10 CITIZEN SCIENCE INITIATIVE FOR BIODIVERSITY MONITORING

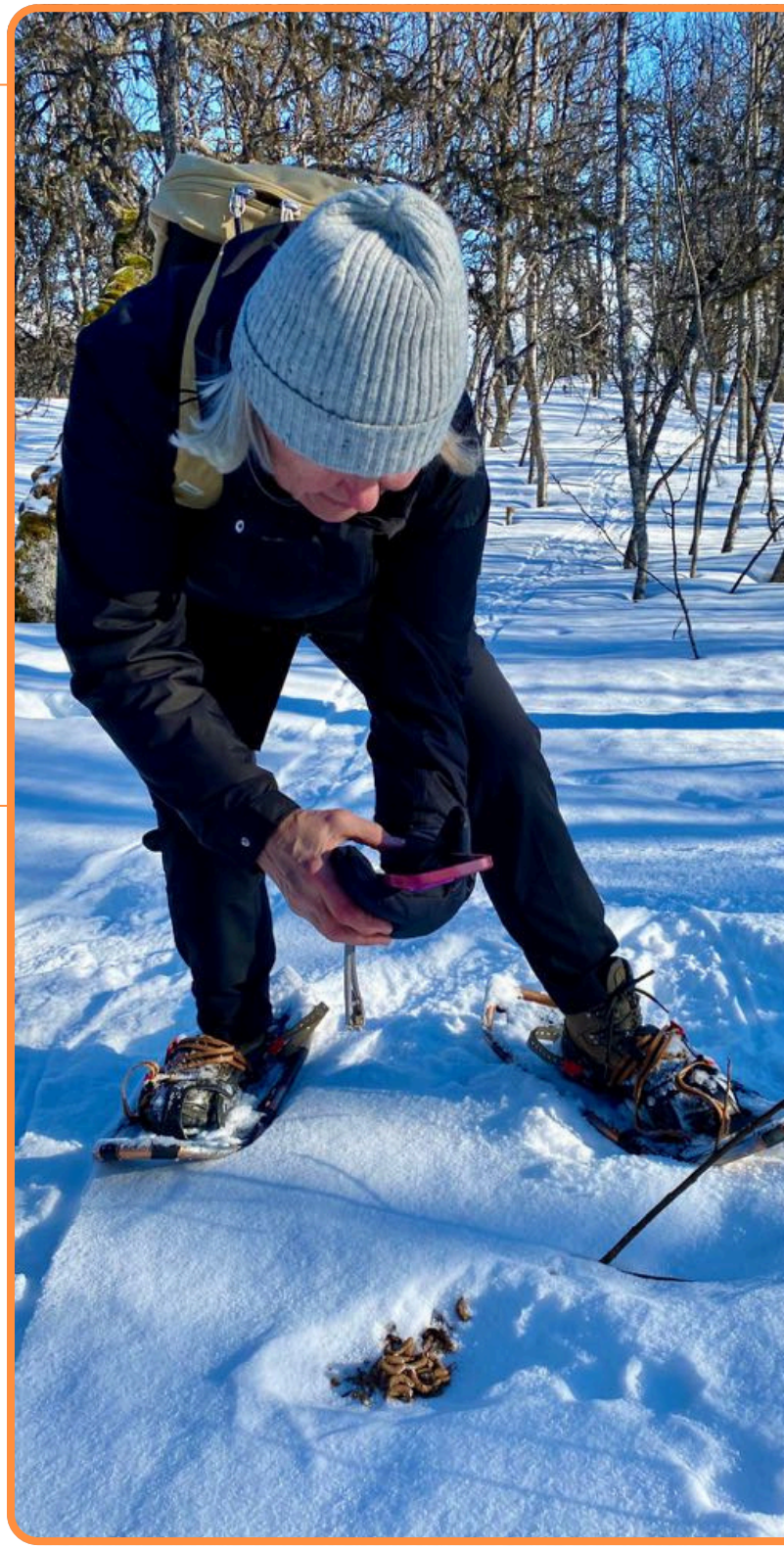
TETTRIs

Funded by the European Union

Target group and goal

Citizen science practitioners and people interested in citizen science for the purpose of **biodiversity monitoring** (including citizen scientists). The aim would be for the practitioners to take inspiration from this existing project to create their own project on **biodiversity observation** aided by **AI** instruments.

By following this recipe the readers will be able to fulfill their own project idea, either by taking inspiration from this successful story and thus **creating their own** or by replicating it step by step.



Summary/Description

This recipe is based on the TETTRIs-funded FOOTPRINTS citizen science project, dedicated to the **observation** of animals in winter by using the photos of their footprints in the snow to identify them.

This in turn is used to understand the **distribution of these animals** in the region where the data is gathered.

The following recipe is a **pathway** to build your own biodiversity-centred citizen science initiative.

You Will Need

- 1 research **question**.
- 1 or more **hypotheses**.
- **Background information** on the species you want to study (e.g. what species do you expect to find? Where? When? How can you identify them?).
- 1 or more **open source models for AI** (Artificial Intelligence) recognition.
- 1 **web based or app** linked to a repository to help with the data storage.
- 2 or more "**experts**" to validate the knowledge and the data.
- 5 or more **people** to help you gather the data - the more involved the merrier!
- **Communication** and outreach resources and plan.

Steps to implement the Course

1	Specify your research question.
2	Find people that can help you answer this question: are there researchers in your area that study this topic? Are there any initiatives already looking at this? Do you know anyone who is also interested in answering this question?
3	Gather the resources you need: refer to the list above for likely things you will need.
4	Plan your actions.
5	Make sure you invite as many people as possible to the sampling campaigns, anyone can join. It is important that your outreach efforts use concise and simple language that anyone can understand (think about people whose mother tongue is not the local language or people with neurodiversities). Think about inclusion: are you accidentally excluding someone from participating? Can you change the setting to include them? (it is not always possible to include everyone, but it certainly makes a difference if you try).
6	Train your participants: The time you need to train them depends on how simple or difficult the tools are to use and tasks to undertake. This is important to ensure high data quality and thus the usability of the data.
7	Data analysis: don't forget to include your participants in the data analysis as well (principle of CS number 4).
8	Inform your participants about the results (principle of CS number 5): Do it in a way everyone can understand.
9	If you are going to publish results, do it in a way that complies with the FAIR principles and open science principles. Acknowledge your participants (principle of CS number 7).

Timeframe

Preparation phase: between **3 to 6 months** to prepare for data collection, establishing protocols, testing the instruments:

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- Pilot testing of the AI app, with the goal of designing appropriate instructions for participants to take the most effective photos and preparing a data management plan.
- Make contact with schools/target groups for guided events, and start promoting participation to the public more broadly.
- For school/guided event groups, develop educational materials to integrate the data collection into an education program suitable for the target audience(s).

Implementation phase: it depends on the season/species, for Footprints this is winter but for a different species/climate, it could be indefinite. Minimum viable time around 3-4 months:

- Implement and evaluate guided outings
- Continue promoting public participation, supported by regular newsletter communication and availability to answer questions, etc.

Data analysis phase - 2-3 months:

Ideally this is ongoing and updated whenever necessary by stakeholder partners who set the hypotheses at stage 1 of development. A minimum viable timeline to timetable 2 months analysing the data after a 3-4 month season of data collection. Longer may be required for longer date collection seasons.

To follow the more **structured repeat-sampling format** that the Footprints' team adopted for one of their two research areas, as they concluded that this is the most innovative and promising way to use the tools developed by **Footprints**, you want to build in more intensive outreach and training of participants to help them understand how to choose sites, how often to resample, and how to share their more structured data/metadata with project coordinators.

Estimated Budget (Indicative)

In the case of Footprints, the team worked for two years with a total budget of EUR 150 000; they were a small team of professionals based in Norway with other forms of employment, thus this budget covered a designated percentage of their salaries. Moreover, the amounts required for personnel, travel and logistics, are dependent on where the team is located. The following figures are taken from the Footprints budget, and thus must be cautiously considered as the costs will vary with project:

Personnel (e.g. trainers, coordinators, administrators)	• EUR 45 000 for the development of an AI tool (mostly salary of the developer); • EUR 10-15 000 for salaries in the location where the unstructured/opportunistic approach to sampling was followed. • EUR 20-25 000 in the location where the structured approach was used instead.
Travel and logistics (e.g. fieldwork, workshops)	Highly dependent on the sampling area size, species of interest and location of the study.
Materials and equipment (e.g. lab tools, field kits, digital tools)	See under personnel costs for the development of the AI tool; no specific equipment is required from participants other than their phones or cameras to take pictures.
Dissemination (e.g. website, printing, videos)	If the website needs to be done from scratch this could be between EUR 2-5,000; printing and video production costs for the Footprints team totalled less than 300 euros, as they had in-house expertise and equipment for taking pictures and producing videos.

Note: *This budget is indicative and should be adapted to local contexts and available funding schemes.*

What went well / Even better if

What did we learn?

We learned there's a lot of interest in citizen science programs that make new types of nature observation possible! We also affirmed that it is possible to successfully ask participants to take on more structured monitoring, and that it is possible to integrate citizen science into educational programming tailored to different audiences.

Along these lines, our work affirmed that clear communication is critical when describing research protocols. Similarly it was important to be accessible for regular two-way communication to answer questions, affirm participants, share results, and create a sense of community among participants

What challenges did we encounter?

Weather is a challenge, and we learned that we needed back-up plans to keep participants engaged when the weather meant there were longer than anticipated gaps in between times of active participation.

Another challenge: we found there was no existing off-the-shelf tool (at least not that we could find) that supported the type of data collection we collected georeferenced photos, linked to a gpx line showing movement along a route, with various metadata fields. We solved this by using two different tools simultaneously (iNaturalist + Survey123) linked together in one set of instructions in a google doc. But it would be easier for both project leaders and participants if there was one tool that served this purpose.

Outputs and Indicators

Participation indicators could include the number of participants, number of public/school presentations, average number of replicate surveys per participant.

Data indicators could include the number of sites sampled and resampled, quality metrics (e.g., self-assessment by participants of survey completeness), evenness of habitat sampled.

Outputs can include educational programs/lesson plans that integrate citizen science, and data that is relevant for occupancy modeling, species distribution modeling, or other analytical purposes co-designed with intended data end users and stakeholders.

Optional: Related Deliverables or Resources

- Prototype ID app
- Instructions for participants
- ECSA 10 Principles of Citizen Science
- ECS platform
- ECS Academy

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