Assessment of stakeholders' perceptions of satellite based assessment of Cyanobacteria blooms, as a decision support system towards improvement of water management in Romania

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ASSESSMENT OF STAKEHOLDERS' PERCEPTIONS OF SATELLITE-BASED ASSESSMENT OF CYANOBACTERIA BLOOMS, AS A DECISION SUPPORT SYSTEM TOWARDS IMPROVEMENT OF WATER MANAGEMENT IN ROMANIA

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ABSTRACT

Keywords: *CyanoAlert, satellite-based assessment, stakeholders*

Over the past years, there has been significant progress in the field of water quality monitoring that has also introduced new challenges. First and foremost, there is an ongoing development in satellite-based retrieval techniques, accompanied by technological development of the equipment deployed *in situ* to monitor chlorophyll and cyanobacteria. To design and adopt potential adaptation and mitigation strategies for the future, analyses of the current monitoring system that is implemented in Romania are necessary in order to look into the current status of the stakeholders' perception of algal blooms and to promote integration of satellite-based monitoring of cyanobacteria into the existing water monitoring program. The present work aims to assess the overall cost of the *in situ* water quality monitoring programs in Romania with particular focus on algal and cyanobacteria blooms, and evaluate if and how the local/national authorities involved in water quality monitoring are open to potential integration of satellite-based assessments into their programs. A number of challenges were considered, as follows: the level of understanding of such a service; the level of satisfaction and willingness to change existing work protocols; the financial capacity of the authorities responsible for water quality monitoring activities to pay for the costs of such an implementation.

MATERIALS AND METHODS

Data collection was carried out based on the following 20 questions:

Q1. Are you involved in water quality monitoring activities?
Q2. Does the monitoring program include bathing areas?
Q3. If you have economic activities (fishing, aquaculture) have you encountered problems (mortality) due to the massive development of algae?
Q4. Are you satisfied with the structure of the current monitoring program?
Q5. Is algal biomass (phytoplankton) in your opinion an important parameter of water quality assessment?
Q6. How do you estimate the cost of performing the assessment of algal biomass (phytoplankton) analysis?
Q7. Is estimation of chl-a concentrations a relevant and important proxy for total biomass, with respect to your monitoring needs?
Q8. Does the institution you represent / operate with equipment / sites / specialized applications in the rapid prognosis of algal blooms or accidental pollution?
Q9. Have you heard of the satellite assessment of algal blooms?
Q10. What are the benefits of using this assessment (from satellites), in your opinion?
Q11. Do you consider it necessary/useful to include such an assessment in the current monitoring protocol?
Q12. Do you consider that such a service/product would increase the accuracy and/or value of your field assessments?
Q13. Do you think such a service/product could complement your field assessments?
Q14. Which of the following service would your institution be interested in receiving: data files for own interpretation and combination with other information or data processing ; information provided via public web pages; interpreted results such as reporting and analytics; auditing and environmental certification; data layers for webGIS?
Q15. Which delivery channel do you believe would be required by your institute for the CyanoAlert service: web portal; mobile app; online databases; API; tailored information via email?
Q16. Which of the following products would be most useful to you and your institute: chl-a concentration estimates; cyanobacteria presence alerts; floating vegetation alerts; weekly/monthly updates; forecasts?
Q17. Which additional water quality parameters would be of interest for you: suspended matter; coloured dissolved organic matter; turbidity; Secchi Disk Depth; lake water surface temperature?
Q18. What is the budget currently allocated by your institute for water quality monitoring (in specific chl-a and cyanobacteria)?
Q19. Would you include in the institution's budget the purchase of such a system?
Q20. What language would your institute need the CyanoAlert service delivered in?

The survey was carried out during 01.01.-31.03.2019. In the survey have been involved the following category of stakeholders: regional (R) water management authority; research institutions and universities (RI&U), NGO and private companies (Others).
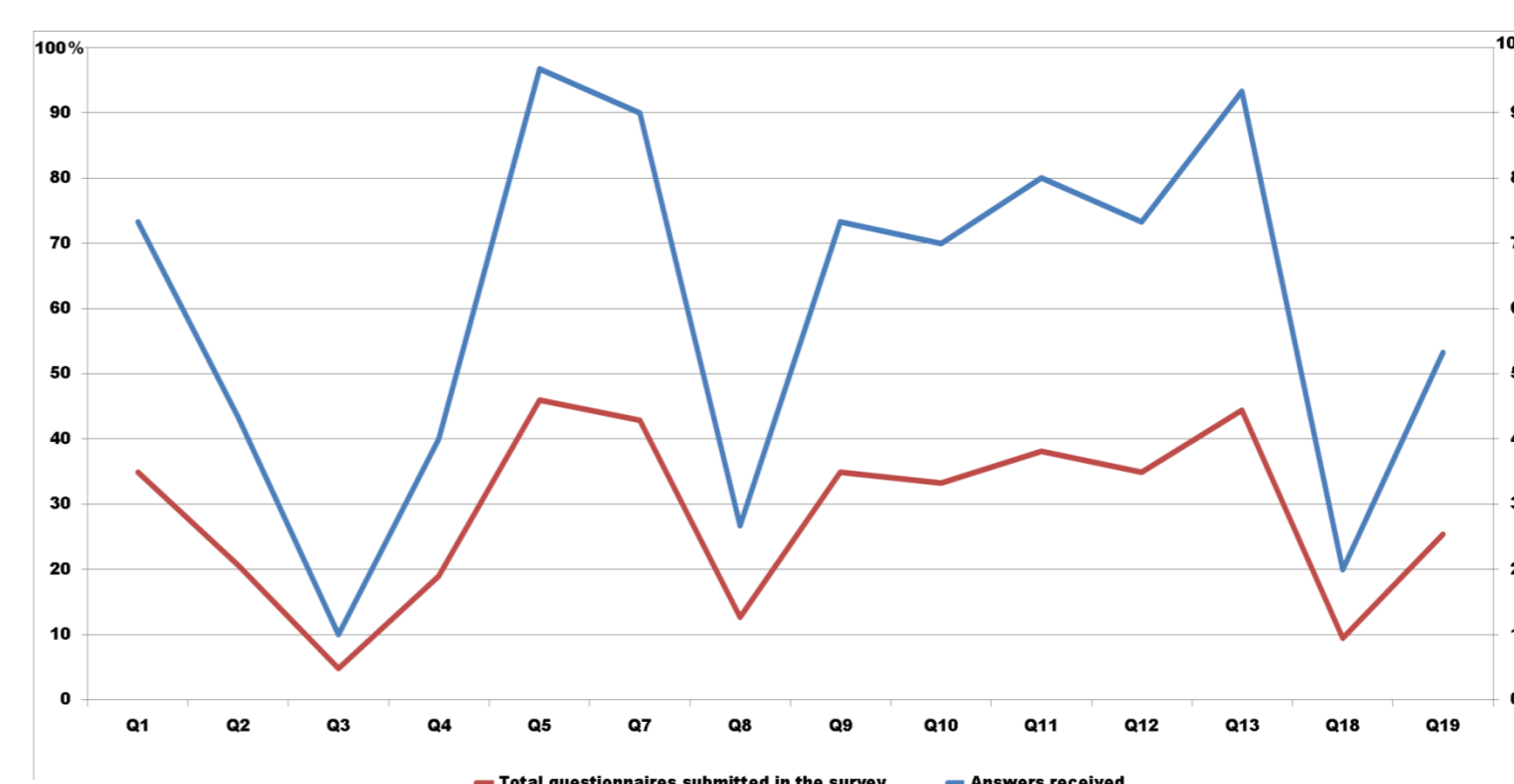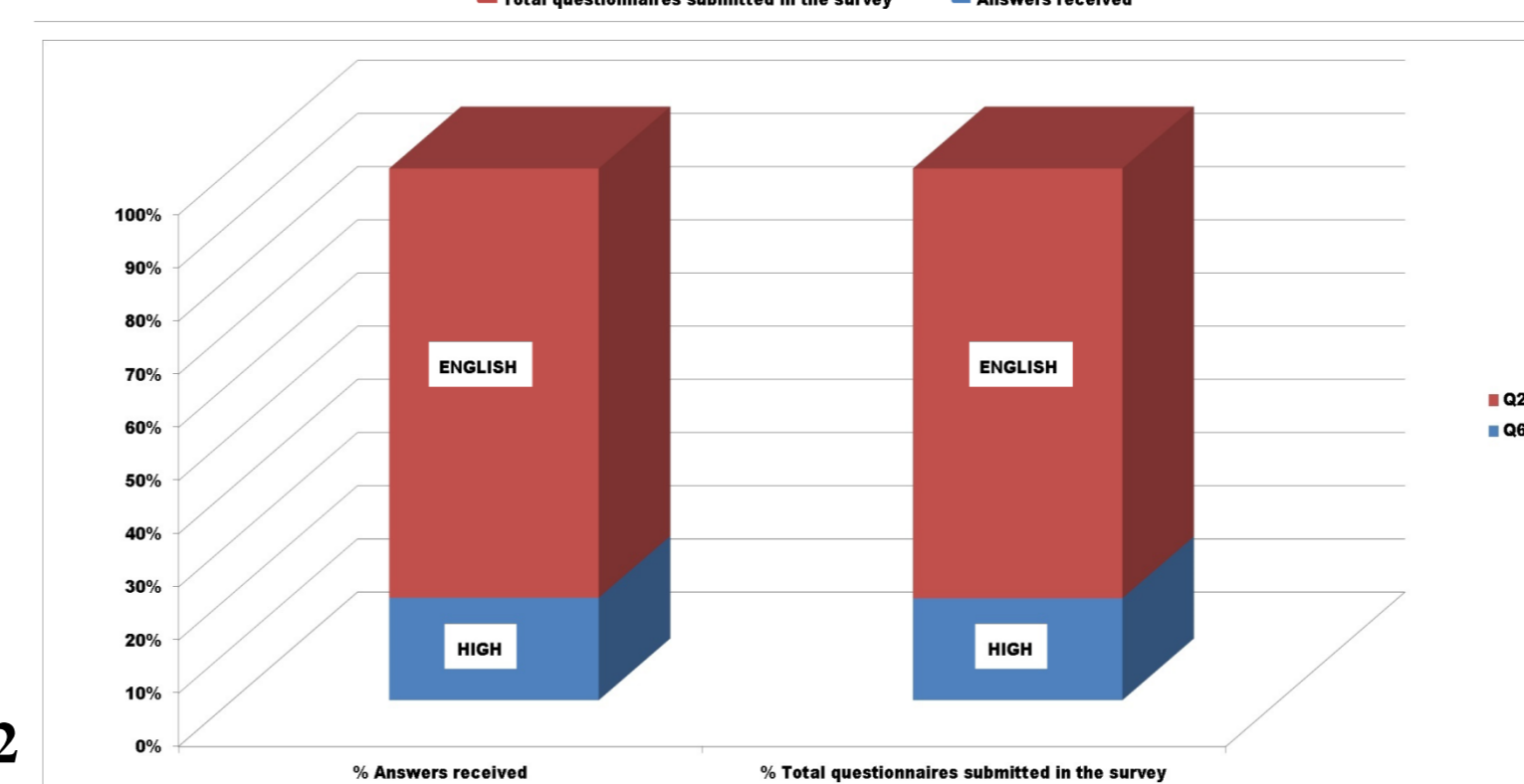
RESULUTS

Fig.1

Fig.2

To the Yes-No questions (**Fig.1**) the respondents gave the affirmative response in case of Q3, Q18 between 1-25%; between 25-50% (Q8, Q4, Q2); 50-75% (Q19, Q10, Q9, Q12, Q1); between 75 -100% (Q5, Q7, Q11 and Q 13).

In case of Q6 related to the cost for the assessment of algal biomass few of the respondents consider that the cost are high (**Fig.2**)

In case of Q20 the respondents choose the language for CyanoAlert services, English.

The most appreciate deliverable channels in case of regional water management authority (**Fig.3**) interpreted results such as reporting and analytics (status, trends and changes) (47.36%) and were data files for own interpretation & combination with other information or data processing (39.13%).
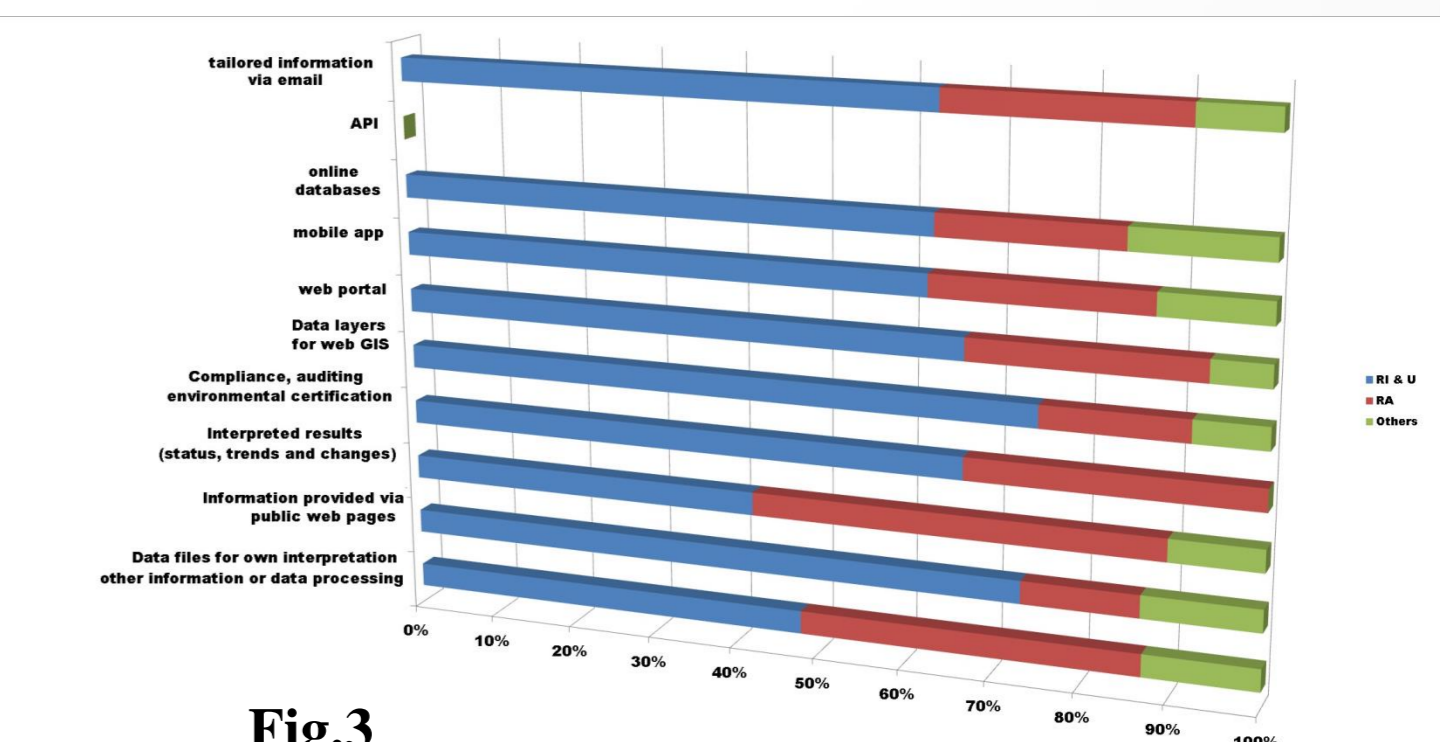

Fig.3

Of the total number of questionnaires submitted during the investigation, only 23.8% of the questionnaires sent to the Regional Water Management Authority were returned
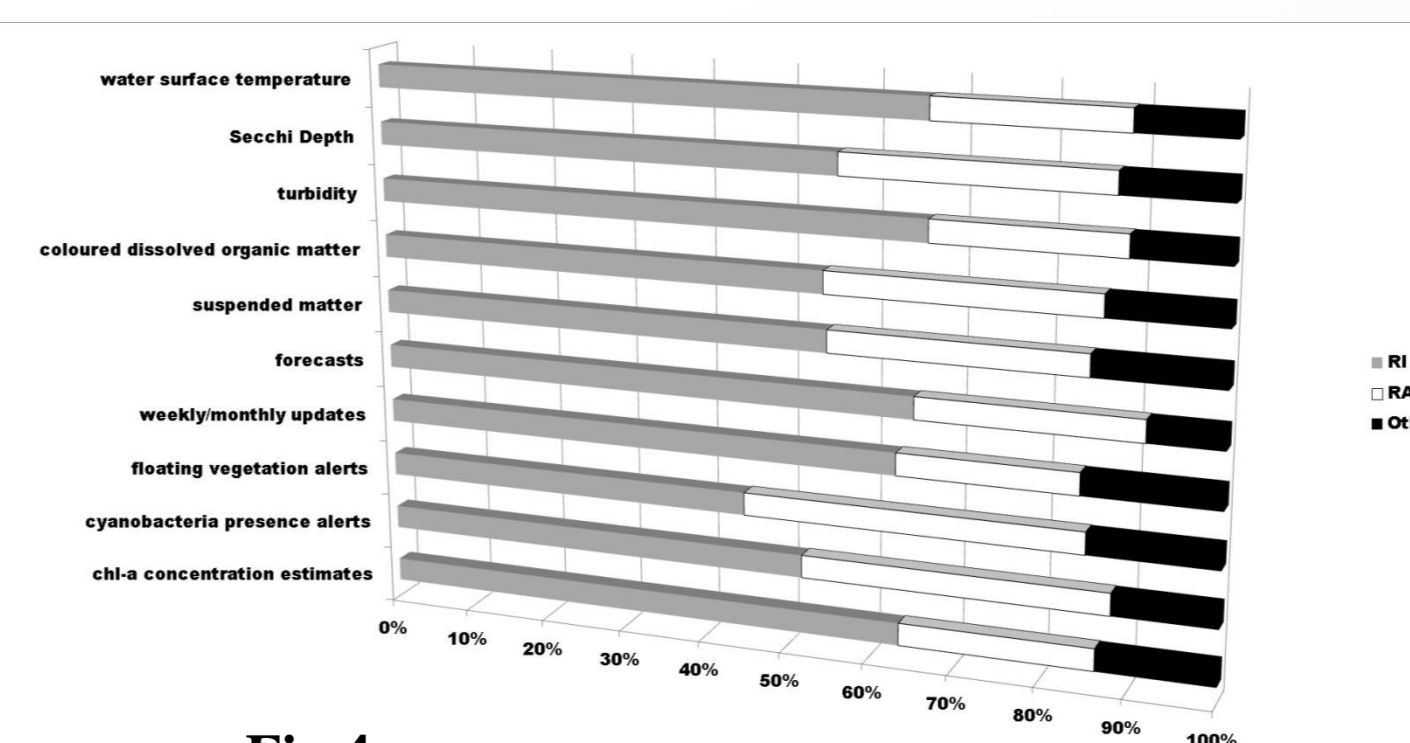
Fig. 4. show relatively low interest in satellite services regarding cyanobacteria presence alerts about 36% of the respondents from regional water management authority compared to research institutions and universities (52%).

Fig.4

CONCLUSIONS

From the evaluation of the stakeholder attitude on satellite assessment of water quality, have been identify the following characteristics: the lack of knowledge regarding the benefits of the satellite based assessment of cyanobacteria blooms; low form of engagement in case of water management authorities, in this case the adopted strategy was not able to reach the target audience; high degree of consensus regarding the benefits and an open-end channel of communication and negotiation.