



TRAINING MATERIALS for Responsible Open Science Part V: Citizen Scientists

Authors: Signe Mežinska, Ivars Neiders

Reviewers: Rosemarie Bernabe, Sandra Bendiscioli, Stephanos Cherouvis, Ilaria Anna Colussi, Keziah Chanyisa Khayadi Dash, Su Nee Goh, Eva Hnátková, Margarita Poškutė, Vivian Mbanya, Lilian Kwamboka Mocheche, Mari-Liisa Parder, Vana Stavridi.



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Introduction

The aim of the ROSiE Training Materials for Responsible Open Science is to learn how to practice open science (OS) and citizen science responsibly and how to prevent research misconduct in the context of OS and citizen science by providing necessary knowledge and developing specific skills and attitudes.

In the ROSiE Didactic Framework we have identified the following skills and attitudes necessary for responsible practising of OS and citizen science in four domains: (i) local and global citizenship, (ii) personal and social responsibility, (iii) epistemic skills, and (iv) collaborative problem-solving.



Local and global citizenship

- awareness of the importance and social benefits of OS and citizen science in local and global contexts
- participation in ethics and integrity self-regulation of OS and citizen science community



Personal and social responsibility

- personal and professional responsibility for implementation of OS and production of results
- openness to share own research data, results, tools and publications and appreciation of efforts of others



Epistemic skills

- ability to organize, present and use open data and knowledge with integrity
- ability to critically assess data, knowledge and scientific results produced by others
- ability to identify ethical and integrity issues in OS



Collaborative problem-solving

- ability to apply critical thinking skills in collaborative analysis of ethical and integrity problems in OS
- discussing, finding solutions and making decisions to handle ethics and integrity issues within OS community

To achieve optimal results, the ROSiE training materials rely on several learning and teaching strategies: (i) collaborative problem solving; (ii) case-based activities; (iii) dialogical activities; (iv) transformative learning. More information about these teaching strategies you can find in the ROSiE Didactic Framework.

This training material consists of a trainers' file including six units and respective activities, as well as a separate folder including handouts for trainees. The activities can be implemented separately (e.g., for organising a single workshop to discuss cases) or for organising a complete two-day training course. The suggested schedule for the training course is as follows:

Time	DAY 1	Type of activity
90 min.	Unit 1. Ethical and societal foundations of citizen science, its purpose	Socratic seminar
15 min.	Break	
90 min.	Unit 2. Protection of research participants	Case discussion
15 min.	Break	
90 min.	Unit 3. Rights of citizen scientists	Case discussion (Pro and Contra)
Time	DAY 2	Type of activity
90 min.	Unit 4. The quality of the research outputs and data sets	Case discussion
15 min.	Break	
90 min.	Unit 5. Conflicts of interest in citizen science	Case discussion (Four Quadrant method)
15 min.	Break	
90min.	Unit 6. Risks to environment, animals, plants, and ecosystems	Case discussion

Additionally, trainers can use the [ROSIE online training course](#) as a complementary resource to this training material. Students and researchers can use ROSiE online learning modules to implement **self-directed learning**. In this case, the trainee as a user of online ROSiE training materials takes the initiative, with or without the help of the trainer, determines his/her learning needs, formulates learning goals and evaluates learning outcomes. In this process, trainees are in charge of their learning, and they are autonomous in choosing what, how and where they are learning. Online training materials can also be used for the implementation of **blended learning**, which combines traditional on-site training led by a trainer with using online content to allow trainees to build their own learning experience. By blending face-to-face and online training methods, trainees can benefit from guidance and interaction with a trainer while



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having access to interactive and flexible training opportunities outside the classroom. Blended learning allows development of **multimodal learning** through visual, auditory, reading, discussion and writing methods. Multimodal learning expands inclusive learning opportunities.

Unit 1. Ethical and societal foundations of citizen science, its purpose

Activity 1. Responsible citizen science

DESCRIPTION

This activity based on home readings a classroom discussion in a form of Socratic seminar on principles and values of citizen science in the context of open science. The discussion is based on European Citizen Science Association (ECSA) “10 principles of citizen science”. The main purpose of the activity is to address the nature and ethical foundations of citizen science and open science.


Type of activity: Socratic seminar

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSIE online training course](#) → Responsible Open Science → Citizen Scientists → Ethical and societal foundations of open science

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	- demonstrate knowledge of nature and ethical foundations of citizen science and open science	- explain and discuss values of citizen science and open science, their ethical foundations, and social benefits
	- understand the significance of citizen science for identifying and solving scientific problems and societal challenges	- provide examples for role of citizen science in identifying and solving scientific problems and societal challenges

PROCEDURE

1. Before the workshop print out the required readings: [European Citizen Science Association \(ECSA\) 10 Principles of Citizen Science](#) and the handout (file “[CS_U1A1 Handout](#)”) for each trainee.
2. **Step 1 – 20 minutes.** At the beginning of the workshop, trainees should read the required readings and fill in the double-entry reading journal table in the handout. The left side should contain quotations from the ECSA “10 Principles of

Citizen Science". The right side should contain trainee's response to each quotation (a question, commentary, analysis). When filling in the table, trainees may use the following prompts, included in the handout:

- *I agree/disagree with..., because...*
- *It is not clear for me...*
- *I see the following challenges...*
- *I have a question regarding...*

- Step 2 – 60 minutes.** The classroom discussion is organized as a Socratic seminar. The aim of the Socratic seminar is to achieve "*a deeper understanding about the ideas and values in a particular text*"¹. The trainer is facilitator of the discussion, the discussion is led by using open-ended, high-level questions. Trainees are sitting in a circle.
- The Socratic Seminar starts with introduction of the rules:
 - Only those trainees who have read the text and filled in the double-entry reading journal are allowed to participate;
 - It is important to focus on the text and to refer to evidence from the text;
 - Trainees are encouraged to talk to each other, not just to the trainer and to listen and respond to others' arguments.
- Common questions used during a Socratic Seminar activity both by trainer and trainees include:
 - *What does this concept/idea/phrase etc. mean?*
 - *What do you think the authors are trying to say?*
 - *Is this what you mean to say...?*
 - *What is the origin of this?*
 - *What are the implications this?*
 - *What else could that mean?*
 - *What would happen if....?*
- This [overview of Socratic seminar](#) provides a list of suitable questions and more information about how to prepare for a discussion.
- Step 2 – 10 minutes.** At the end of Socratic seminar the trainer leads a reflection on the main ideas discussed.

PLANNING

Resources and equipment:

- Handout "[CS U1A1 Handout](#)"

¹ Castellanos-Reyes, D. (2020). Socratic Seminar. In R. Kimmons & S. Caskurlu (Eds.), *The Students' Guide to Learning Design and Research*. EdTech Books.

https://edtechbooks.org/studentguide/socratic_seminar

- Required readings [ECSA 10 Principles of Citizen Science](#)
- Make space for the trainees to sit in a circle

FURTHER READINGS

1. Castellanos-Reyes, D. (2020). Socratic Seminar. In R. Kimmons & S. Caskurlu (Eds.), *The Students' Guide to Learning Design and Research*. EdTech Books. https://edtechbooks.org/studentguide/socratic_seminar
2. Haklay, M., Dörler, D., Heigl, F., Manzoni, M., Hecker, S., & Vohland, K. (2021). What Is Citizen Science? The Challenges of Definition. In: K. Vohland, A. Land-Zandstra, L. Ceccaroni, R. Lemmens, J. Perelló, M. Ponti, R. Samson, & K. Wagenknecht (Eds.), *The Science of Citizen Science* (pp. 13–33). Springer. https://doi.org/10.1007/978-3-030-58278-4_2
3. Haklay, M., Fraisl, D., Greshake Tzovaras, B., Hecker, S., Gold, M., Hager, G., ... & Vohland, K. (2021). Contours of citizen science: a vignette study. *Royal Society open science*, 8(8), 202108. <https://doi.org/10.1098/rsos.202108>
4. Vohland, K. et al. (2021). Editorial: The Science of Citizen Science Evolves. In: K. Vohland, A. Land-Zandstra, L. Ceccaroni, R. Lemmens, J. Perelló, M. Ponti, R. Samson, & K. Wagenknecht (Eds.), *The Science of Citizen Science* (pp. 1–12). Springer. https://doi.org/10.1007/978-3-030-58278-4_1

Unit 2. Protection of research participants

Activity 2. Protection of personal data in citizen science

DESCRIPTION

This activity is built around case discussion. Trainees are asked to discuss in small groups cases on ethical issues in collecting and open sharing of personal data in citizen science by using examples from social sciences and natural sciences. Afterwards, small groups report to the whole group and continue with a reflective discussion involving the whole group.



Type of activity: case discussion

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSiE online training course](#) → Responsible Open Science → Citizen Scientists → Protection of research participants

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	<ul style="list-style-type: none"> - recognize and analyse the risks to research participants in the context of citizen science 	<ul style="list-style-type: none"> - discuss how to minimize risks to research participants when practicing citizen science
	<ul style="list-style-type: none"> - apply critical thinking skills - questioning, comparing, summarizing, drawing conclusions, and defending - to case studies on ethics and integrity in OS 	<ul style="list-style-type: none"> - develop reflective questions to define ethical problems in the case study - discuss cases with colleagues - justify a personal position on the case

PROCEDURE

1. The activity includes a case discussion. Two case descriptions are included in the file "[SC_U2A2 Handout](#)". You can also choose to watch one of the cases in the classroom - **animation of this case is available on the [ROSiE Knowledge Hub](#)**.
2. Print out the case description and questions for discussion for each trainee (file "[SC_U2A2 Handout](#)").
3. Introduce the activity, its aim and, briefly, the procedure.

4. Ask trainees to split in small groups (4-5 trainees in a group) and to choose a rapporteur - a group member who will report results of the small group discussion to the whole group. Provide each group with a paper for taking notes.
5. **Step 1:** small group discussions – **30 minutes**. Trainees read the case description and discuss the questions in small groups. Each group takes notes. Rapporteurs prepare to present the results to the whole group.
6. **Step 2:** reports from small group discussions – **40 minutes**. Depending on the number of the small groups, allocate a time slot for each group presentation (e.g., if there are 4 small groups, each group have 10 minutes for a presentation). Rapporteurs present the results of their group discussions.
7. **Step 3:** group discussion – **20 minutes**. The trainer moderates a reflective group discussion. The trainer writes the solutions suggested during the discussion on the whiteboard and summarises them. Sample questions for reflective discussion are, e.g.:
 - *What citizen scientists can do to protect privacy of research participants and/or persons affected by the research?*

PLANNING

Resources and equipment:

- Handout “[CS_U2A2 Handout](#)” and/or video of case animation available on the [ROSiE Knowledge Hub](#)
- Paper for taking notes during small group discussions
- Whiteboard for discussion notes
- Make space for the trainees to work in small groups

FURTHER READINGS

1. Campbell, R., Goodman-Williams, R., & Javorka, M. (2019). A trauma-informed approach to sexual violence research ethics and open science. *Journal of interpersonal violence*, 34(23-24), 4765-4793. <https://doi.org/10.1177/0886260519871530>
2. DuBois, J. M., Strait, M., & Walsh, H. (2018). Is it time to share qualitative research data? *Qualitative Psychology*, 5(3), 380–393. <https://doi.org/10.1037/qup0000076>
3. Fox, J., Pearce, K. E., Massanari, A. L., Riles, J. M., Szulc, Ł., Ranjit, Y. S., ... & L. Gonzales, A. (2021). Open science, closed doors? Countering marginalization through an agenda for ethical, inclusive research in communication. *Journal of Communication*, 71(5), 764-784. <https://doi.org/10.1093/joc/jqab029>
4. The Embassy of Good Science: “[Privacy in research](#)”

Unit 3. Rights of citizen scientists

Activity 3. Authorship, contributorship and group co-authorship in citizen science

DESCRIPTION

This activity is built around case discussion and involves evaluating pro and contra arguments for different types of acknowledging citizen scientist contributions to research. Trainees are asked to discuss two cases in small groups, develop and discuss their arguments. Afterwards, small groups report to the whole group and continue with a reflective discussion involving the whole group.



Type of activity: case discussion

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSIE online training course](#) → Responsible Open Science → Citizen Scientists → Rights of citizen scientists

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	<ul style="list-style-type: none"> - be aware of citizen scientists' right to be recognised and acknowledged by academic scientists and society 	<ul style="list-style-type: none"> - discuss and assert their right to be recognized and acknowledged by academic scientists and society
	<ul style="list-style-type: none"> - apply critical thinking skills - questioning, comparing, summarizing, drawing conclusions, and defending - to case studies on ethics and integrity in OS 	<ul style="list-style-type: none"> - develop reflective questions to define ethical problems in the case study - discuss cases with colleagues - justify a personal position on the case

PROCEDURE

1. Introduce the activity, its aim and, briefly, the procedure.
2. Ask trainees to split in small groups (3-4 trainees in a group) and to choose a rapporteur - a group member who will report results of the small group discussion to the whole group.

1. Print out case descriptions and the table to fill in pro and counter arguments (file "[CS_U3A3 Handout](#)"). You can also choose to watch one of the cases in the classroom - **animation of this case is available on the [ROSIE Knowledge Hub](#)**.
3. **Step 1:** small group discussions – **30 minutes**. Trainees read the case description and discuss the task in small groups. Each group fills in the table included in the handout with pro and contra arguments. Rapporteurs prepare to present the results to the whole group.
4. **Step 2:** short reports from small group discussions – **20 minutes**. Rapporteurs present the results of their group discussions - pro and contra arguments for each type of acknowledging the contribution of citizen scientists in this case.
5. **Step 3:** group discussion – **40 minutes**. The trainer moderates a reflective group discussion. Sample questions for reflective discussion are, e.g.:
 - *Based on the pro and contra arguments developed during the group work, what is the best solution for this case?*
 - *Do you have other suggestions for recognizing the contribution of citizen scientists in scientific publications?*

PLANNING

Resources and equipment:

- Handout "[CS_U3A3 Handout](#)" and/or video of case animation available on the [ROSIE Knowledge Hub](#)
- Make space for the trainees to work in small groups

FURTHER READINGS

1. COPE Council (2003). How to Handle Authorship Disputes: A Guide for New Researchers. <https://doi.org/10.24318/cope.2018.1.1>
2. ICMJE. Defining the role of authors and contributors. <https://bit.ly/N7uoq3>
3. Smith, E., Bélisle-Pipon, J. C., & Resnik, D. (2019). Patients as research partners; how to value their perceptions, contribution and labor? *Citizen science: theory and practice*, 4(1). <https://doi.org/10.5334/cstp.184>
4. The Embassy of Good Science: "[Authorship criteria](#)"
5. Vasilevsky, N. A. et al. (2021). Is authorship sufficient for today's collaborative research? A call for contributor roles. *Accountability in Research*, 28(1), 23-43. <https://doi.org/10.1080/08989621.2020.1779591>
6. Ward-Fear, G., Pauly, G. B., Vendetti, J. E., & Shine, R. (2020). Authorship Protocols Must Change to Credit Citizen Scientists. *Trends in Ecology & Evolution*, 35(3), 187–190. <https://doi.org/10.1016/j.tree.2019.10.007>

Unit 4. Quality of research outputs and data sets

Activity 4. Responsibility of citizen scientists for quality of data

DESCRIPTION

This activity is built around case discussion. Trainees are asked to discuss in small groups a case on data quality in citizen science. Afterwards, small groups report to the whole group and continue with a reflective discussion involving the whole group.


Type of activity: case discussion

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSIE online training course](#) → Responsible Open Science → Citizen Scientists → Quality of research outputs and datasets

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	- be aware of responsibilities of citizen scientists for data quality and integrity	- explain how biased, fabricated, falsified or poor-quality data could undermine the validity of scientific research
	- demonstrate knowledge how to ensure quality of open data	- collect data responsibly and keep complete and accurate records

PROCEDURE

1. Print out the case description and questions for discussion for each trainee (file "[CS_U4A4 Handout](#)").
2. Introduce the activity, its aim and, briefly, the procedure.
3. Ask trainees to split in small groups (4-5 trainees in a group) and to choose a rapporteur - a group member who will report results of the small group discussion to the whole group. Provide each group with a paper for taking notes.
4. **Step 1:** small group discussions – 30 minutes. Trainees read the case description and discuss the questions in small groups. Each group takes notes. Rapporteurs prepare to present the results to the whole group.

5. **Step 2:** reports from small group discussions – 30 minutes. Depending on the number of the small groups, allocate a time slot for each group presentation (e.g., if there are 4 small groups, each group have 10 minutes for a presentation). Rapporteurs present the results of their group discussions.
1. **Step 3:** group discussion – 30 minutes. The trainer moderates a reflective group discussion. The trainer writes the solutions suggested during the discussion on the whiteboard and summarises them. Sample questions for reflective discussion are, e.g.:
 - *Which ideas proposed during the discussion so far seem to you the best? Why?*
 - *How the case reflects the problems faced in your experience as citizen scientists?*

PLANNING

Resources and equipment:

- Handout "[CS U4A4 Handout](#)"
- Paper for taking notes during small group discussions
- Whiteboard for discussion notes
- Make space for the trainees to work in small groups

FURTHER READINGS

1. Balázs, B., Mooney, P., Nováková, E., Bastin, L., Jokar Arsanjani, J. (2021). Data Quality in Citizen Science. In: *The Science of Citizen Science*. Springer
https://doi.org/10.1007/978-3-030-58278-4_8
2. Herodotou, C., Scanlon, E., & Sharples, M. (2021). Methods of promoting learning and data quality in citizen and Community Science. *Frontiers in Climate*, 53. <https://doi.org/10.3389/fclim.2021.614567>
3. Haklay, M. (2021). Why is it so difficult to integrate citizen science into practice? *Citizen Science and Public Policy Making*, 108.
<https://discovery.ucl.ac.uk/id/eprint/10130136>.

Unit 5. Conflicts of interest in citizen science

Activity 5. How to recognize conflicts of interest in citizen science?

DESCRIPTION

This activity applies the Four Quadrant Method for case analysis on conflict of interests in citizen science. Trainees are asked to discuss a case in small groups and fill in the Four Quadrant template. Afterwards, small groups report to the whole group and continue with a casuistic reasoning and justification discussion involving the whole group.



Type of activity: case discussion (Four Quadrant method)

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSIE online training course](#) → Responsible Open Science → Citizen Scientists → Conflicts of interest in citizen science

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	– understand the concept of conflict of interest and how to deal with it	– recognize and disclose conflicts of interest in cases when citizen scientists have personal or political interests at stake
	– apply critical thinking skills - questioning, comparing, summarizing, drawing conclusions, and defending - to case studies on ethics and integrity in OS	– develop reflective questions to define ethical problems in the case study – discuss cases with colleagues – justify a personal position on the case

PROCEDURE

1. At least one week before the class send the trainees the link to the reading material on [Conflict of Interests](#) from The Embassy of Good Science.
2. Print out the case description for each trainee (file "[CS_U5A5 Handout](#)"). You can also choose to watch the case in the classroom - **animation of this case is available on the [ROSIE Knowledge Hub](#).**

3. Introduce the activity, its aim and, briefly, the procedure of the Four Quadrant Method².
4. Ask trainees to split in small groups (3-4 trainees in a group) and to choose a rapporteur - a group member who will report results of the small group discussion to the whole group.
5. **Step 1.** Initial perception – **20 minutes**. Trainees read the case and in small groups discuss some general questions to identify relevant aspects of the case:
 - *What are the ethical issues at stake in this case?*
 - *Who are the stakeholders?*
 - *How should stakeholders react to this case?*
6. **Step 2.** The Four Quadrant Analysis – **20 minutes**. Each group fills in the four quadrant table included in the file “CS_U5A5 Handout”.

I. Relevant Facts: What are the most relevant facts concerning the situation?	II. Uncertainties: Which features of the situation are uncertain, lacking in clarity, or controversial?
III. Courses of Action: What are the practically available options for providing a solution to the case (how to react to the case and how to prevent such cases in the future)?	IV. Contextual Features: What legal, financial and institutional policies and regulations apply to the case?

7. **Step 3.** Reports from small groups – **20 minutes**. The small groups report the results of the Four Quadrant Analysis to the whole group.
8. **Step 4.** Casuistic Reasoning and Justification – **30 minutes**. The trainer moderates the whole group discussion on the following questions:
 - *What is at issue? What is the major ethical issue at the case?*
 - *Do you know other cases like this one?*
 - *How to recognize a conflict of interests? What types of conflicts of interests should be disclosed in citizen science?*
 - *What should stakeholders do to prevent conflicts of interests?*

PLANNING

² Detailed description of the modified Four Quadrant Method for case analysis is provided by the EnTIRE project: Armond A.C. et al. (2019). [D.5.3 Delivery of the entire set of case deliberation methods and case analyses as input for the platform](https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c3a7e938&appId=PPGMS), pp. 98-102.

Resources and equipment:

- Handout "[SC_U5A5 Handout](#)" and/or video of case animation available on the [ROSIE Knowledge Hub](#)
- Paper for taking notes during small group discussions
- Whiteboard for discussion notes
- Make space for the trainees to work in small groups

FURTHER READINGS

1. Aytug, Z. G., Rothstein, H. R., Kern, M. C., & Zhu, Z. (2019). Is there social consensus regarding researcher conflicts of interest? *Ethics & Behavior*, 29(2), 101-140. <https://doi.org/10.1080/10508422.2017.1402683>
2. COPE Council (2016). COPE Discussion Document: Handling competing interests. <https://doi.org/10.24318/EITeSLhp>
3. COPE Council (2021). COPE Flowcharts and infographics: Undisclosed conflict of interest in a published article. <https://doi.org/10.24318/cope.2019.2.7>
4. Resnik, D. B., Konecny, B., & Kissling, G. E. (2017). Conflict of interest and funding disclosure policies of environmental, occupational, and public health journals. *Journal of occupational and environmental medicine*, 59(1), 28. <https://doi.org/10.1097/JOM.0000000000000910>
5. Resnik, D. B., Elliott, K. C., & Miller, A. K. (2015). A framework for addressing ethical issues in citizen science. *Environmental Science & Policy*, 54, 475-481. <https://doi.org/10.1016/j.envsci.2015.05.008>
6. The Embassy of Good Science: "[Conflict of interests](#)", "[Intellectual conflicts of interest](#)"

Unit 6. Risks to environment, animals, plants, and ecosystems

Activity 6 Protection of animals, plants and ecosystems in citizen science

DESCRIPTION

This activity is based on a case discussion. Trainees are asked to discuss in small groups a case on risks for ecosystems created by conducting citizen science activities. Afterwards, small groups report to the whole group and continue with a reflective discussion involving the whole group.


Type of activity: case discussion

Time: 90 min.

Target group: citizen scientists

Blended learning options: [ROSiE online training course](#) → Responsible Open Science → Citizen Scientists → Risks to environment, animals, plants, and ecosystems

Learning outcomes:

	Learning outcomes <i>It is expected that trainees will:</i>	Indicators for their achievement <i>Trainees who have fully met the learning outcome are able to:</i>
	<ul style="list-style-type: none"> - understand the risks to environment, plants, animals, and ecosystems in the context of citizen science 	<ul style="list-style-type: none"> - minimize risks to environment, plants, animals, and ecosystems when practicing citizen science

PROCEDURE

1. Introduce the activity, its aim and, briefly, the procedure.
2. Ask trainees to split in small groups (4-5 trainees in a group) and to choose a rapporteur - a group member who will report results of the small group discussion to the whole group. Provide each group with a paper for taking notes.
3. Print out case description and questions for discussion for each trainee (file "[CS_U6A6 Handout](#)").
4. **Step 1:** small group discussions – **30 minutes**. Trainees read the case description and discuss the questions in small groups. Each group takes notes. Rapporteurs prepare to present the results to the whole group.

5. **Step 2:** reports from small group discussions – **30 minutes**. Depending on the number of the small groups, allocate a time slot for each group presentation (e.g., if there are 4 small groups, each group have 10 minutes for a presentation). Rapporteurs present the results of their group discussions.
6. **Step 3:** group discussion – **30 minutes**. The trainer moderates a reflective group discussion. The trainer writes the solutions suggested during the discussion on the whiteboard and summarise them. Sample questions for reflective discussion are, e.g.:
 - *How to make citizen scientists aware about possible risks to ecosystems, animals and plants?*
 - *What can be done to minimize the risks?*
 - *What is your personal experience of participation in research that has a potential to cause harm to ecosystems, animals or plants?*

PLANNING

Resources and equipment:

- Handout "[CS_U6A6 Handout](#)"
- Paper for taking notes during small group discussions
- Whiteboard for discussion notes
- Make space for the trainees to work in small groups

FURTHER READINGS

1. Cooke, S. J. et al. (2017). Troubling issues at the frontier of animal tracking for conservation and management. *Conservation Biology*, 31(5), 1205–1207. <https://doi.org/10.1111/cobi.12895>
2. Quinn, A. (2021). Transparency and secrecy in citizen science: Lessons from herping. *Studies in History and Philosophy of Science Part A*, 85, 208–217. <https://doi.org/10.1016/j.shpsa.2020.10.010>
3. Soroye, P. et al. (2022). The risks and rewards of community science for threatened species monitoring. *Conservation Science and Practice*, 4(9), e12788. <https://doi.org/10.1111/csp2.12788>
4. Tulloch, A. I. T. et al. (2018). A decision tree for assessing the risks and benefits of publishing biodiversity data. *Nature Ecology & Evolution*, 2(8), Article 8. <https://doi.org/10.1038/s41559-018-0608-1>