Citizen science and Flemish scientists:

evolutions in knowledge, opinions, and attitudes

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Summary

In a survey of 119 Flemish scientists, we asked about knowledge, opinions and attitudes about citizen science. We compared these results with an earlier study by the Young Academy (2015). This shows, among other things, that citizen science has become more widely known, that involvement in a citizen science project correlates positively with a positive appreciation of citizen science, but that scientists also have a great need for support when starting up their own citizen science project. We formulate a number of recommendations on this.

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1. Introduction

Citizen science is on the rise. Consider, for example, projects such as Curieuzeneuzen[1] (Curious Noses), in which citizens help to measure air or soil quality. Or take Telraam[2], a project in which citizens place a smart sensor behind their windows to map out traffic. It seems that projects like this are becoming more and more popular and more and more citizens are willing to participate. Researchers themselves also seem to be increasingly open to a citizen science approach. To investigate this evolution, Scivil, the Flemish Knowledge Centre Citizen Science, in collaboration with the Jonge Academie[3] (Young Academy) and the platform Iedereen Wetenschapper[4], (Everyone Scientist), conducted a survey among Flemish scientists about their knowledge, experiences and interest in citizen science. The survey was widely disseminated through the channels of the Young Academy and Flemish research institutes. The survey was deliberately not distributed through Scivil's channels in order to limit the bias in the data. After all, Scivil mainly reaches scientists who are already interested in citizen science, while with this survey we wanted to map the general interest in citizen science among all Flemish scientists.

In 2015, a similar survey was conducted among Flemish scientists by the Young Academy[5]. We would therefore like to view the results of our study in the light of this survey, in order to gain insight into the evolution of scientists' perception of citizen science.

[1] https://curieuzeneuzen.be/, https://media.nature.com/original/magazine-assets/d41586-018-07106-5/d41586-018-07106-5.pdf
[2] https://telraam.net/
[3] https://jongeacademie.be/
[4] https://www.iedereenwetenschapper.be/
[5] Soen, V., Huyse, T., Jonge Academie (2016). Citizen Science in Flanders: You count!? (U telt mee!?)

2. Participants

A total of 119 participants completed the survey. The youngest participant was 21 and the oldest 93 (M = 45.1, SD = 16.4). 47 participants were women (39.5%). There are fewer participants than the 2015 survey and the average age is higher with a greater spread (2015: 374 participants, M = 35.3, SD = 12.0). The number of women is slightly lower (2015: 45.9% female).

Scientists from different scientific domains took part. Social sciences and humanities were the most represented, followed by exact sciences, biomedical and medical sciences, and technical sciences (see figure below), which is in line with the 2015 survey.

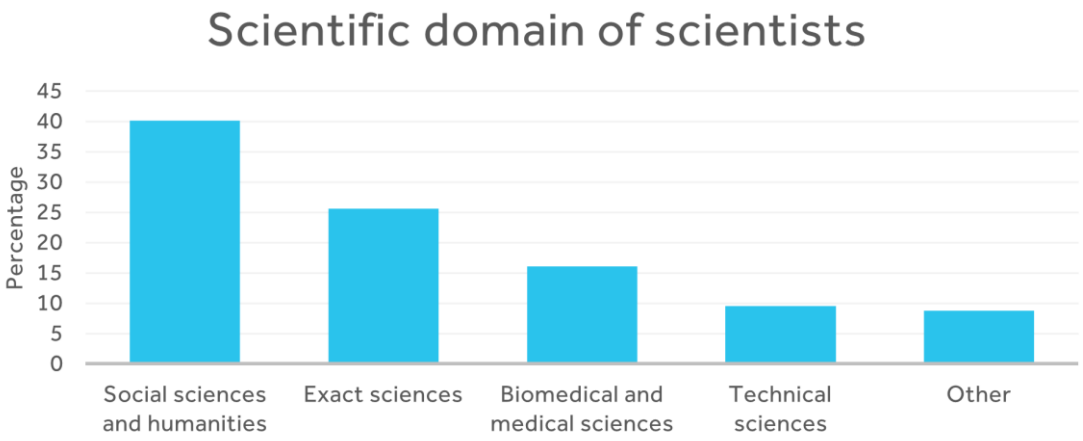

Figure 1. Scientific domain of the scientists.

The positions of the scientists were also diverse. For example, the survey was completed by professors and full professors, lecturers and senior lecturers, doctoral students, postdoctoral researchers, and retired academics. A number of other profiles also took part, including students and field researchers.

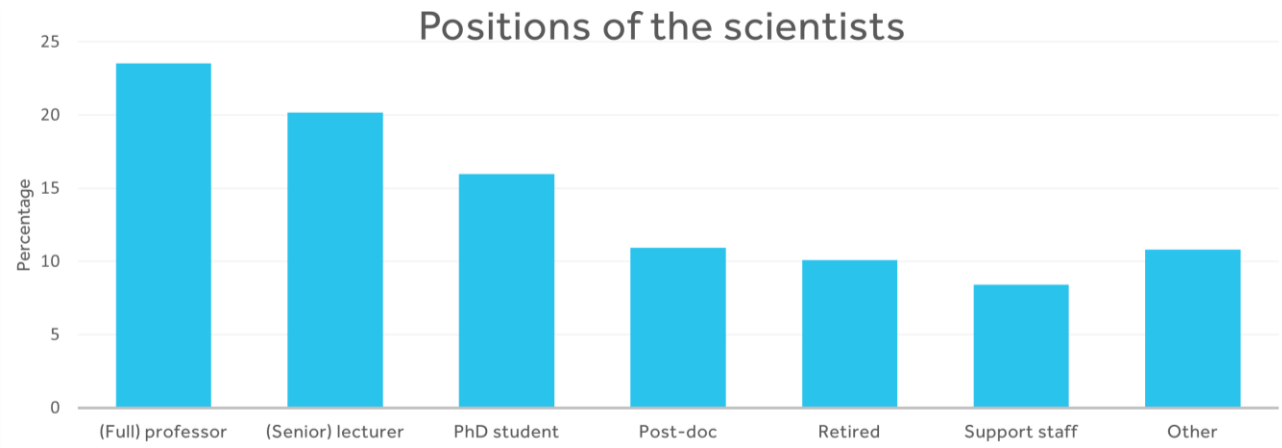

Figure 2. Positions of the scientists.

3. Knowledge about citizen science

Almost three in four participants indicated that they know what citizen science means (73.5%). In addition, 16.2% indicated that they had already heard of it, without knowing exactly what it stands for. Only 10.3% said they had not heard of citizen science. This is in stark contrast to the 2015 survey, where only 22.2% of the participants indicated that they knew citizen science and the majority (58.9%) were unfamiliar with the concept. The concept of 'citizen science' therefore seems to be much better known.

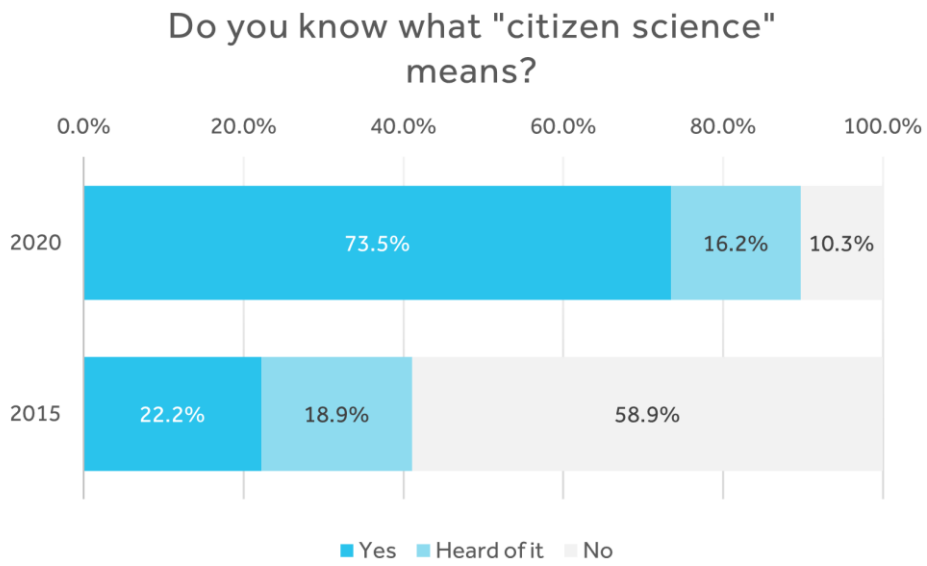

Figure 3. Knowledge of citizen science.

In our survey, women more often than men indicated that they were aware of the concept. The concept was also most familiar to participants between the ages of 30 and 50. There were no notable differences between the various scientific domains.

The participants who did not know what citizen science means or had not yet heard of it, were given the following explanation of the term:

"Citizen science is scientific research conducted in whole or in part by non-scientists (citizens), often in collaboration with or under the guidance of professional scientists. The citizen scientists are therefore not only test subjects or respondents in a survey, they themselves also perform scientific actions in the research. Some examples of citizen science; it can involve measuring local air quality or traffic (e.g. Curieuzeneuzen or Telraam) but also counting or observing plants, animals or other things in your environment (e.g. The Great Shell Counting Day or Street Poetry). Some projects, on the other hand, require the analysis of scientific data, photos or historical texts (e.g. Radio Meteor Zoo or Getuigenissen)."

After this explanation, we asked them if they knew of an example of citizen science. Subsequently, 83.9% of this group gave an example, and only 16.1% did not. In summary, we can say that the vast majority of scientists are familiar with the concept of citizen science or have at least heard about a citizen science project.

We asked the scientists who did know what citizen science is if they could explain what it means themselves. 82 participants (68.9%) answered this question. The overview below (in Dutch) shows which words they used the most. The words most often used were 'burgers' (citizens), 'ondezoek' (research), 'wetenschap' (science), 'data' (data), 'verzamelen' (collect). The Flemish

scientists surveyed seem to frame citizen science mainly if it involves citizens in scientific research and data collection. Although data collection is a well-known activity to involve citizen scientists, it is by no means the only way to involve citizens. Citizens can also contribute in other ways, for example when setting up a study or reporting it, elements that were less often reflected in the scientists' answers.

Figure 4. Word cloud definition.

4. Experience of citizen science

We asked participants if they had previously been involved in a citizen science project, either as a participant or as part of their professional activity. This was the case for two out of five (41.4%). There was a wide variety of projects, with 'Curieuzeneuzen' (Curious Noses) being the most mentioned (see figure below).

Figure 5. Word cloud citizen science projects.

We also asked which projects people had heard of, without necessarily participating themselves. The surveyed scientists could name a maximum of three projects. Again, Curious Noses was the

most popular answer here (30 times), followed by Airbezen[6] (18 times) and Het Grote Vogeltelweekend[7] (The Large Birdcount Weekend) (9 times).

Where scientists had already participated in a citizen science project as part of their professional activity, this was generally very positively experienced. 21 of the 22 participants for this question (95.4%) answered with a positive score, including 11 (50.0%) “very positive”. Only 1 respondent (4.6%) answered with a negative score (see figure below). These results are in line with the 2015 survey, where the scientists also found their contribution to a citizen science project mostly positive.

Collaboration with citizen scientists was also generally found to be positive. 17 participants (77.3%) gave a positive score for this, only 2 participants (9.1%) answered neutrally and 3 participants (13.6%) negatively.
In addition, when we asked whether the citizen scientists' contribution was valuable, 90.9% answered this question as rather positive to very positive.

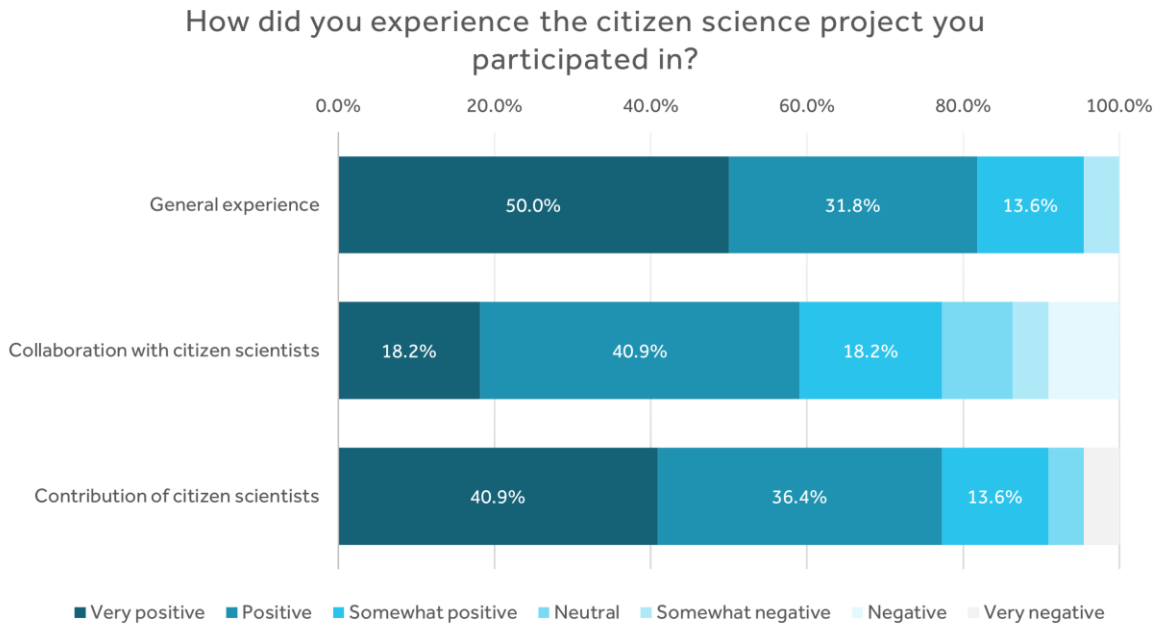

Figure 6. Experiences with citizen science.

As mentioned before, citizens can be involved in a citizen science project in various ways. In the surveyed projects, citizens were most involved in the delivery of data (44.2%). Other common forms of participation are data processing, reporting of the results and the (co-)creation of the research question or research method.

We also asked what benefits and disadvantages the scientists experienced within their citizen science project. The biggest benefit appears to be the possibility to collect a lot of data, followed by conducting socially relevant research and scientific training among citizen scientists (see graph). Collecting large amounts of data was also mentioned as the biggest benefit in the study by the Young Academy (2015).
The graph below shows the extent to which certain benefits were experienced by the scientists who already participated in a project (blue). We also asked the same question of scientists who had not previously participated in a citizen science project (grey). Both groups make a similar

[6] https://www.uantwerpen.be/en/projects/airbezen/
[7] https://www.natuurpunt.be/het-grote-vogelweekend

estimate, as can be seen in the figure. Other benefits mentioned but not included in the figure are involving one's own family (grandchildren) and gaining inspiration for new research questions.

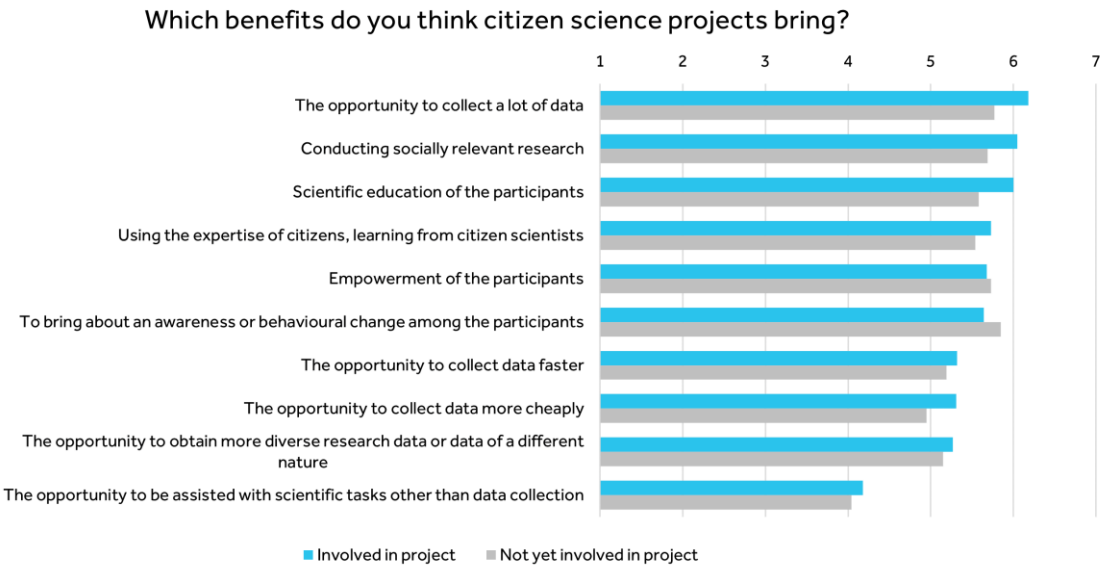

Figure 7. Benefits of citizen science.

The biggest disadvantage of a citizen science project appears in our survey to be the additional communication work, which is in line with the results from the 2015 survey. Other prominent disadvantages in our survey are the challenge of long-term commitment of participants to the project and the additional administrative work.

The graph below compares the estimated disadvantages between scientists who have already (blue) and not yet (grey) participated in a citizen science project as part of their professional activity. Here we see larger differences than with the advantages. For example, the additional communication work is seen as less of a disadvantage by scientists without experience with citizen science. Financing and legal, ethical and privacy aspects are more likely to be regarded as disadvantages by scientists without experience with citizen science.

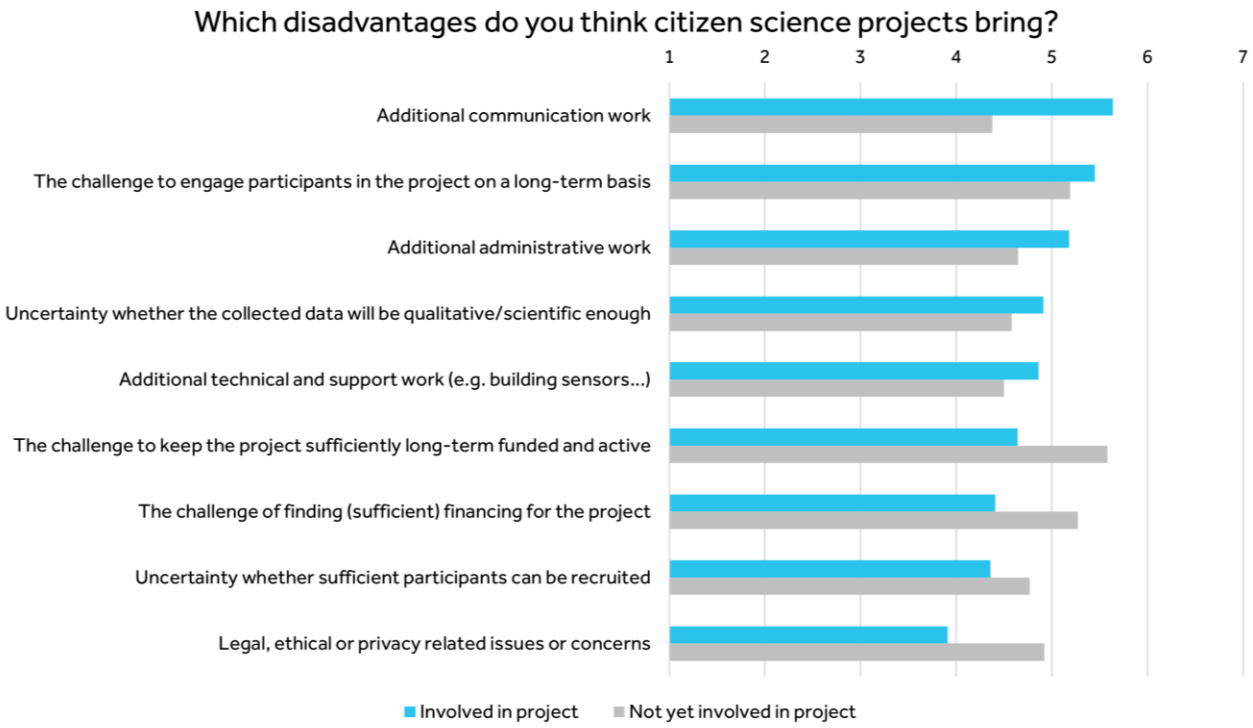

Figure 8. Disadvantages of citizen science.

Finally, we asked whether scientists in a citizen science project encountered legal, ethical or privacy-related issues. This was the case for 40.91% of the participants, which is also in line with the Young Academy survey (2015). Examples are issues around GDPR, taking pictures, storing data, etc.

The scientists also indicated that they had taken steps to address these issues, such as using ethical committees and legal services within their own institution or re-editing footage.

5. Future of citizen science

The vast majority of participants (87.37%) said they see a future in citizen science. Although 75% already answered this question positively in 2015, confidence in citizen science has increased even further

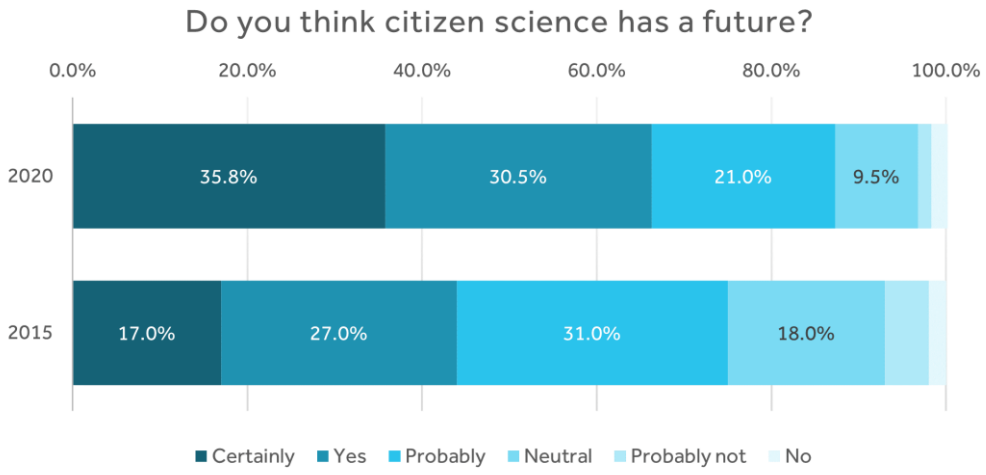

Figure 9. Future for citizen science.

The question was also asked whether the participants themselves would consider starting a citizen science project in the future, to which more than one in three (37.7%) replied positively. In our survey, participants under the age of 50 in particular indicated that they were considering their own project. The overall number is slightly lower than in the 2015 survey.

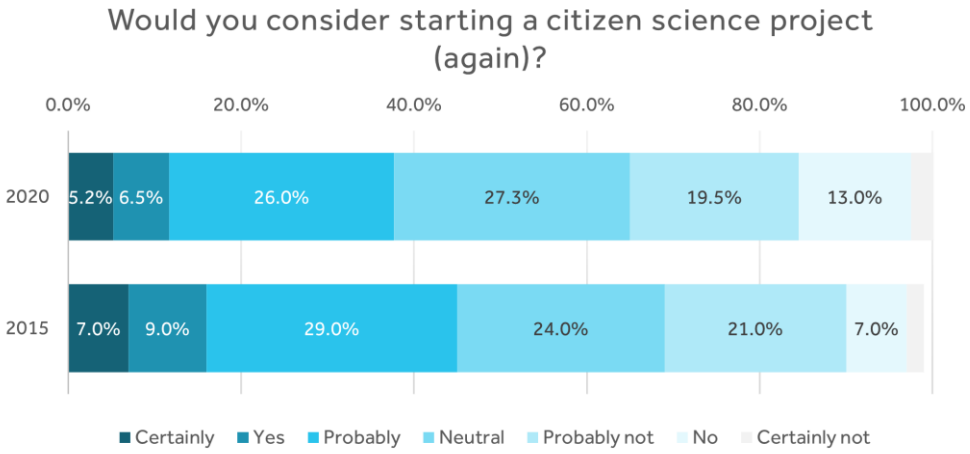

Figure 10. Willingness to start citizen science.

Finally, we asked what information scientists need before they start their own citizen science project and for what matters they would ask for help from a third party. The surveyed scientists have a fairly large need for information within all the themes listed. They indicated that they needed the most information about guidelines for financing options, for legal, ethical and privacy aspects, and for communication.

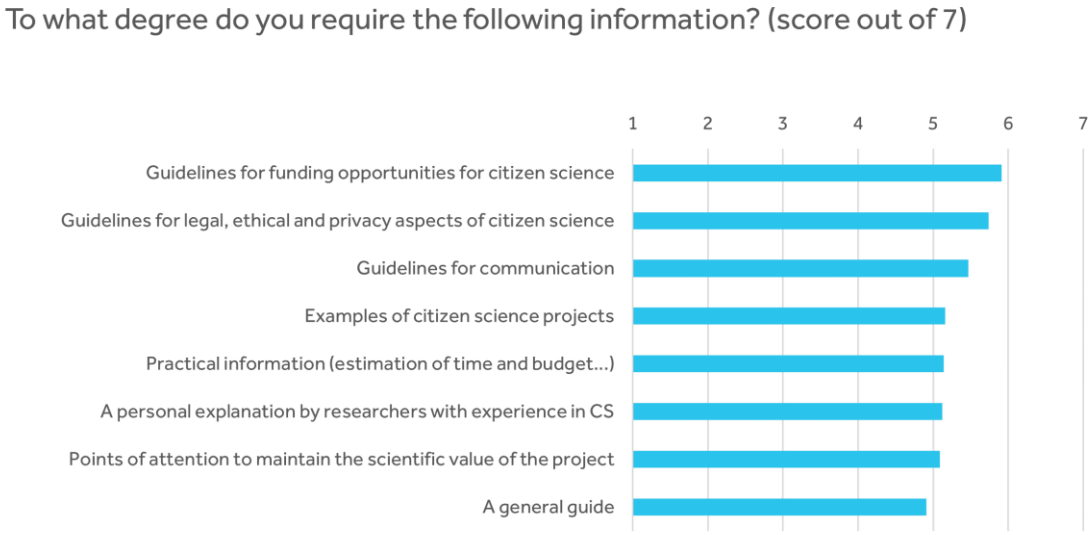

Figure 11. Requirements for citizen science.

The scientists also indicated that they mainly wanted to collaborate with a third party to develop an online platform or app, recruit participants and create press coverage of the project.

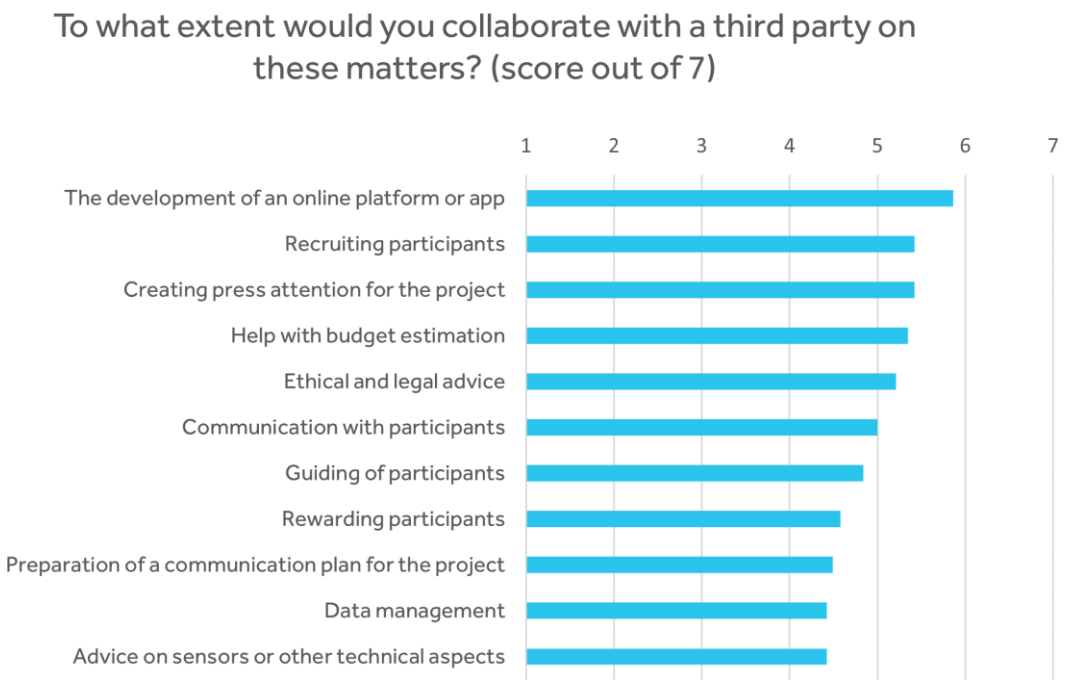

Figure 12. Third parties for citizen science.

6. Conclusion

In this report we gave an overview of the results of our survey among Flemish scientists regarding their knowledge, experiences and interest in citizen science. To map an evolution, we compared the results with a similar survey from 2015 conducted by the Young Academy.

First, we can say that citizen science seems to have become more well known among scientists. Most scientists were therefore able to give examples or explain the concept. In the description that scientists gave to “citizen science”, terms related to citizens, scientific research and data collection were the most discussed.

Where scientists had already participated in a citizen science project, they generally experienced this as very positive. According to these scientists, the biggest advantages were “The possibility to collect a lot of data”, “Conduct a socially relevant research” and “Scientific education of participants”. The biggest drawbacks were “Additional communication work”, “The challenge of long-term engagement of participants” and “Additional administrative work”. Scientists with no experience with citizen science estimate these aspects less negatively, while they expect greater disadvantages in legal, ethical and privacy-related issues and difficulties in finding funding.

Third, scientists indicated that they see a future in citizen science. Moreover, the belief in a future for citizen science has increased since 2015. However, the willingness to (re)start personally has not increased compared to 2015. It is important that the right support can be offered to scientists who want to start their own project. Scientists most need advice with regard to financing options, legal, ethical and privacy aspects, and communication.

It is recommended to repeat this survey on a regular basis, for example every five years, in order to further map the evolution of citizen science in Flanders. Further elaboration on this theme can also be interesting. For example, a follow-up study could investigate whether and why the willingness to start a project has declined. In this way we can uncover the barriers and find out how they can be overcome. It may also be interesting to look in more detail at the scientists who

have already carried out a citizen science project. This would allow them to investigate what their main goals were within the project and what they know about their participants.

With support from the Flemish Government

Vlaamse overheid

Appendix: complete questionnaire

Q1. What is your age?

Q2. Wat is your gender?

Q3. Which research institution(s) are you affiliated with?

University of Antwerp
University of Ghent
Hasselt University
KU Leuven
Free University of Brussels
Artesis Plantijn University College
Artevelde University College
Erasmus University College Brussels
Maritime Academy
University College Ghent
University College PXL
West Flanders University College
Karel de Grote University College
Vives Catholic University College
LUCA School of Arts
Odisee
Thomas More
UC Leuven-Limburg
imec
Institute for Nature and Forest Research
Nature Point (Natuurpunt) Study
VITO
Flemish Environmental Agency
Other (please provide further explanation)

Q4. In which scientific domain(s) are you professionally active?

Social and Human Sciences
Exact Sciences
Biomedical and Medical Sciences
Technical Sciences
Other (please provide further explanation)

Q5. What is your current position/role?

PhD student / Pre-doc
Post-doc
Lecturer
Senior Lecturer
Professor
Full Professor
Lecturer
Field Researcher
Technical-Administrative staff / Support staff
Other (please provide further explanation)

Q6. Are you familiar with the concept of “citizen science”?

Yes
No
Heard of it, but not exactly sure what it entails.

Q7. Citizen science is scientific research conducted in whole or in part by non-scientists (citizens), often in collaboration with or under the guidance of professional scientists. The citizen scientists are therefore not only test subjects or respondents in a survey, they themselves also perform scientific actions in the research. Some examples of citizen science; this can involve measuring local air quality or traffic (e.g. Curious Noses or Telraam) but also counting or observing plants, animals or other things in your environment (e.g. The Great Shell Counting Day or Street Poetry). Some projects require the analysis of scientific data, photos or historical texts (e.g. Radio Meteor Zoo or Getuigenissen (Testimonials)). After reading this explanation, can you name any examples of citizen science yourself?

Yes
No

Q8. How would you describe citizen science?

Q9. Have you already been involved in a citizen science project?

Yes, in the context of my professional activity
Yes, as a citizen scientist, volunteer or participant
Yes, professionally and as a citizen scientist
No

Q10. Can you name the title of a citizen science project in which you are or were professionally involved? Leave this question blank if not applicable.

Q11. Can you list up to 3 examples of citizen science projects that you have heard of but were not involved in? Leave this question blank if you don't know or remember any examples.

Q12. Can you name a maximum of 3 examples of citizen science projects in which you are or were involved as a citizen scientist? Leave this question blank if not applicable.

Q13. In what way(s) do or did the citizen scientists participate in the project? (Multiple answers are possible).

They provide(d) data (counting, observing, using sensors...).
They process(ed) or analyse(d) data (transcribing, annotating...).
They are/were involved in the reporting and dissemination of the results (presentation, writing...).
They are/were involved in determining the research method.
They are/were involved in determining the research question.
Other (please provide further explanation)

Q14. How do/did you experience the citizen science project in general?

Q15. How do/did you experience the collaboration with citizen scientists?

Q16. How valuable are (were) the contributions of citizen scientists to the research?

Q17. What benefits are (were) associated with your citizen science project?

The opportunity to collect data more cheaply.
The opportunity to collect data faster.
The opportunity to collect a lot of data.
The opportunity to obtain more diverse research data or data of a different nature.
The opportunity to be assisted with scientific tasks other than data collection.
To bring about an awareness or behavioural change among the participants.
Empowerment of the participants.
Scientific education of the participants.
Conducting socially relevant research.
Using the expertise of citizens, learning from citizen scientists.

Q18. Are there any benefits not listed?

Q19. What disadvantages are (were) associated with your citizen science project?

Additional communication work.
Additional administrative work.
Additional technical and support work (e.g. building sensors...).
Uncertainty whether sufficient participants can be recruited.
Uncertainty whether the collected data will be qualitative/scientific enough.
The challenge of finding (sufficient) financing for the project.
The challenge to engage participants in the project on a long-term basis.
The challenge to keep the project sufficiently long-term funded and active.
Legal, ethical or privacy related issues or concerns.

Q20. Are there any disadvantages not listed?

Q21. Were any legal, ethical or privacy-related issues raised during the citizen science project?

No
Yes, namely

Q22. What steps have you taken to address these ethical, legal or privacy issues?

Q23. Would you consider starting your own citizen science project?

Q24. What kind of project would that be? Describe it briefly.

Q25. What benefits do you think could come from having your own citizen science project?

The opportunity to collect data more cheaply.
The opportunity to collect data faster.
The opportunity to collect a lot of data.
The opportunity to obtain more diverse research data or data of a different nature.
The opportunity to be assisted with scientific tasks other than data collection.
To bring about an awareness or behavioural change among the participants.

Empowerment of the participants.
Scientific education of the participants.
Conducting socially relevant research.
Using the expertise of citizens, learning from citizen scientists.

Q26. Are there any benefits not listed?

Q27. What disadvantages do you think could be associated with your own citizen science project?

Additional communication work.
Additional administrative work.
Additional technical and support work (e.g. building sensors…).
Uncertainty whether sufficient participants can be recruited.
Uncertainty whether the collected data will be qualitative/scientific enough.
The challenge of finding (sufficient) financing for the project.
The challenge to engage participants in the project on a long-term basis.
The challenge to keep the project sufficiently long-term funded and active.
Legal, ethical or privacy related issues or concerns.

Q28. Are there any disadvantages not listed?

Q29 Would you consider starting up another citizen science project?

Q30. What information do you need before you can start your own citizen science project?

A general guide to citizen science (e.g. an overview of the phases and steps to be taken in a project).
Points of attention to maintain the scientific value of the project.
Guidelines for communication in citizen science projects.
Guidelines for legal, ethical and privacy aspects of citizen science.
Guidelines for funding opportunities for citizen science.
Practical information (estimation of time and budget...).
Examples of citizen science projects.
A personal explanation by researchers with experience in citizen science.
Other (please provide further explanation)

Q31. On what issues would you collaborate with a third party if you started a citizen science project?

Recruiting participants.
Creating press attention for the project.
Preparation of a communication plan for the project.
Communication with participants.
Guidance of participants.
Rewarding participants.
Help with budget estimation.
Ethical and legal advice.
Data management.
The development of an online platform or app.
Advice on sensors or other technical aspects.

Other (please provide further explanation)

Q32. Do you think citizen science has a future?

Q33. Why (not)?

Q34. Do you know Iedereen Wetenschapper (Everyone Scientist)?

Never heard of it.
Heard of it, but I don't know much about it.
I know what Everyone Scientist is and does, but haven't used it myself yet.
I've already used Everyone Scientist to find or promote a project.

Q35. Do you know Scivil?

Never heard of it.
Heard of it, but I don't know much about it.
I know what Scivil is and does, but have not used their services myself.
I have already attended Scivil events or used their services.

Q36 Everyone Scientist and Scivil support citizen science in Flanders. What support would you expect or need from these organisations in the field of citizen science?

Q37. May we pass on your answers to this questionnaire anonymously to employees of recognised Flemish scientific institutions for further research? (university colleges, universities and institutions such as imec, VITO...) Read more in our privacy statement about how we manage the data collected in this survey.

Q38. May we contact you to ask more questions? For example for a focus group on citizen science? Enter your email address below without obligation. Your email address will be separated from the rest of the questionnaire so that your answers remain anonymous. Read in our privacy statement how we manage the data collected in this survey.

Q39. Would you like to say anything else about citizen science or about our questionnaire?