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A HORIZON SCAN OF EMERGING TECHNOLOGIES FOR ALIEN SPECIES CITIZEN SCIENCE

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INTRODUCTION

Citizen Science (CS) or community science significantly contributes to the study and management of biological invasions. Public participation in research and management boosts awareness, engagement, scientific literacy and can reduce conflict in invasive species management. Technological developments such as social media, internet scraping, eDNA, apps, sensors, search engines and predictive analytics, can foster projects and increase their reach. The list of technologies is long and their potential for alien species citizen science is unclear. **To help research funders and project initiators, we performed a horizon scan on the value of emerging technologies for alien species citizen science.**

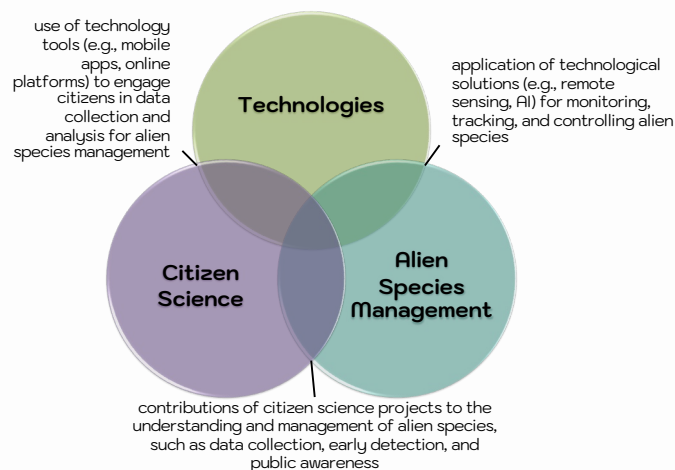
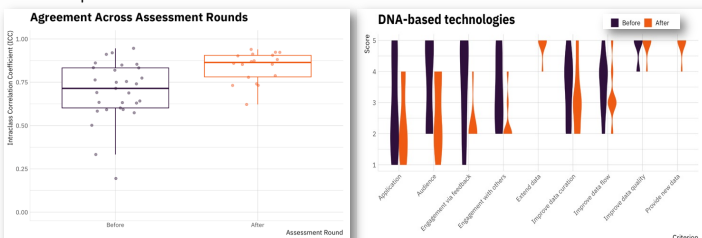
Assessment criteria

- **Audience:** the technology can attract new target audiences for IAS citizen science and/or support more inclusivity in IAS citizen science (can overcome inequalities in participation, attract under-privileged audiences/those underrepresented in the scientific enterprise, allow participation of sensory/cognitive/otherwise impaired...)
- **Engagement with others:** the technology supports better connections with other participants, helpful in building a community
- **Engagement via feedback:** the technology increases the quality, amount or rate of feedback (including supporting learning) to participants
- **Application:** the technology can be embedded in everyday life and therefore has the potential for wide, generic application
- **New data:** the technology yields new types of data that would not be available without the technology (improved the detectability of IAS, new types of data, species interactions, new information sources)
- **Extends data:** the technology expands the scope of data collection or analysis (e.g. better coverage spatially, temporally)
- **Improves data quality:** the technology improves species ID, reduces uncertainty, improves validation
- **Improves the flow of data:** the technology increases the speed of record transmission (e.g. for early warning)
- **Improves the curation of data:** the technology itself allows for improved data curation (better metadata, sustainability and long term preservation data, open data, tracked provenance of data, FAIR data management, enable to better credit citizen scientists for their data contributions)

Expert elicitation

A network of 44 experts from the COST Action Alien-CSI identified potentially useful technologies, discussed assessment criteria and assessed 39 technologies against them

- Assessors rated the usefulness of technologies on a 5-point Likert scale
- Technologies were assessed by on average 8 different experts (min 4, max 12)
- Consistency among assessments was explored using inter-rater reliability metrics (Intraclass Correlation Coefficient, Krippendorff's alpha, Fleiss' Kappa), violin plots and ordinations
- Experts discussed inconsistent ratings and re-assessed technologies (Delphi method)



RESULTS

- Mobile-based data collection platforms and social media were the top-ranking technologies in support of invasive species CS
- Technologies differed in their potential when considering individual criteria, e.g.
 - DNA-based technologies ranked high on acquiring new data
 - Open data technologies scored high on improving data quality
 - Virtual reality and gamification scored highly for their potential to increase engagement



DISCUSSION AND CONCLUSIONS

- The horizon scan identified and assessed emerging technologies for alien species CS
- The results provide guidance for research funders and project initiators on the potential of these technologies
- Increased consensus on the potential of different technologies was achieved through expert discussions

The findings highlight the value of emerging technologies in fostering CS projects and improving the management of biological invasions

Useful References

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