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INTERACTIVE REPORT

Environmental

CHALLENGES AND CLIMATE ACTION

PART 6
INTERVIEWS WITH EXPERTS
(POLAND AND ITALY)



Free publication

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What Vocational Education can do for Climate Action (VEforCA)

Activity no. 1: Interactive report: environmental challenges and climate action

SUMMARY REPORT

Research, Part 6

Interviews with experts – Poland and Italy

Language version: English

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within the project

What Vocational Education can do for Climate Action (VEforCA)





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Introduction

Individual interviews with four experts in total, i.e. two experts in each partner country (Poland, Italy) were conducted as part of the project "What Vocational Education can do for Climate Action" (VEforCA). Individual interviews constituted another part of the research within the project (in addition to desk research, surveys, focus groups). In each country, experts were selected by partner institutions from among promoters of citizen science initiatives and on the basis of identified local climate actions.

The general objectives of the research component of the project were:

- To identify the environmental issues perceived as particularly urgent and serious by the local communities.
- To identify the environmental challenges which have a direct impact on citizens' daily life.
- To collect climate action case studies related to existing successful initiatives taken in each partner country to involve VETs in climate actions.
- To discuss the relevant case studies (i.e. environmental challenges and related actions) identified through the desk research and inputs collected through the surveys.
- To analyse strengths, weaknesses and potential for replicability of citizen science approaches.
- To identify methods used in VET education in each local context to open up science and boost citizens' participation, in order to understand impact on engaging VETs, especially those with a disadvantaged background and parents, with environmental issues.

The purpose of individual interviews with experts - promoters of civic science in the field of environmental and climate action was in particular to:

- To get to know the experience of experts in citizen science.
- To analyse strengths, weaknesses and potential for replicability of citizen science approaches.
- To identify methods to open up science and boost citizens' participation, in order to understand impact on engaging VETs, especially those with a disadvantaged background and parents with environmental issues.
- To get to know the direct involvement of VET through the approach to "citizen science".
- To learn about simple and common digital tools and mobile devices, and new bottom-up solutions aimed at causing changes in the environment used in CS.
- To learn how to very effectively motivate people to participation and in boosting their interest in CS topics.

In Poland, the interviews were conducted by Fundacja „Fundusz Inicjatyw” ("Initiative Fund" Foundation). Both interviews were recorded for transcription purposes. The first interview took place on November 25, 2022 with an expert working at the Mammal Research Institute, which is an independent scientific and research unit of the Polish Academy of Sciences.

Interview no. 2 in Poland took place on December 20, 2022 with the participation of a representative of the „Na Miejscu” Foundation, which is an organization that uses a citizen science approach, especially in the field of climate and ecological actions.

Interviews in Italy were conducted by the Prometeo Association. The first interview took place on November 18, 2022, and the second on November 22, 2022.





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Conclusions from research in two partner countries

On the basis of four individual interviews conducted in two partner countries with experts - promoters of civic science, we can draw several conclusions.

First of all, citizen science is a very useful tool to familiarize ordinary citizens with issues related to scientific research, the research process, and the daily work of scientists. Thanks to citizen science, scientists can make ordinary citizens aware of what they do, what their work is for, what its effects are - generally and in the local context.

Through citizen science initiatives, science as a professional and social activity goes beyond the walls of universities and research institutes. Citizen science initiatives undoubtedly serve to popularize science in society.

Thanks to citizen science, scientists can carry out a wider range of research work, collect scientific data from a larger area (territory), in a larger number / scale, or faster.

The experts presented a variety of tools and methods (especially digital tools and mobile devices) that they used as part of their citizen science initiatives, thanks to which they opened up science to citizens and increased the involvement of citizens, including people from disadvantaged backgrounds and parents, especially in the area of environmental issues and environmental problems.

All the experts agreed on the possibility of using the citizen science approach by VET institutions for pro-ecological initiatives, especially local ones.

Probably the biggest challenge for scientists - which was pointed out by the experts - is to attract people willing to engage in civic initiatives in the long term. It is very difficult to keep people involved in citizen science initiatives. People get discouraged quickly, they don't understand that you have to wait many months or even several years for the results of your work (research results developed by scientists).

A difficulty in implementing citizen science initiatives is also the appropriate "preparation of non-professional researchers" to conduct research, collect and analyze data, and equip them with the necessary materials. This process is very time- and cost-consuming.

Citizen science initiatives also struggle with the "quality of data" collected by non-professional researchers. Not every scientific initiative is possible to be implemented using this approach. Professional researchers overseeing research must be sensitive to possible gaps and poor quality of the data they receive from citizens, and must take these aspects into account when analyzing data and developing research results.

According to the experts, the implementation of more initiatives in the field of citizen science requires not only adequate funding, but also wider promotion in the media, bringing citizens closer to this method, possible actions in which ordinary citizens could get involved, especially in their local community, for the benefit of the local community.





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Overview of the interviews

Issue no. 1

The first topic raised during the interviews was the issue of citizen science. The Polish and Italian experts were asked a few questions: *How your activity in citizen science started? Was there a turning point? What is your personal mission to take part in such activities?*

Conclusions:

The experts are people who have been involved in initiatives in the field of citizen science for years, and in this way they try to both involve citizens in scientific initiatives and promote science outside the walls of universities, scientific institutes and social institutions.

Polish expert no. 1 pointed out: “The Institute where I have been working for many years has been trying to introduce a citizen science approach to its activities as part of its projects. For example, we implemented projects where we tried to familiarize children and youth with what scientific work is and what lies behind it. As part of the project “How far is a dog from a wolf?” – school children collected genetic samples from their dogs, which were then sequenced by scientists and we checked the genetic proximity of domestic dogs to wolves from the Białowieża Forest. On the other hand, in another project, young people received camera traps and conducted their own observations. In this way, we fulfill the mission of bringing people closer to science. As scientific institutes are financed from the state budget (by society), as scientists we have an obligation to give people feedback about our work and results.

Polish expert no. 2 pointed out that she personally and the foundation she works for both have been using the citizen science approach for a long time, although for a long time they did not call it citizen science. “It’s hard for me to indicate exactly when we started working with a citizen science approach. As a foundation, we have been dealing with the so-called place-making, i.e. creating public spaces and taking care of the city and our surroundings, actively involving residents in our activities. In fact, each of our actions, whether it was the redevelopment of a green square, the establishment of neighborhood gardens, or the preparation of a project for the participatory budget, was associated with an element of diagnosis with the active participation of residents. Only we called our approach action research”. (...) “The first tool we use that could be classified as citizen science is the method we call the “place game”. Using a questionnaire among a representative sample of residents, representatives of local businesses, officials, stakeholders related to a given space, we collected opinions, e.g. in terms of traffic in the city, accessibility of communication routes for pedestrians, sense of security. We counted steps and measured distances. Our goal was to get to know the perspectives of different groups of residents, because the distance of 500 meters in the city is perceived differently by young people and differently by a disabled person, an elderly person or a mother with a pram. By engaging the represented groups of residents and stakeholders in our research, we obtained an extremely valuable diversity of perspectives. Only we didn’t call our approach citizen science, but rather community science.”

Italian expert no. 1 started working on the citizenship approach more than a decade ago. He states: “As part of the activities of the Maremma Natural History Museum, which I manage, from around 2010, I felt the need to create a computer system for collecting data on biodiversity that would allow the participation of volunteers. After a long search for available cheap or open source solutions, I discovered Indicia, an open-source software provided by Imperial College as part of the Citizen Science Project





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(Opal), which involves many UK universities. The program allows you to monitor soil, air, water, biodiversity. Opal then expanded beyond the UK, laying the foundations for the European Citizen Science Association (ECSA since 2014), of which I co-founded. In 2013, ECSA was presented at Green Week in Brussels, in the presence of the European Commissioner for the Environment, and in 2014 it was registered in Germany and run by the Natural History Museum in Berlin. I personally served as a member of the Board of Directors from 2014 to 2020.”

The Italian expert no. 2 started working on citizen science in 2017 through a collaboration with the Natural History Museum of the Maremma. As a manager, she participated in herpetological activities organized by the museum. Since then, cooperation with the museum has become her main professional activity and passion at the same time.

The experts emphasized that knowledge of the concept of citizen science in society is low, and the understanding of science and the work of scientists is quite general. Often the work of scientists is misunderstood and underestimated.

Polish expert no. 1 pointed out: “The work of a scientist in Poland is not highly valued. There is a bad perception of scientists in society. There is little awareness of what scientific work looks like and what it can be used for. By engaging people in our scientific activities, we want to show what the work of scientists is all about, what the collected data is for, how it can help scientists in their work. But we also want to show young people that a scientist is also a human being, that they do not always succeed in everything. (...) "Thanks to such projects, we try to "open" the Institute and show people that every person can contribute to science.”

The experts emphasized that the opportunity to use the citizen science approach in their daily work is also a way for them to fulfill their personal mission in the field of promoting science, bringing science closer to citizens, and engaging people in various initiatives.

Polish expert no. 2 pointed out: “The mission of our foundation is to give residents the opportunity to shape their surroundings in public space. We want people to be co-creators of activities carried out in their environment, to have a sense of influence, but also to understand the processes taking place in the city and the relationships between them. For example, in the aspect of communication and car traffic. There are many myths about this. One of them is the belief that if we widen the roads, there will be less traffic jams, and all studies show that widening roads even increases car traffic, and the problem of congested streets is growing. It is difficult for people to explain such relationships with theory alone. Talking about it, giving examples from abroad, from other cities, is not effective. Only when people get involved in something themselves, e.g. when they start measuring traffic and seeing the results of their actions, do they begin to understand. This educational aspect of the citizen science approach is very important to our work.”

Italian expert no. 1 added: “a citizen approach broadens horizons, creates valuable networks of people who believe in advancing science through community involvement, at different levels and in different sectors. You don't have to reinvent the wheel, just respect other people's experiences and work closely with them to improve scientific knowledge in general.”

In turn, Italian expert no. 2 underlined: “my mission is to make people aware of the importance and complexity of the scientific method, to bring the environment closer to society through a process that sees them as heroes. Showing people how, through science, we can influence political decisions, in my case in the area of environmental protection.”





Issue no. 2

In the next step of the interviews, the experts were asked what citizen science approach meant to them personally and discussed the tools and solutions that could be used in citizen science initiatives. The following questions were asked: *What is citizen science in practice? What kind of digital tools, mobile devices, and bottom-up solutions aimed at causing changes in the environment are used in citizen science?*

Conclusions:

The experts pointed out that, of course, there is no single definition of citizen science. Different scientists and activists use different concepts of the way of doing science, in which scientists at every stage of the research process are assisted by non-professional researchers.

As Italian expert no. 1 noted, “there are many definitions of citizen science. My favorite is: involving volunteers and scientists in collaborative research activities to generate new knowledge based on scientific evidence.”

Polish expert no. 1 pointed out: “I would call citizen science the inclusion of people not related to science at various stages of data analysis or data collection in creating a wider science, including making it available outside. Thanks to this method, people feel they are part of the creation of science, they contribute to the creation of information that we - scientists - collect.”

In turn, expert no. 2 from Poland noted: “from my perspective, citizen science is simply a method of doing things. This approach and form of cooperation in scientific research. On the one hand, it is conducting research and a way to obtain data and, in general, inclusion from a new research perspective, but on the other hand (...) it is also a form of education and participation of a community and giving people such influence”.

For Italian expert no. 2, citizen science is “the involvement of citizens (sensu lato) in the scientific process, from the development of an experimental application to the presentation of results. Citizen science collects original data to answer unpublished scientific questions.”

Citizen science promoters pointed to many diverse tools, especially computer programs and applications, which they successfully use in the implemented initiatives / projects in the field of citizen science.

Polish expert no. 1 listed some tools used by her and her Institute:

- “The application in which data from camera traps are collected and recorded. The data collected by Polish non-professional researchers are then sent to the Global Biodiversity Information Facility. Poland as a country, thanks to research information obtained from citizens through the application, provides knowledge about the occurrence of animal species on a European scale. In addition, the Institute uses an Internet platform (MammalWeb), on which non-professional researchers can upload data (recordings) from camera traps. People involved in the project and data collection on the platform can create their account and deposit and share data free of charge. They can also create their own collections of recordings, show stories of what is happening around them.”

- “Camera traps are increasingly used by hunters, for example to monitor the occurrence of various species in hunting grounds.”



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- “As part of the Open Forest Data project, we use a platform to digitize science resources. Each person involved in the project can deposit the collected data there, which we then digitize and make available to the public. From the platform, anyone can download any content, e.g. 3D scans of skulls from our zoological collection. Everyone can set up their own collection and, for example, deposit ornithological data.”

Polish expert no. 2, in turn, noticed that the foundation she works for tries not to use IT tools (smartphones) as part of the project with children, so as not to increase the time that young people spend with the phone in hand. She indicated:

- “We work with children aged 8-9 in early school age. We didn't want to use mobile phones or cameras too much, due to the age of the kids, so we opted for very simple offline tools. For example, we work with a mock-up, which is a way of telling what the children saw in the field.”

- “As part of the air quality survey initiative, children from 3 primary schools select sites and, together with atmospheric physicists, deploy passive sensors to measure air quality, NO₂ concentration in various locations around their schools. After some time, the sensors are transferred to the laboratory for analysis of the results.”

- “The police speed radar was very attractive in the Road Safety Study. With the children, we took speed measurements in front of schools.”

The Italian expert no. 1 emphasized that “sky is the limit”. In his opinion, when it comes to tools and solutions that can be used in citizen science, there are no limits to imagination. We live and work in an ever-changing reality, and this is one of the most fascinating aspects of citizen science and science in general.

Italian expert no. 2 pointed to the widespread use of smartphones and various applications. She said: “The main tool used by citizen scientists to participate in a citizen science project is certainly smartphones. It is possible to use both applications and platforms created for specific ad hoc projects. As well as to use a smartphone to complement/enhance real research kits for fieldwork that citizen scientists can use to collect data themselves.”

Issue no. 3

In the next step of interviews with experts, issues related to engaging citizens and local communities in citizen science initiatives were discussed. The following questions were asked: *What is beneficial for a local/global community in using citizen science approach? What is the impact of citizen science, if any, on changing the role of science? In your opinion, does citizen science increase the agency of citizens and local communities?*

Conclusions:

All the experts agreed on the many benefits of engaging ordinary people in citizen science activities, both individually for non-professional researchers and for the local community, the whole society, and of course science itself and the way it is perceived by citizens.

Polish expert no. 1 emphasized that thanks to such initiatives there is an increase in environmental awareness and knowledge in the society. She pointed out: “People often don't realize what they really have around them. As part of the MammalNet project, we lent camera traps to people





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free of charge and we often got feedback from them that I didn't know that there were so many animals in my neighborhood / backyard. (...) If people start to pay more attention to what is going on around them, they start to respect the environment that surrounds them and in which they live. In people who engage as non-professional researchers, there is a change of approach, an increase in awareness, an increase in knowledge; the feeling of being important grows. The upbringing of society takes place. (...) Maybe some of these people will link their professional career with the world of science in the future.”

Polish expert no. 1 emphasized that “science must start opening up to people. The world of science is often perceived as a hermetic environment, hardly cooperating with people. With this level of digitization, in the digital age, we as scientists need to move to a stage where we give people feedback on our work. We have to show the society that we are open to people, that everyone can come to us and see what we do as scientists. A citizen approach is one of the coolest ways to involve citizens in science.”

Expert from Poland no. 2 pointed out:

- “From our many years of experience, I can see that citizen science can be a way of social participation. In our work, we see how many people are tired of participating in various civic/social consultation processes. People we want to engage in our projects tell us that, for example, two years ago some researchers talked to us about this city square and nothing has happened since then. There is a certain frustration in people that, despite consulting them, nothing changes, or the whole process takes a long time. (...) So I have more courage and the feeling that I am telling people honestly when I say that together we can explore some problem, some challenge regarding a specific place, and only then see what we come up with. Then people “take care” of this topic, they are interested in it, they also get to know their neighbors. These are always aspects that integrate the local community. So I feel like a citizen approach is of great value to the community.”

- “When it comes to the benefits of citizen science in a global perspective, in urban science - which is what we do - we see that it is difficult to find any inspirations, any partners. But when it comes to projects based on the collection of Big Data, the use of large online tools, I have the impression that a lot of citizen science projects concern natural and ecological issues. Biologists often use this tool, it is developing very rapidly in these fields of science. I was involved in such nature activities myself when I was in Australia. It's great fun and a sense of being part of some global movement. Meeting people from a completely different part of the world where we are fighting for the same cause.”

Polish expert no. 2 also added that “it seems to me that thanks to the citizen approach, the way of communicating the results of research projects may change a bit. (...) it is a challenge to communicate the results of scientific research to various groups in an accessible way. In the citizen approach, if we involve people in a given study, we must present the results of our activities in a way that is legible for mere mortals, and this can be a great potential for science. A bit like rebuilding bridges between the world of science and the wider public.”

Italian expert no. 1 on the benefits of citizen science for the community pointed to “the fact of playing a role - being able to describe or provide specific clues about the phenomenon, in a broader and more recognizable context, perhaps with tools developed by other communities and/or in other social or geographical contexts.”

At the same time, he said: “I don't know if we can still talk about impact because, although increasingly widespread, citizen science is in the vast minority compared to classical science. We are certainly moving towards a paradigm shift in which slowly many “ivory towers” will have to collapse. This does not mean a deconstruction of traditionally understood science, but a greater involvement of the society and - what is very important - a parallel deep revision by many scientists of their way of doing and understanding science, questioning themselves and cooperation in creating means and





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instruments that can facilitate this process. Citizen science has the potential (still not fully exploited in my opinion) to raise the awareness of citizens and local communities about climate change. How? By involving them directly in collecting data that until now has only been talked about on TV or in books.”

Italian expert no. 2, in turn, noted that: “there are many aspects that make a citizen science project beneficial for the local community. First of all, thanks to cooperation with scientists, citizens can effectively solve problems affecting their community (e.g. water pollution). Secondly, thanks to the results achieved, communities can influence political decisions regarding common goods (e.g. urban greenery). There are also myriad personal benefits that citizens derive from participating in citizen science initiatives: the development of one's own cultural background, the psychological benefits of being in contact with nature, the sense of inclusivity and usefulness of active citizenship experiences.” “(...) Thanks to the citizen approach, science is no longer the exclusive prerogative of a few experts, but is open to the general public. I would describe the impact of citizen science as concrete and revolutionary. A good citizen science project must, among other things, sensitize the public, make them aware that their behaviour may have an impact (for example) on climate change.”

Issue no. 4

The next part of the interview with the promoters of citizen science raises issues related to the possibility of integrating citizen science into the vocational education and training (VET) sector in a given country and popularizing this method of conducting research. The following questions were asked: *How citizen science can be integrated into vocational education and training? What actions should be taken to popularise the idea of citizen science? What is the starting point for involvement / participation in activities in the field of citizen education for people/participants (also according to your experience)?*

Conclusions:

The experts highlighted several possible practices and solutions where a citizen science approach could become part of the VET system. They emphasized the innovativeness of this method, its novelty and curiosity. They agreed on the possibility of its use in education and on the labour market. At the same time, they pointed out the need for systemic changes in the education or higher education system so that this approach could be implemented on a large scale.

Italian expert no. 1 noted that “it would be nice and interesting if there were university lectures (in other countries this is already a reality) dedicated to citizen science. This would certainly facilitate the paradigm shift process. In addition, at lower levels of education, it would be useful to involve schools in citizen science projects. This is already happening, even in our country. It just needs to be more structured and promoted.”

Italian expert no. 2 pointed out that “in recent years, citizen science has emerged in universities as a field of study and/or as a topic for doctoral projects. The exchange of experiences and networking between different realities facilitates the development of every professional. The implementation of trainings (including for teachers of primary and secondary schools) is another important step in professional development.”

Polish expert no. 1 noted that VET institutions could “train people in the collection or statistical analysis of scientific data, because there are shortages in the labour market in this area. (...) people are





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trained in data analysis, but they lack ecological knowledge to be able to engage in nature information. In addition, interdisciplinarity is important and showing how different types of science and fields of study can "cooperate" with each other - this is an aspect that has not yet been fully developed. (...). I also see the possibility of using "ecosystem services" - education about what resources the environment gives us, how we use it and how to balance the use of individual elements, based on publicly available data. In Poland, it does not prosper at all, and in Western countries it is starting to work well".

She also emphasized that: "The open online course did not work for us. As part of our project, it was possible to sign up for an online course and go through individual modules at any time, obtaining a certificate at the end. Ten people signed up for the course and only one completed it. In other countries (Spain and Great Britain) it went very well, but it didn't work for us. It failed to encourage people to undertake self-education."

Polish expert no. 2 pointed out: "I think potentially citizen science is a great tool because the benefits are for both sides. Certainly this is another new, interesting aspect. It is crucial to include this perspective in every other area, be it gastronomy or transport, whether it is the fashion and beauty sector. For people, it would potentially be a very interesting educational perspective."

In terms of actions that can be taken to popularize citizen science and engage citizens, the experts had different thoughts and concepts. On the one hand, they emphasized the challenges posed by the involvement of non-professional researchers in the scientific process (including the time and costs needed), and on the other, they pointed to the benefits for both sides (professional researchers and engaged citizens). They pointed out the need for a wide promotion of this method in the media.

Polish expert no. 1 pointed out that: "Physically going out to people always gives the best effect of popularizing citizen science and science in general. You have to show people, e.g. how the application works, that they can take some photos, see a map, etc. Social media are crucial for popularization on a wider scale, they attract the most people, also competitions with prizes. People need to feel like they're getting something in return for their commitment."

Expert from Poland no. 2 also noted that: "when I think about what would need to be done to increase people's involvement and make this process meaningful, a red light always lights up for me. I think it's important to be open and honest with people. We make sure that people understand what they are involved in, what is the purpose of it, so that they have a chance to learn about the results of research, even if they are one piece of the whole puzzle, which is the case in citizen science. We're always trying to make sure people get something back, so that they get some benefit from participating."

The expert also referred to the organizational and financial issues of using the citizen approach in scientific research: "in order to prepare citizens well for the work of non-professional researchers, a huge time investment is needed, and therefore also financial. Each group works differently, differently with adults and differently with children. In our urban projects related to communication and public space - where there were different groups - we had to accompany and help at all stages in order to receive reasonably good quality data from people. It seems to me that with the cost savings for research, it can be a bit tricky", i.e. the costs can be higher than in the case of classical scientific research.

The Italian expert no. 1 pointed out: "The answers can be many, depending on the scientific sector we are referring to. In my sector, the biodiversity sector, promoting citizen science means (also) organizing a lot of public events to directly involve citizens and give our activities the right visibility."





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Expert no. 2 from Italy pointed out: “popular events, workshops, laboratories that bring the civic approach closer to society. We will soon establish the first Italian citizen science association. We hope that thanks to advocacy activities we will be able to focus political and media attention on citizen science as a new way of doing science. In other countries, governments are allocating ad hoc funds to such initiatives, and we hope to be able to do the same in Italy.”

In addition, she emphasized that people get involved when “the topic is close to their heart. It is easier to involve people in activities that concern them (e.g. air pollution in the city where they live). In green action, the citizen science challenge is to get people to understand that protecting biodiversity is important to their health.”

Issue no. 5

In the next step of the interviews, experts were asked about the citizen science initiatives in which they had the opportunity to participate. The following questions were asked: *How many citizen science projects have you had contact with (as an organizer, participant or observer)? What were they about?*

Conclusions:

Unsurprisingly, the experts participated in many different initiatives using a citizen science approach, not only in their own country but also abroad. Among them, activities in the environmental, ecological and climate areas prevailed. Many initiatives in which the experts participated were transnational.

Polish expert no. 1 listed 3 main projects in the field of citizen science in which she was / is professionally involved:

- the "Open Forest Data" project, implemented by the Royal Botanic Gardens, concerning the restoration of natural, native plant species in urban surroundings;
- an initiative involving cooperation with hunters in collecting data on the occurrence of animal species;
- project: MammalNet, involving animal observation - people take pictures of animals in their area and upload via the application.

Polish expert no. 2 among the projects in the field of citizen science in which she participated listed:

- “a project focused on finding mobility scenarios to improve air quality so that residents can choose transport other than their own car (e.g. scooter, bicycle, on foot). The citizenship science area includes activities with 3 primary schools in Warsaw, children, teachers and parents. We measured the quality of road and transport infrastructure from the perspective of children, measurements of distance times. We wanted to determine what an attractive road means to children. We tried to compare what noise sensors measure and what children feel. The kids marked places where there were problems, e.g. a dangerous pedestrian crossing or a green light on the crossing that was too short. Starting from children's ideas, together with experts, we try to introduce specific changes around schools, e.g. redevelopment of a pedestrian crossing.”
- An environmental project in Australia that analyzed pictures of animals so that AI could recognize them with greater accuracy. The project was so attractive to people that thousands of people were involved in it.





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- Urban Garden project in Natural History Museum in London, consisting of counting, measuring, photographing snails found in people's gardens or measuring the real temperature.
- we are preparing to implement a climate-related project. It will examine to what extent climate change affects people at the level of neighborhoods and housing estates, and to what extent some activities undertaken by people, such as collecting rainwater, planting roofs with greenery, concrete yards, translate into the temperature in the city.

The Italian expert no. 1 has been involved in “dozens, maybe hundreds, of such initiatives. First as part of cooperation with Great Britain, then as part of ECSA, and finally in Italy. The projects covered many different applications of science and were carried out in different contexts.”

Italian expert no. 2 participated in several activities related to biodiversity monitoring.

The experts pointed out that there is no one universal and effective method of attracting citizens to citizen science initiatives. Each project requires an individual approach to encourage people to engage as non-professional researchers. Experts agreed that the durability of citizens' participation in such activities varies, there is no rule. Some people give up very quickly, others are engaged and active throughout the whole research process.

As Polish expert no. 1 pointed out: “In our project with camera traps, some people are constantly active from the very beginning. People get engaged. Two people bought their own camera traps. Against the background of all countries where this project is implemented, Poland has the most records, after Spain.

In the application we get new records from all over Poland and the number is constantly growing. In places where there is no citizen science on a daily basis, people are very eager to get involved. We have “permanent” people. We organize a competition for the best photo and the most active participants once a month.”

Italian expert #1 pointed out that the insufficient involvement of citizens in citizen science's initiatives “is one of the main problems of citizen science in Italy. Engagement is generally short-lived and needs to be constantly renewed. This is not always the case, for various reasons. Retaining people is the greatest challenge of citizen science. While some observers regularly provide many observations, most provide a very small number of observations spread out over time. This participation should be revitalized.” He emphasized the importance of social media, promotion in local newspapers, Internet portals, associations, schools, etc.

According to Italian expert #2, non-professional researchers can be found “potentially everywhere. In the case of environmental projects (such as those organized by the museum where I work), it is easiest to involve students. Schools are another very important area of influence.” The expert also emphasized that she meets two main categories of non-professional scientists. The first “are people who have been participating in our projects for years, others leave after some time”. In addition, new people join during the project.

Issue no. 6

Further in the interviews, the experts shared their views on the strengths and weaknesses of the citizen science approach by answering the question: *What are the strengths and weaknesses of citizen science?*





Conclusions:

The strengths of citizen science include: a large potential for conducting research, the possibility of a wide range of activities by scientists, reaching places where it would be difficult to conduct research without the help of non-professional researchers (Polish expert no. 1: “we are reaching places that even with the largest funding of scientific projects we would not reach because we are not able to cover the whole of Poland with our monitoring system, and people can be everywhere and collect data, thanks to which we have a lot of measurement points”; in turn, the Italian expert no. 2: “in a short period of time it is possible to collect a large amount of data, having more people you can explore more areas”

Polish expert no. 2 added that thanks to the involvement of citizens, scientists gain a new research perspective: "the elusive perspective that these people bring, it would be much more difficult for researchers to go to these places." Italian expert no. 2 added that the citizen approach 'allows the scientific community to communicate with people and policy makers'. This was also confirmed by the Italian expert no. 1, noting the "close contact with local communities" thanks to the implementation of research using citizen science.

The experts disagreed over the cost of the citizen science approach. According to an Italian expert, such research generates "low costs". In turn, the Polish expert emphasized that preparing non-professional researchers to collect good quality data is very time-consuming and generates significant costs.

With regard to the weaknesses of the citizen science approach, the experts agreed on the difficulty of recruiting and retaining non-professional researchers for the entire research process. Polish expert no. 1 indicated that "it is very difficult for people to take the first step" and expert no. 1 from Italy pointed to "low sustainability of projects in the long term". Polish expert no. 2 added: "non-professional researchers lack patience, they want results immediately."

Most importantly, however, all the experts emphasized the difficulties in ensuring by scientists (as persons responsible for research and its results) that the data collected by non-professional researchers are of good quality.

Polish expert no. 1 pointed out: “Everyone can get involved in research, so without a good data quality verification system, we are not always able to determine whether the data is valuable. The data is not always suitable for our research plans” (...) “People tend to prove themselves, so they collect the most attractive data. In our project, we got pictures of a wolf or a badger, but we didn't have a picture of roe deer, which is common in Poland. People need to be made aware that any data is attractive to us.”

Polish expert no. 2 added: “taking care of data quality is a challenge. In our project, when measuring air quality, some sensors were destroyed or stolen. Getting people back to the researchers with the results isn't always successful."

The statements of the Polish experts were also confirmed by the Italian expert no. 2, stating: "the weakness is the quality of the data (...) citizen science has the potential to be applied in various fields of science, but in the case of non-specialized volunteers, some methodologies must necessarily be simplified."



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In addition, the experts pointed out such weaknesses of citizen science as: "communication with non-professional researchers is difficult to implement", "impossibility to use this approach in some research areas / scientific disciplines", and "limitations at local level in terms of political support".

Issue no. 7

Interviews with the experts were concluded with a discussion of possible pro-environmental initiatives, asking them the following questions: *What, in your opinion, has the greatest impact on improving the condition of the environment in our country? Do you think that educational institutions, especially in the VET sector, can contribute in any way to climate action? Do you think that citizen science-approach can contribute to the fight against climate change?*

Conclusions:

The experts agreed that in the first step it is necessary to increase people's ecological and environmental awareness. Only by making citizens aware of the ongoing climate change and the impact of our everyday choices and actions on the environment can it lead to a change in habits and habits, i.e. people abandoning non-ecological behaviour.

Polish expert no. 1 noted: "What is needed is a change in the awareness of people and individuals. Classic environmental education is not enough. Each of us knows that burning garbage pollutes the environment, and people burn garbage anyway. Penalties and fines are not effective either. People often think individually. We don't think about what we leave to our children, grandchildren, lack of future awareness."

The other Polish expert pointed out that "the climate issue is very broad, but basically without large-scale top-down decisions there is no chance for major changes. I think, it is necessary to build awareness, to constantly show people the consequences of certain decisions, e.g. energy, industrial, for our lives and for future generations. Awareness-raising activities are needed, developing ideas for pro-climate actions. So that people would vote with this key, so that politicians could approach the topic of ecology more seriously."

Italian expert no. 2 added that a "change in people's lifestyles towards more environmentally-sustainable choices" is needed.

The experts agreed that VET institutions can play a positive role in climate action.

Italian expert no. 2 pointed out: "Absolutely yes! Informed citizens, supported by scientists, can put pressure on governments to implement concrete actions in the fight against climate change."

Polish expert no. 1 added that: "education should look different: not informing, but rather realizing the effects of one's own actions, their consequences. Children are the best educators. Environmental education should be conducted from kindergarten. Children can make their parents and grandparents aware. The shaming by a four-year-old works better than any media promotion. Educational activity, showing the basic principles of the functioning of nature at the lowest levels of education gives the best results in the future."





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All the experts also agreed that a citizen science approach can contribute to the fight against climate change.

Polish expert no. 1 noted “citizen science has the power to show how the impact of an individual fits into a wider scale, e.g. a smog sensor – if everyone could install it, they would notice the effect. Certainly, citizen education has potential.”

Expert no. 2 from Poland added: "yes, that's when the understanding is deep and real, and your own experience and the feeling of being part of a movement is necessary and it is an effective tool to improve our environment in our country, but we should think globally."

Italian expert no. 1 pointed out: “Of course it is. In my opinion, this should indeed be the main road. The scientific approach means awareness that leads to appropriate behaviours that imply choices and general guidelines to be followed, both on a personal and societal level.”

Issue no. 8

At the end of the interviews, the experts were asked: *Is there anything else you'd like to add??*

Polish expert no. 1 emphasized that in Poland “people often do not pay attention to science when they have other problems. For example, the economic situation means that the priority of paying attention to science is much lower. In Poland, it is much easier to say that I am not interested in issues such as climate change or the environment, because I have completely different problems - economic, social.”



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