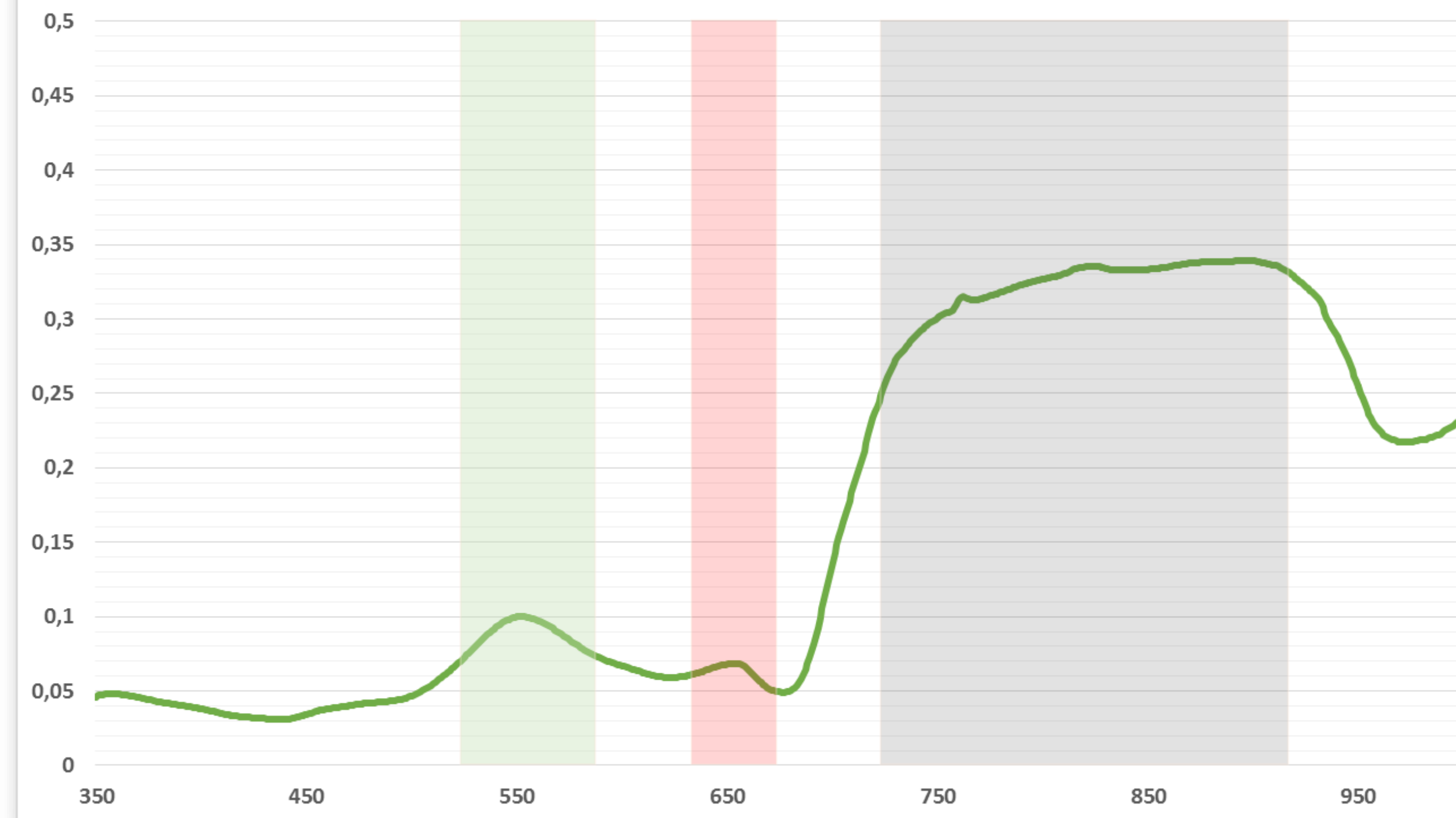


 Algae
Service
for
Life





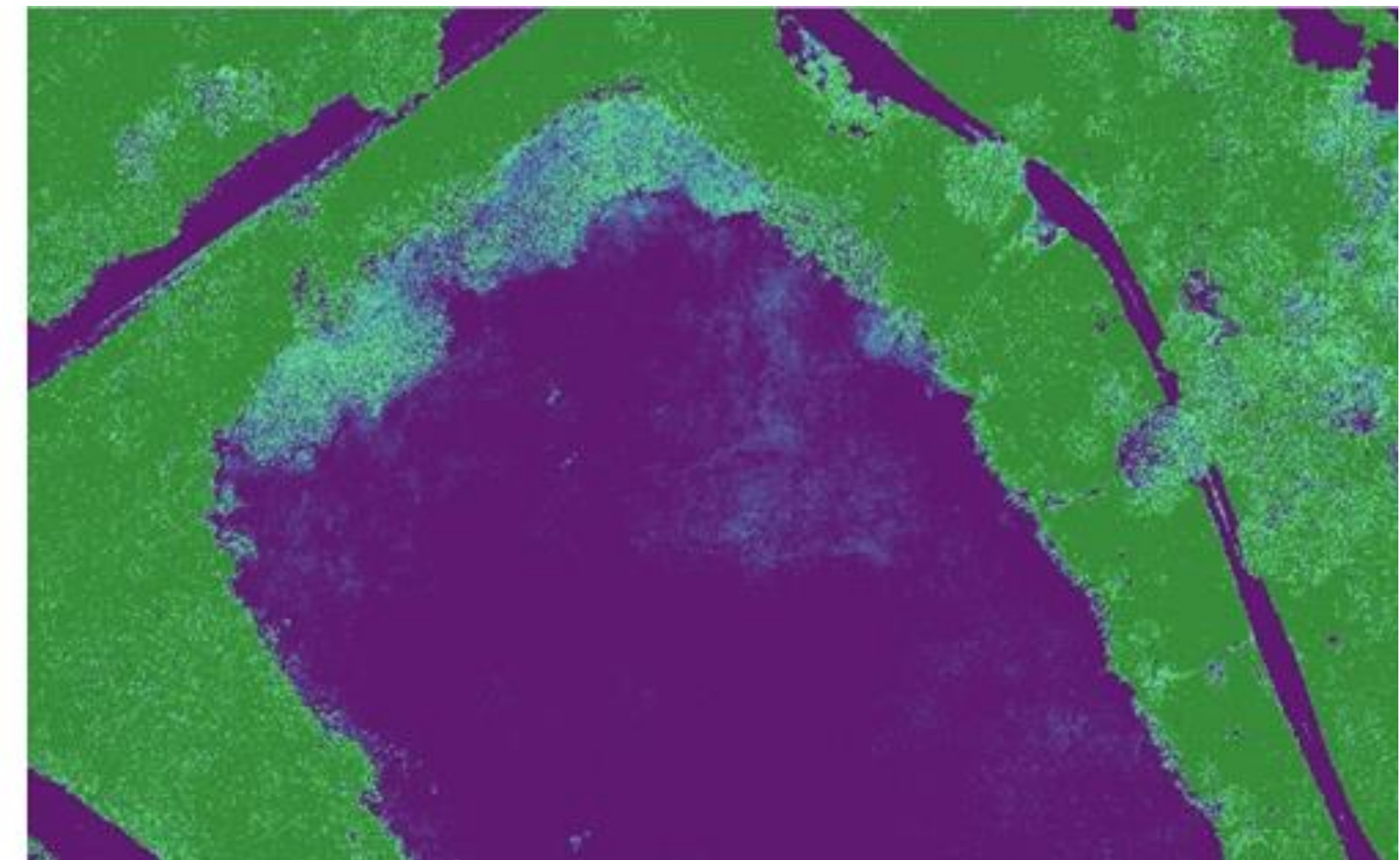
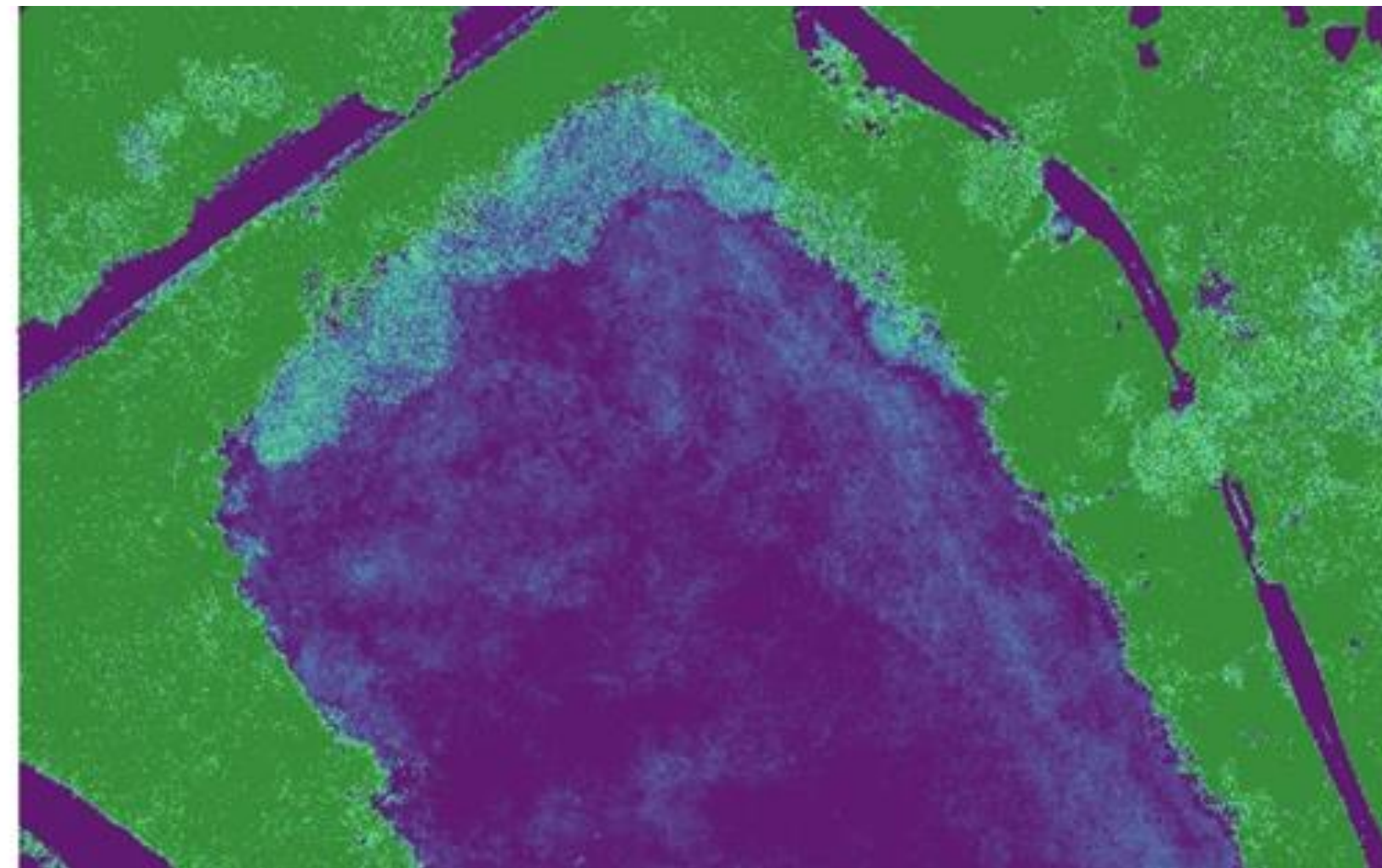
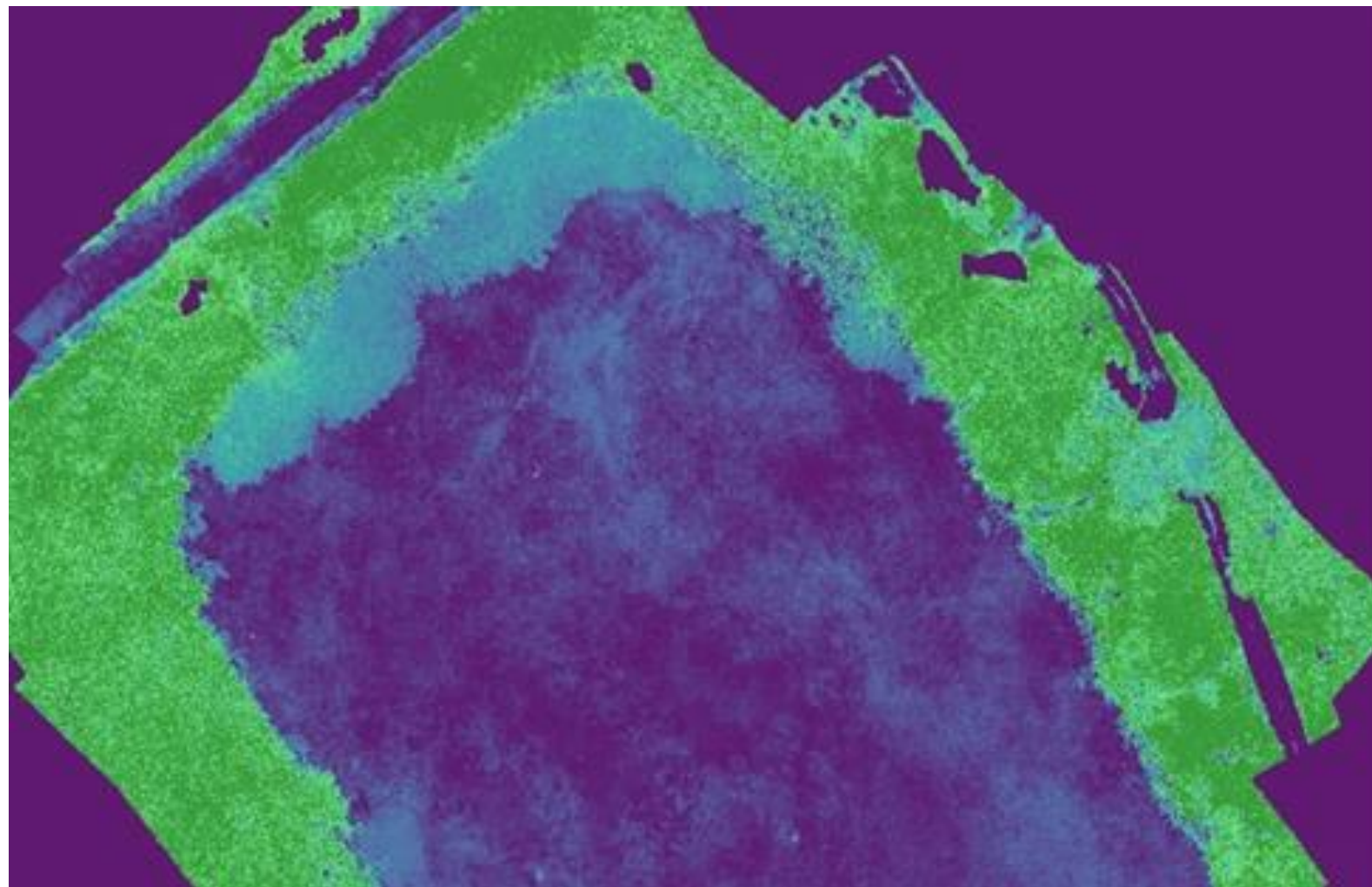
Average reflectance of cyanobacteria in 350-1000 nm range



Spectral Data

Multitemporal analysis

Flights at 10 AM, 11 AM and 1 PM

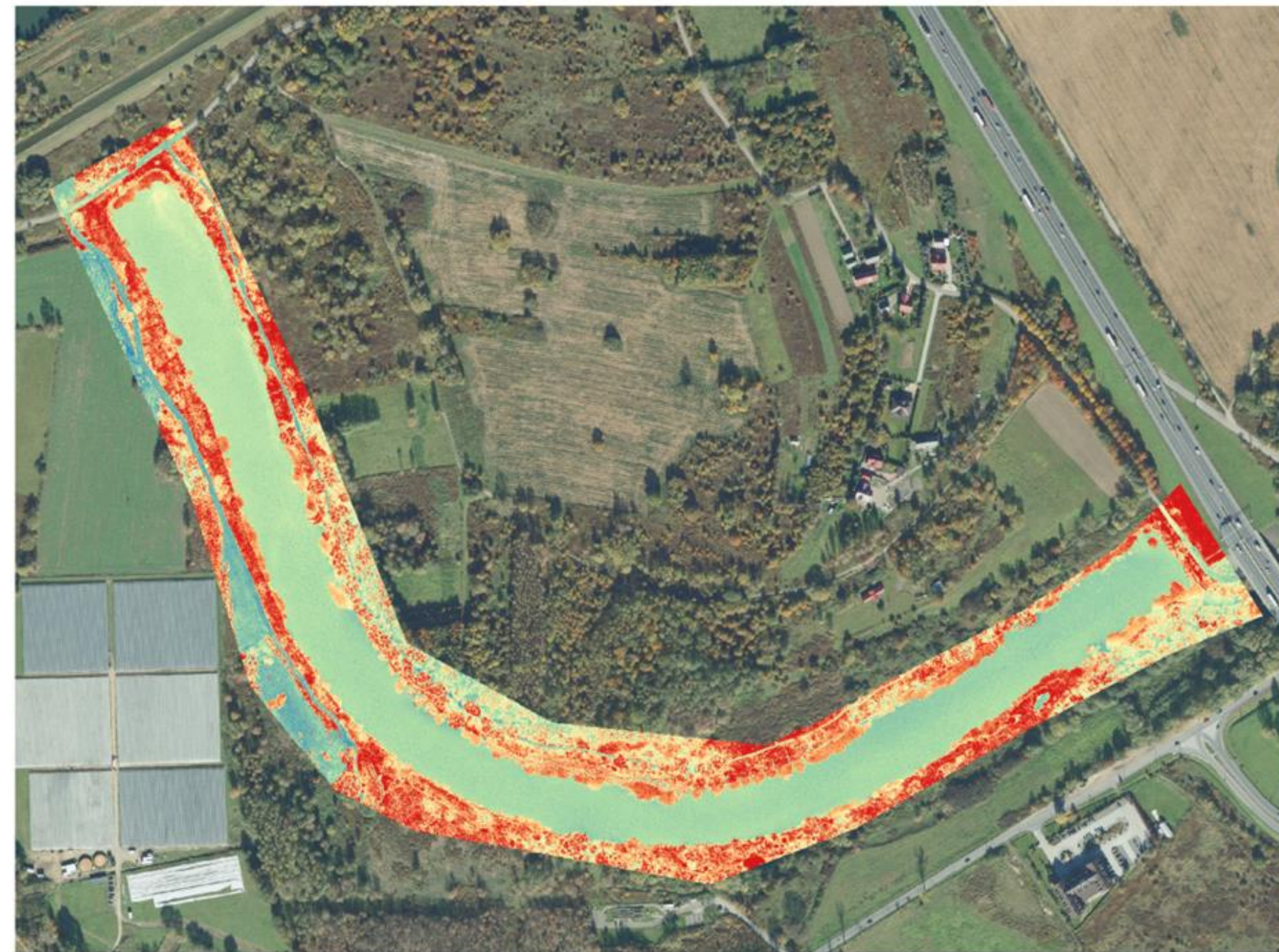


UAV monitoring of cyanobacteria blooms

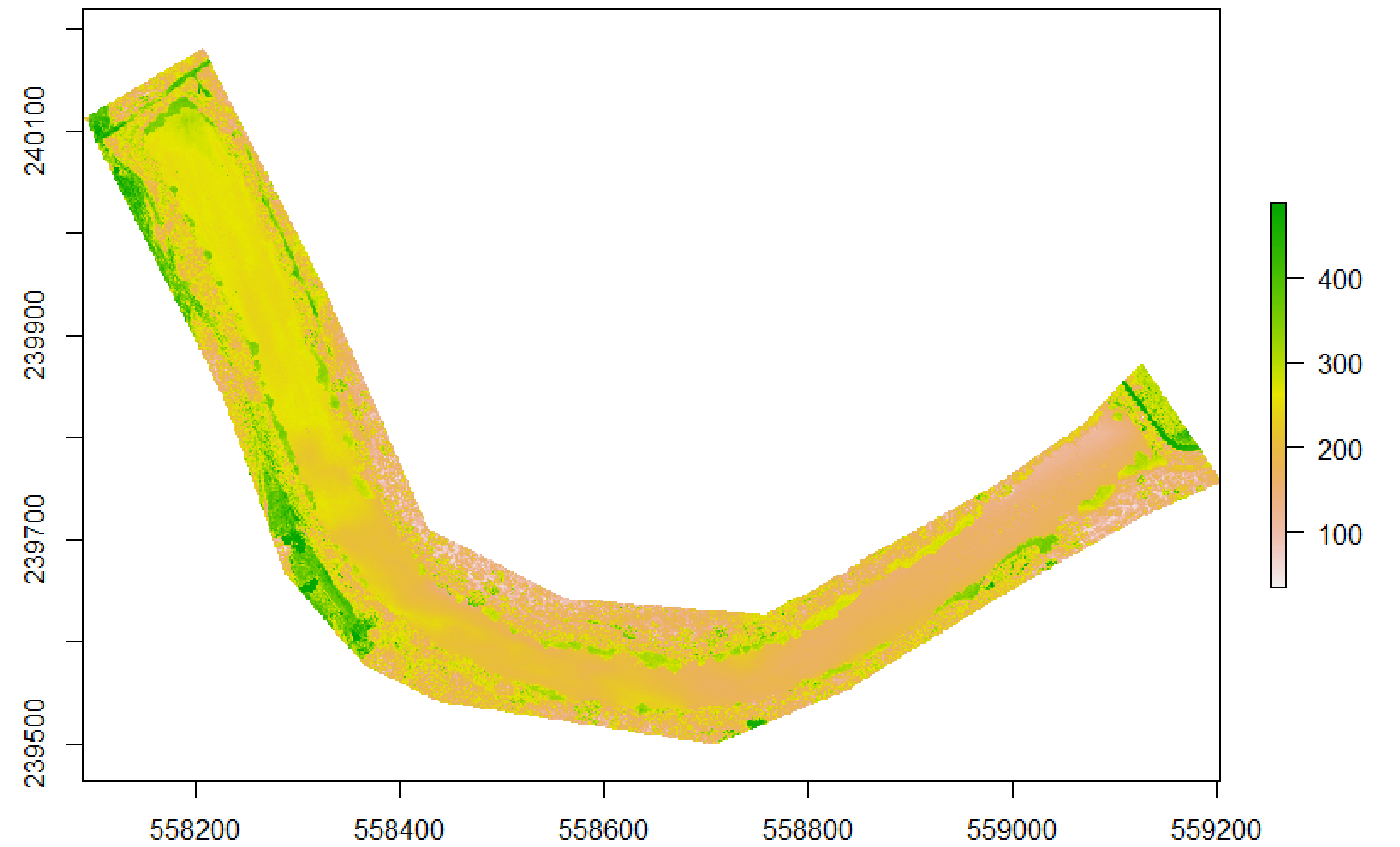
Legend

TGI [DN]

-150
0
5000
25000
55000
80000
120000
140000
175000



100 0 100 200 300 400 500 m



Questionnaire

https://docs.google.com/forms/d/e/1FAIpQLSd3EemWUQLa2iGsos8azU0yO7WIsolzepfUZnnFP21WP_8a-A/viewform



WATER BLOOMS

The project AlgaeService for LIFE is conducting a study on the knowledge about water blooms. Thank you for taking a few minutes to answer the questions below. We encourage you to answer all of the questions, however, you may leave any question unanswered. Your opinion is very important and will be anonymous.

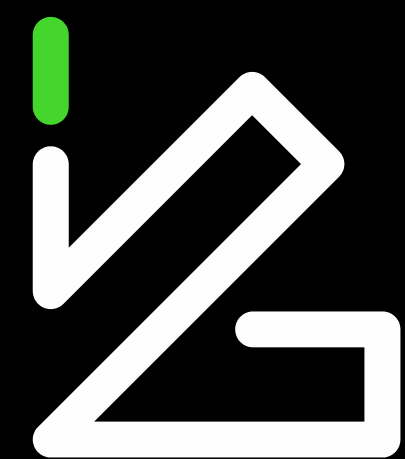
1. Have you ever observed water blooms?

- ☐ Yes
- ☐ No
- ☐ I do not know what the blooms are

**Thank you very much for
your attention!**







Łukasiewicz

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