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PR3A2 Report on the participation of DHH adults in Citizen Science Projects

Participation of d/Deaf and Hard of Hearing Adults in Citizen
Science Projects for climate change



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Citizens in Power is a Cypriot non-for-profit educational and research organization with experience in facilitating the active participating of the public in civic life through the provision of innovative material and trainings.



IASIS is a Greek NGO that is active in the fields of social inclusion, mental health and education, offering counselling and psychosocial support to marginalized groups.



IRSAM is a French Institution specializing in hearing impairments and sensory disabilities in both children and adults. It supports people with disabilities, in specialized workspaces, in mainstream settings and in learning and training centers.



IST is an Italian Institute and a non-for-profit foundation, providing a wide range of educational and training services and activities, as well as, support for the DHH and other linguistic and cognitively impaired children and adults.



RITE is a Cypriot non-for-profit organization that seeks to contribute to scientific and applied research with the purpose of reinforcing innovation, technology transfer, knowledge consolidation and policy reform.



Web2Learn is a Greek organization specializing in open education, science and policy, as well as, social connectivity. It has experience in civic engagement strategies for environmental preservation in a range of citizen science projects.

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INTRODUCTION

There is a growing presence of citizen science projects in recent times, actively involving the public in scientific research and data collection to deepen understanding of biodiversity and contribute to its preservation. Among these initiatives, we will highlight six projects that stand out for their emphasis on encouraging citizen participation and promoting environmental awareness among individuals with hearing impairments (DHH).

These projects include "Discovering Magnolias" in Italy organised by the Institute for the Deaf in Turin, involving 40 adult DHH participants, "Wild in My Street," "Spider Observatory," and "Birds in Gardens" in France by the IRSAM Association, specialising in hearing impairment, also encompassing 40 adult DHH participants across its three projects, as well as "Observing Butterflies in Cyprus" in Cyprus co-organized by CIP and RITE associations, comprising 10 adult DHH participants, and finally "Climate Change and its consequences to our natural habitat" run by Web2learn in Greece, who involved 8 DHH.

In total, 100 adult DHH participants have been able to engage and immerse themselves in participatory science projects, not only related to biodiversity but also significantly linked to the crucial issue of climate change. These initiatives have provided a unique opportunity for DHH adults and trainers to actively engage in authentic scientific endeavours aimed at advancing knowledge to combat climate change.

The underlying goal of these projects is to create a pathway for the public, especially individuals with hearing impairments, to explore and appreciate the natural world around them. By actively participating in these initiatives, individuals have the unique chance to engage with and learn about various plant and animal species in their local environments. Each of these citizen science projects (CS) had a specific objective, whether it was observing magnolias, exploring urban wildlife species, studying spiders, observing garden birds, or monitoring butterflies in Cyprus. Through these different perspectives, valuable scientific

data has been collected on species distribution, behaviours, conservation statuses, and factors influencing their existence.

Beyond the realm of data collection, these participatory scientific efforts also serve as platforms for learning and environmental education. Participants are empowered to develop vital skills in observation, species identification, and data collection, deepening their understanding of ecosystems and their complex interconnectivity. By actively involving citizens in these projects, a vital bridge is established between the domain of science and society, underscoring that each individual has the capacity to meaningfully contribute to biodiversity preservation and address pressing environmental challenges.

Throughout this report, we will delve into the various stages, outcomes, and impact of these scientific projects, highlighting the crucial role of public engagement in scientific research and biodiversity preservation. The collective effort of these projects forms the foundation, illustrating the potential of citizen science to forge harmonious coexistence between humans and the natural world we inhabit, providing the opportunity for everyone, regardless of their disability status, to become sensitised to the realm of participatory science and climate change. To go a step further and ensure that more people participate in citizen science projects, it is essential that citizen science professionals adapt their materials and media. This seems to be the key to involving adults with disabilities and giving them a sense of being agents of action on the issue of climate change.



CHAPTER 1

Summary of description of each Citizen Science Project





Observing Butterflies in Cyprus

By



&

RITE



European Butterfly Monitoring Scheme aims to promote the monitoring and protection of butterflies. This CS project enlists the participation of thousands of volunteers throughout Europe to follow a specific methodology and guided instructions to observe butterflies in order to contribute to butterfly conservation.

The Cyprus Butterfly Monitoring Scheme is coordinated by Dr. Elli Tzirkalli, Research Associate at the Open University of Cyprus (TEM lab).

The citizen science projects conducted in Cyprus in collaboration with partners CIP and RITE have facilitated the active participation of deaf and hard of hearing (DHH) adults in the European Butterfly Monitoring Scheme.

This project aims to monitor and protect pollinators by studying the effects of climate change. Two methods are used to observe butterflies: the transect, where participants follow a guide to record observations of species and weather conditions, and the "15-min Count," where participants count butterflies for 15 minutes and can use an app to upload photos.

Approximately 56 species of butterflies are observed in Cyprus, inhabiting diverse habitats such as meadows, agricultural areas, forests, and riparian zones. Monitoring the butterfly population is essential for assessing environmental changes and determining their conservation status. The collected data contribute to the development of European indicators related to agricultural policies and biodiversity strategy.

The planning of these projects considered the specific needs of the DHH community in Cyprus. As English proficiency is limited among the DHH, adaptations were necessary to make the projects accessible. Since some projects were in English, they were translated into Greek. The creation of online accounts and the use of applications posed challenges, thus Greek projects were identified. In partnership with the Open University of Cyprus and the Terrestrial Ecosystems Management Lab, the projects were adapted, and resources in Greek sign language were developed.

The participation of DHH individuals was made possible through simplified methodologies in Greek and explanatory videos in sign language. A Viber group was established to facilitate

communication and result sharing. Participants took photos and videos of butterflies, guided by a sign language instructor. Results were reported via adapted forms.

In total, 10 participants were recruited and guided by

instructors. Communication was maintained through the Viber group, and two project coordinators—the sign language instructor and the project coordinator—provided support. The expert in citizen science, Dr. Elli Tzirkalli, also assisted in identifying the observed species.

In conclusion, these projects were adapted to include DHH participants, emphasizing accessibility and active engagement. They have demonstrated the importance of tailoring methods to include specific communities while fostering collaboration among researchers, trainers, and participants.



Discovering Magnolias in Italy

By



ISTITUTO DEI SORDI
DI TORINO



The citizen science project "Discovering the Magnolias" was initiated by educator Chiara Moretti in collaboration with the Turin Institute for the Deaf. The main objective of the project was to map and identify magnolia plants in the Pianezza region while actively involving the deaf community. The project was based on a previously successful initiative, with a particular focus on observing pink and white magnolias that bloom between April and June.

To achieve this goal, the project brought together forty participants, including residents of the "Casa Decibel" at the Turin Institute for the Deaf and young deaf students from the Italian course. Involving this community created an inclusive approach and encouraged the participation of everyone in scientific research.

Participants used the mobile application PlantNet to identify and record the magnolias they encountered during their walks in the green spaces of the region. The photos taken were then used to create a poster representing the experience, which was analysed during the Italian lessons with the deaf and hard of hearing individuals. These analyses provided a better understanding of the presence and distribution of magnolias in the Turin region.

The project also aimed to study flowering over several years to assess the impact of climate change in the region. By collecting and analysing data on the presence of magnolias over an extended period, the project sought to provide valuable information for better understanding the effects of climate change on local biodiversity.



Wild in my street

By

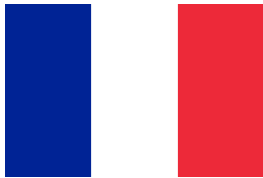


sauvages
de ma rue

The citizen science project "Wild in my street" is an initiative aimed at exploring urban biodiversity by encouraging active and engaged citizen participation. Its primary objective is to raise public awareness about the crucial importance of biodiversity and to create awareness of the challenges related to climate change, while fostering citizen mobilisation to preserve nature in urban environments.

What makes this project remarkable is its inclusive and adapted approach towards deaf and hard of hearing individuals (DHH). Special attention has been given to enabling their full participation. Specifically, tailored training sessions have been designed, and resources such as sign language interpreters, captioned visual materials, and other accessible resources have been deployed to facilitate smooth communication and clear understanding of information.

The project's progression revolved around different key stages. Participants, including DHH individuals, received training to identify plant species present in their neighbourhoods. They were then encouraged to explore their urban environment, observe the surrounding flora attentively, and document their discoveries using photographs. These collected data, including photos, were carefully compiled into a database that provides an overview for analysing trends in urban biodiversity over several years.



Birds in gardens

By



The "Birds in gardens" project is a citizen science initiative that relies on the active engagement of citizens to study and record bird species present in gardens and urban green spaces. The basic principle is simple: participants are invited to dedicate some time each day, week, or month to observe birds in their garden or nearby environment.

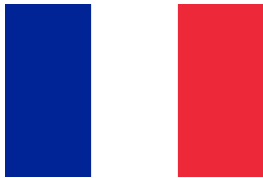
Its main objective is to better understand urban avian biodiversity and its evolution over time. By collecting data on observed bird species, their frequency, and geographical distribution, scientists can obtain valuable information about the state of wildlife in urban areas.

This project offers several advantages. Firstly, it involves not only the general public but also deaf and hard of hearing participants in scientific research, turning citizens into actors in biodiversity conservation. This fosters a broader awareness of the importance of nature and the need to protect it.

Furthermore, the project provides essential data for monitoring the populations of birds in urban areas. Regular bird monitoring helps detect potential variations in their numbers, migrations, and behavioural patterns. Such information is valuable to biologists and ecologists seeking a better understanding of the factors influencing bird presence in urban environments and evaluating the effects of climate change and urbanisation on biodiversity.

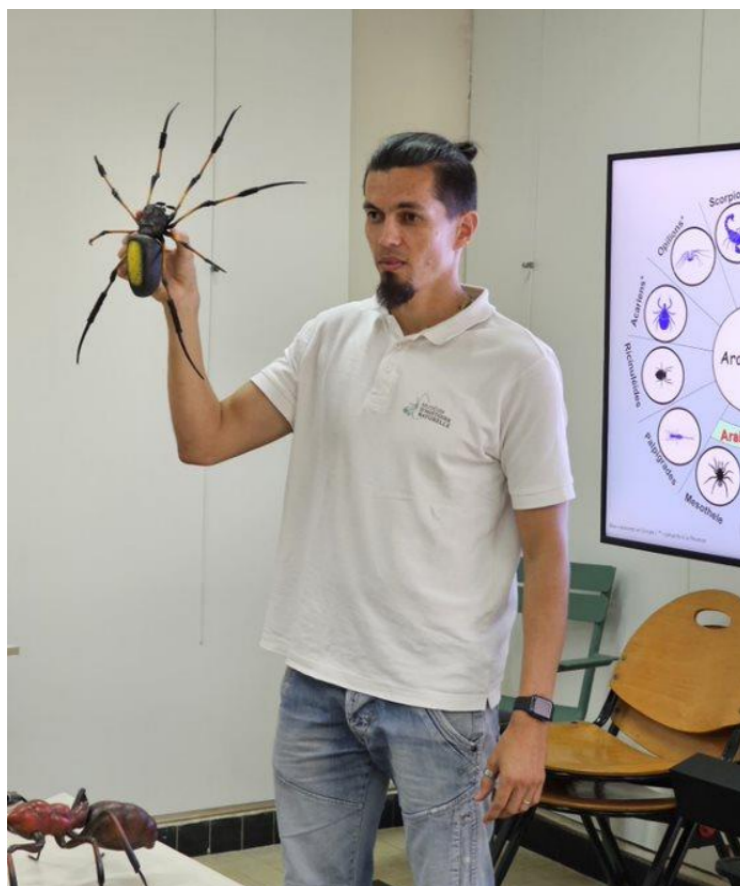
Participating in the project does not require deaf and hard of hearing individuals to be experts in ornithology. Bird identification guides, explanatory booklets, and mobile applications are typically provided to help participants recognize different species. Thus, the project is open to all, from curious beginners to passionate birdwatchers.

Lastly, it also holds significant educational value. By closely observing birds, learning to identify them, and understanding their behaviours, participants gain better knowledge of the wildlife around them.



Spider observatory

By



Observatoire des araignées

The " spider observatory " participatory science project is a scientific initiative aimed at observing and cataloguing the different spider species present on the island of Réunion, in

partnership with the Museum of Natural History in Saint-Denis, Réunion. The main objective of this project is to enrich scientific research by completing the inventory of spiders in the region while raising awareness about the importance of the ecology of these species and their association with different habitats.

The project stands out for its inclusive approach, actively involving participants who are deaf and hard of hearing (DHH). Specific measures have been implemented to facilitate their participation.

This project holds significant importance as it creates awareness of the crucial role played by spiders in biodiversity and local ecology, regulating insect populations and contributing to ecosystem balance. By gaining a better understanding of the diversity and geographic distribution of spider species, scientists can deepen their knowledge of the island's ecology and implement appropriate conservation measures.

The project's implementation involved several key stages. DHH participants were introduced to the lifestyle of spiders, learned to recognize local species, and acquired observation and identification skills. They then engaged in regular observation sessions, photographing encountered spiders and collecting data on their presence and habitat.

Data collection and transmission occurred progressively throughout the project, allowing information sharing with the participatory scientific community.



Climate Change and its consequences in the Environment

By

Web2Learn
Open, social learning



The Citizen Science project focused on climate change and its consequences to plant biodiversity. It was a project that was designed by the Web2Learn team in collaboration with DHH trainers of the Center of Greek Signed Language who provided their insights and feedback to adjust the project to the needs and abilities of the target group.

Participants firstly assisted to a short and introductory presentation by a Web2Learn staff member, while they were then equipped with their phones and the iNaturalist app to take and store photos of plants and trees in the city's center.

For the realisation of the citizen science project, Web2Learn created a [presentation](#) that included a video of the CitSci4All Toolkit (in Greek sign language). The video of the first unit of the CitSci4All Toolkit was showed to facilitate participants' understanding of citizen science for climate change. An educational [handout](#) was created by Web2learn and shared to DHH adults. During the project, participants used their mobile phones in which they had downloaded the iNaturalistGR app.

To build and run the citizen science project, Web2learn first had to establish contact with the DHH group who would run the project to understand its needs and overall context. Thus, they reached out to the Center of Greek Signed Language in Thessaloniki. The DHH educators of the center were engaged and familiar with the DHH community in Thessaloniki. The citizen science project was called "Climate change and its consequences in the environment".

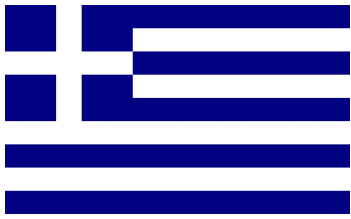
As citizen science is a rather an under-explored field at national level in Greece, Web2Learn team proposed a design for a citizen science project based on the information and discussion they had with the DHH educators. They realised that they can run a plant biodiversity mapping with adults by using the iNaturalist app that is also available in Greek language and it is accessible by DHH people. Therefore, the project focused on this topic and they made sure to instruct the DHH educators about the project's objectives and tools (iNaturalist app) that will be used during the citizen science activity.

On the 2nd of September, Web2Learn staff member, Stefania Oikonomou, joined the DHH adults in the Center's premises. She delivered a short presentation about the CitSci4All project, citizen science for climate change and the aim of the citizen science project to be implemented by participants. Then, DHH adults, equipped with their mobile phones and the



iNaturalist app, went outside and started taking photos of plants, trees and flowers in Thessaloniki's city center. Data collection lasted for about 40 minutes in which participants collected more than 30 photos that were stored to the iNaturalist app.

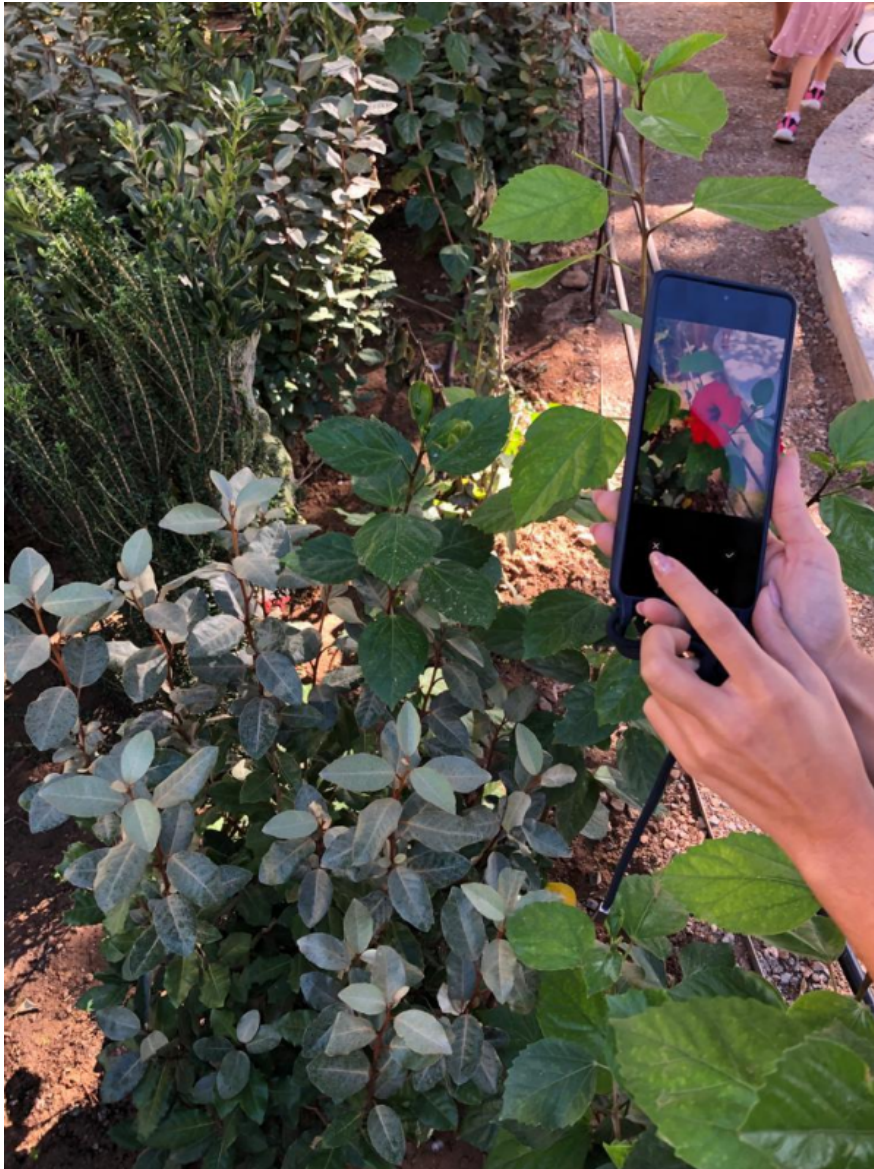
Throughout the project, adults showed vivid interest in citizen science as well as getting to know how biodiverse their city center is.



I am a citizen and I object

By

iasis



The CitSci4All initiative was briefly showcased in this project, where adults were familiarized with citizen science related to climate change by navigating through the CitSci Toolkit and watching the respective video. Subsequently, they embarked on their own citizen science endeavour, guided by Elli Nikolakopoulou, psychologist, and trainer of IASIS NGO, as well as Polyvios Kosmatos, interpreter of Greek Sign Language.

In total, 7 DHH adults and 1 DHH instructor collaborated in this effort, which was focused on observing plant diversity in the neighbourhood of Ano Patissia, Athens, Greece.

The Citizen Science initiative was centred around climate change and its impact on the green parts of the city. This endeavour was conceptualized by IASIS RnD department in association with a DHH trainer from OMKE- Deaf Federation of Greece to reassure that the project is accordingly adapted to the needs of the target group.

In this endeavour, 7 DHH adults and 1 DHH trainer were involved while the initiative took place in the headquarters of IASIS NGO in Ano Patissia, Athens.

The event began with a thorough introduction on how to use the app iNaturalist. After this, participants used their mobile phones, paired with the iNaturalist app, to capture and document plants in an urban neighbourhood nearby Patission Street.

In initiating our citizen science endeavour, our primary step was to connect with the DHH group that would be executing the project to comprehend the overall idea. Therefore, we first had a bilateral meeting with the interpreter Mr Kosmatos to organize the initiative. The project was aptly titled “Είμαι πολίτης και επίσταμαι”, meaning “I am a citizen and I know well”, since in Greek science (επιστήμη) comes from the ancient greek verb «επίσταμαι» meaning “comprehending something in a great extent”.

Starting with a thorough explanation of the overall scope of the activity, our primary aim was to support DHH adults in understanding in depth the added value of this activity for the scientific community. Sharing examples such as the project Dryver, or TeRRifica was of great importance for the participants. Throughout the activity, the adults were consulted on how to use the app not only to record the flora of the park but also on how to enrol themselves in ongoing CS projects, such as the project Apollo which is under the responsibility of the University of Ioannina. Equipped with their mobile devices and the iNaturalist app, the DHH



participants proceeded to explore the outdoors, taking photos of the flora in the city centre of Athens. The activity, lasted around 30 minutes, and participants collected and uploaded the results on the iNaturalist app.

CHAPTER 2

Results of the experimentation of Citizen Science Projects



The following results were collected during the implementation phase of each PR3 CS project.

In this chapter we present the **main results of each CS project** based on the data collected from the DHH adults and the **impact these participatory science projects** have had on their **relationship with climate change**.

Presentations of main results of CS project “Butterflies in Cyprus”

This initiative involved DHH participants adults who observed and documented butterflies.

Over the course of the project, the participants successfully recorded data on a total of **20 butterfly species found in Cyprus**. This extensive collection of data is a valuable contribution to understanding the diversity of butterflies in the region and their role in the ecosystem.

The success of this project is partly attributed to the active participation of ten dedicated DHH. Their commitment and passion for observing butterflies in their natural habitat significantly enriched the data collection process.

The "Butterfly in Cyprus" project took place during **May and June 2023**. This period was chosen strategically to coincide with the butterfly activity season in Cyprus, ensuring the optimal conditions for butterfly observations.

Lessons Learned:

- **The Effects of Climate Change on Butterflies:**

Through this project, DHH participants have a sensitization to the Effects of Climate Change. They actively observed butterflies, noting changes in their behaviour, distribution, and breeding periods. This direct experience has sensitised participants to the impact of climate change on wildlife and the environment. Witnessing first-hand the changes in butterfly populations has brought attention to the consequences of climate change on biodiversity.

- **Life of Butterflies:**

The project provided DHH with a unique opportunity to learn about the **life cycle and behaviour of butterflies**. Participants developed a **deeper understanding** of these insects.

- **Different Species and Names of Butterflies:**

By closely examining and photographing butterflies, participants became **proficient at identifying different species and their unique characteristics**. They learned the **names of each species**, fostering a greater appreciation for the diversity of butterflies in Cyprus.

- **Weather Changes:**

Throughout the project, DHH have observed how **climate changes** not only affect butterflies but also their **habitats and interactions with other species**. This awareness has contributed to a better understanding of the complex links between **climate changes and ecosystem balance**. By witnessing these changes, participants have grasped the interconnectedness of all elements in the environment.

- **Strengthening Scientific Knowledge:**

Active engagement in data collection and collaboration with scientists has empowered participants to deepen their knowledge of climate change and its effects on butterflies and the environment. They have acquired skills **in observation, identification, and data collection**, gaining insights into how scientists study the impact of climate change on butterflies.

In conclusion, the "Butterfly in Cyprus" citizen science project has had a positive impact on raising awareness of climate change among participants.

This project has also exemplified the power of citizen science in advancing our knowledge of the natural world and underscores the importance of preserving these insects and their habitats.

Presentations of main results of CS project “Discovering Magnolias”

"Discovering Magnolias" allowed the inclusion of **40 DHH participants** to explore the **biodiversity of magnolias in the Pianezza region in Italy**. During the period from **April to June 2023**, they engaged and collected valuable data that led to a better understanding of the presence and distribution of magnolias in this region.

Throughout this period, the participants succeeded in identifying and documenting no fewer than **60 species of magnolias** in green areas and gardens within the region. These discoveries provided a detailed picture of the magnolia biodiversity in this specific environment.

Lessons learned:

- **Learning Plant Names, Especially Magnolia Species:**

One of the main lessons learned during the "Discovering Magnolias" project was the **learning of plant names**, with a particular focus on **magnolia species**. The participants were guided in identifying the different magnolia species present in the Pianezza region. Through training and field observations, they developed their botanical skills and learned to distinguish the unique characteristics of each magnolia species.

Acquiring this **botanical knowledge** allowed the participants to better understand the surrounding plant diversity and recognize the specific traits of each magnolia species. This learning experience sparked a newfound interest in the **local flora and strengthened their connection with the surrounding nature**.

- **Development of Civic and Educational Skills:**

By actively participating in the "Discovering Magnolias" project, the participants developed **important civic and educational skills**. Becoming citizen scientists, they became aware of their role as **environmental custodians** and **key players in biodiversity conservation**.

The DHH participants acquired **data collection, observation, and scientific documentation skills**. They also learned to work as a team, effectively communicate with other project members, and share their knowledge with the public. These civic and educational skills are essential for building an aware and engaged community in environmental protection.

- **Different Flowering Times of Plants Depending on Temperatures:**

Another crucial lesson drawn from the "Discovering Magnolias" project was the **observation of different flowering periods of magnolias** based on **temperature variations**. Data collected over several years revealed that magnolia flowering patterns were influenced by **climatic conditions**.

Participants observed how temperature fluctuations **affect plant life cycles**, including the **timing of flowering**. These observations highlight the impact of climate change on nature and underscore the need to better understand these phenomena to implement appropriate conservation measures.

- **Awareness of the effects of climate change on nature:**

By taking an active part in observing magnolias and analysing **flowering data** over several months, DHH participants were able to see the effects of **climate change on nature**.

This direct awareness of the impact of climate change on magnolias made the phenomenon more **tangible and concrete for the participants**. They realised that climate change is not just an **abstract concept**, but that it has **real repercussions** on the biodiversity and nature around them.

In conclusion, the "Discovering Magnolias" project has had a transformative impact on the participants, raising their awareness of the effects of climate change on nature, increasing their understanding of the consequences for the ecosystem and stimulating their commitment to climate action.

Presentations of main results of CS project “Wild in my street”

The "Wild in my street" project is a successful citizen science initiative conducted from **April to June 2023**, where **13 DHH participants** explored the **urban biodiversity in gardens, parks, streets, and pavements**. During the project, they collected data on around **19 plant species found in their observation zones**.

The main objective of the project was to raise awareness about urban biodiversity and encourage active participation in its conservation. Using the free Plantnet application, participants were able to identify and observe various plant species in their chosen areas.

Lessons learned:

- **Learning Plant Names and Different Species:**

One of the main lessons learned during the project was the acquisition of new skills in **plant identification and recognition of different plant species**. Through awareness-raising efforts and the use of identification guides, mobile applications, and smartphones, the 13 DHH participants were able to explore their urban environment and learn to recognize no fewer than 19 different plant species. This increased knowledge of plant biodiversity sparked their interest in the nature that surrounds them daily. They learned to distinguish the specific characteristics of each species and understand their role in the urban ecosystem.

- **Effects of Climate Change on Biodiversity and Plant Flowering:**

Another important lesson from the project was the **awareness of the effects of climate change on plant life in the urban environment**. By closely observing the **life cycles of different plant species**, participants noticed variations in **flowering periods**. Some plants bloomed earlier than usual, while others delayed their flowering. These observations highlighted the consequences of **climate change on urban biodiversity**. Participants understood that **temperature variations and environmental changes directly influence** plant growth and behaviour. This awareness strengthened their commitment to biodiversity conservation and the fight against climate change.

- **Sensitization to Nature Preservation in Urban Areas:**

The project also raised awareness among participants about the importance of **preserving biodiversity in urban environments**. By discovering the different plant species present in their neighbourhoods, participants became aware of the richness of nature that often goes unnoticed in urban areas. They realised the significance of maintaining an **ecological balance in urban settings to improve air quality**, promote **pollination**, and foster harmonious **coexistence between humans and local flora and fauna**. This awareness stimulated their civic engagement towards their immediate environment and encouraged them to be active stakeholders in nature preservation within their urban community.

In conclusion, the "Wild in my street" project was an educational and enlightening experience for the participants. Thanks to this participatory science initiative, they developed plant identification skills, became aware of the effects of climate change on urban biodiversity and understood the importance of preserving nature in the urban environment. These lessons learned are invaluable in raising awareness and mobilising more citizens to preserve urban biodiversity and combat climate change, thereby creating a positive impact on their environment and community in the long term.

Presentations of main results of CS project “Birds in gardens”

The citizen science project "Birds in gardens" enabled the collection of data on avian **diversity in gardens and green spaces**. During the participation period from **May to June 2023**, the participants observed and documented a total of **7 different bird species**.

The project was led by a group of **14 DHH participants** who actively engaged in birdwatching in their gardens and surrounding areas. The main objective of the project was to raise **awareness about local avian fauna** and to build a committed community for bird conservation.

- **Learning Bird Names and Different Species:**

Participants had the opportunity to **learn the names and characteristics of the different bird species they observed during the project**. Through this experience, they were able to expand their knowledge in ornithology and gain a better understanding of the avian diversity present in their region. Accurate identification of birds allowed participants to better appreciate the richness of avian wildlife in their **immediate environment**.

- **Effects of Climate Change on Biodiversity and Bird Life:**

By observing variations in bird presence and behaviour throughout the seasons, the DHH participants became aware of **the effects of climate change on avian biodiversity**. Changes in **migratory patterns**, nesting behaviour, and feeding habits of birds were observed, **revealing the impact of climate on their habitat and life cycles**. This awareness reinforced the importance of **conserving natural habitats** to ensure the survival of bird species amidst the challenges posed by climate change.

- **Sensitization to Seasons and Bird Life Cycles:**

The project allowed the DHH participants to gain a **deeper understanding of seasons and their impacts on bird presence**. By observing seasonal variations in bird behaviours, such as migration and breeding periods, the participants developed a deeper appreciation for their

life cycles. This awareness fostered a closer connection with nature and encouraged participants to take an active role in preserving essential habitats for birds.

In summary, the "Birds in gardens" project was an educational and immersive experience, providing DHH participants with the opportunity to learn about avian diversity, understand the effects of climate change, and deepen their knowledge of seasons and bird life cycles in their immediate environment. These lessons learned strengthened participants' commitment to bird conservation and contributed to increased awareness of the importance of protecting natural habitats to support biodiversity.

Presentations of main results of CS “Spider observatory”

The "spider observatory" science participative project took place from **April to June 2023** and involved **13 DHH participants from IRSAM in Réunion Islands**. During this period, approximately 10 spider species were recorded and studied. The participants played a crucial role in data collection and gained valuable insights into spider diversity and their ecological role. This project raised awareness of the importance of spider conservation and highlighted their vulnerability to climate change.

Key Lessons Learned:

- **Learning Spiders' Names and Different Species:**

The project provided DHH participants with a unique opportunity to deepen their knowledge of **spiders and their diverse species**. Through specific workshops and the use of suitable identification tools such as guides and mobile applications, the participants learned to recognize **different spider characteristics and distinguish them based on their shapes, colours, and behaviours**. This immersion into the world of spiders sparked their scientific curiosity and interest in these arthropods. Learning the scientific names of spiders was a crucial aspect of the project, as it facilitated more precise communication about the observed species. This accuracy in identification and nomenclature enhanced the quality of the collected data, providing more reliable information for researchers and scientists involved in the project.

- **Understanding the Crucial Role of Spiders in the Natural Balance:**

The project helped participants better understand the fundamental importance of spiders in **maintaining the natural balance of ecosystems**. As predators, spiders play a crucial role in regulating insect populations, including mosquitoes and flies, which can be pests for humans and crops. Their presence helps control insect proliferation, thus limiting infestations and ecological imbalances. Participants also gained **awareness of spiders' role in food chains and trophic networks**. By preying on herbivorous insects, spiders influence interactions between different species, maintaining biodiversity equilibrium. This realisation led to a

positive change in the perception of spiders as essential actors in **maintaining ecosystem** health rather than mere scary creatures.

- **Grasping the Growing Impact of Climate Change on Spiders' Lives:**

The project highlighted the increasing impact of climate change on spiders and their habitat.

Variations in climatic conditions, such as rising temperatures and changes in precipitation patterns, can influence spider distribution and their **ability to adapt to new environments**.

Some species may be forced to migrate to higher altitudes to find favourable climatic conditions, while others may face changes in their reproductive cycles and feeding behaviour. Participants became **aware of spiders' vulnerability to climate disturbances** and recognized the importance of **closely monitoring their evolution in the context of global climate change**. This newfound knowledge underscored the urgency of conserving natural habitats and protecting biodiversity to ensure the survival and stability of spider populations and, consequently, maintain ecosystem balance.

To conclude, the "Spider observatory" project was an enriching experience that allowed DHH participants to learn in-depth about spiders, comprehend their crucial role in maintaining the natural balance of ecosystems, and understand the increasing impact of climate change on their lives. These learnings contributed to raising awareness of the importance of preserving spiders and their habitat for the well-being of our environment and overall biodiversity.

Presentations of main results of CS “Climate Change and its consequences in the environment”

Overall, **8 DHH adults and 3 DHH trainers were involved** in this project that ran for 3 hours in the premises of the Center of Greek Signed Language and the historical city center of Thessaloniki.

- **Knowledge of biodiversity in the city**

One of the main results of the citizen science project was that Thessaloniki’s city center is **lacking a healthy and green environment**, as they encountered only a few trees and plants of the same biological family. Participants spotted mainly oak trees (Genus Quercus) and pear trees (Pyrus communis), while **small areas of vegetation manifested a rather reduced plant biodiversity**.

- **Use of their digital skills**

In terms of barriers and difficulties, as stated in the implementation form by all participants, they **didn’t encounter any barrier or difficulty** during the citizen science project as it was **designed to fit their context, capacities and resources** (mobile phone, digital skills). In particular, DHH adults find the iNaturalistGR app very easy to use and they quickly understand how it works.

- **Awareness about climate change issues**

Thanks to the design of the citizen science project that included a first introductory, theory-based, part and an applied, hands-on dimension, **DHH adults became more familiar with the issue of plant biodiversity and its importance** for environmental wellbeing. In their implementation reports, DHH adults stated that they were aware of the negative effects of climate change but **didn’t know about citizen science and how they can participate** in action to help save the environment. In this context, **DHH adults asked for more opportunities for participation in citizen science projects** for environmental and social issues, thus there is evidence that the citizen science project had a significant positive impact on their attitudes and engagement.

Presentations of main results of CS project : I am a citizen and I object

A primary observation from our citizen science venture was the evident paucity of green spaces in Athens city centre. Regarding emerging challenges, participants stated that they felt confident using the app as it is user-friendly and easy to grasp. The citizen science project's structure, encompassing an initial theoretical segment followed by a practical component, allowed DHH adults to deepen their understanding of plant biodiversity and its environmental significance. As per their feedback, while they were cognizant of climate change repercussions, they were previously unaware of citizen science and how they could actively contribute towards environmental preservation. It's evident from this feedback that the project considerably influenced their enthusiasm and commitment.

Post-project, the DHH community inquired about potential follow-ups and questioned the potential of mobility since they were interested in meeting deaf people from other countries. IASIS NGO will continue collaborating with the specific group as well as the interpreter since his contribution was of great importance not only in terms of signing but also in terms of inviting the adults and encouraging them to participate. We believe that this line of communication will allow us to organize more activities with the DHH community since it was the first scheduled meeting with the group.

CHAPTER 3

Challenges and opportunities



This chapter will focus on the challenges and opportunities, especially the sustainability of these CS projects in the long term.

Challenges and Opportunities of Cyprus Butterfly

Monitoring scheme:

"Butterflies in Cyprus" citizen science project is promising, aiming to expand participant engagement and encourage broader public involvement while strengthening the role of the deaf and hard of hearing (DHH) adult community in scientific research.

First and foremost, as an open citizen science initiative, "Butterflies in Cyprus" provides a unique opportunity for diverse audiences to get involved. Beyond the participation of DHH adults, the project can also attract and engage other segments of society, such as nature enthusiasts, students, amateur researchers, and families. By broadening its audience and attracting more participants, the project will benefit from a greater diversity of collected data, enriching our knowledge about butterflies and their relationship with climate change.

The successful collaboration between CIP, RITE, and the Open University of Cyprus will continue, strengthening the bond between the DHH community and the scientific community. To extend the project's outcomes, a "Nature Citizen Science Walk" will be organised, an inclusive event open to all, allowing observations of butterflies and the recording of new data after the summer, when butterflies are more active. This initiative will offer a unique opportunity to raise public awareness about citizen science and the importance of biodiversity conservation.

The deliberate involvement of the DHH community in a citizen science project is a significant and innovative development. It reflects a commitment to inclusivity and diversity in scientific research. By providing opportunities for deaf adults to actively participate and contribute to butterfly data collection in Cyprus, the project paves the way for the involvement of people with different hearing abilities in other scientific research projects in the future. This inclusive approach strengthens the role of deaf adults in biodiversity research and amplifies their voice in environmental discussions.

Challenge and opportunities of CS “discovering magnolias” project:

The potential future developments for the "Discovering Magnolias" science participative project are promising and aim to deepen the understanding of biodiversity in the Pianezza region while increasing awareness of climate change within the community of Deaf and Hard of Hearing (DHH) participants.

One of the main prospects for the future is to explore areas of Pianezza that have not yet been visited. Given the vastness of the region, there are still unexplored places where new species of magnolias could be discovered. By comparing the results from the current year with those of the following year, the project team will gain a better understanding of the distribution of different magnolia species in the region and their potential response to climate change.

To enhance awareness of climate change and the importance of biodiversity, educators and DHH participants plan to organise a workshop on the science participative project at the semi-residential "Il Giardino dei Sensi" centre in September. This workshop will provide an opportunity to explain the knowledge and skills acquired regarding climate change and its connection to the participants' everyday environment. By involving more members of the Deaf community in this workshop, the impact of the project will be expanded, and the message of nature preservation will be amplified.

Finally, to commemorate the significant contribution of the Deaf community to the fight against climate change, a symbolic plaque will be placed on a magnolia tree within the Institute. This plaque will serve as a symbol of the European project that mobilised many members of the Deaf and Hard of Hearing community in environmental conservation. It will celebrate the efforts and commitment of the DHH community in science participation and reinforce their active role in the fight to protect biodiversity and mitigate the adverse effects of climate change.

Challenge and opportunities of CS “Wild in my street”

project:

Firstly, in order to better understand the impacts of climate change on urban biodiversity, it could be interesting to conduct in-depth studies on these effects. The results already obtained through the project have highlighted the initial consequences of climate change on plant life in urban environments. However, to delve further into the analysis, more comprehensive studies could be conducted to assess how biodiversity evolves over time throughout the year. These more detailed analyses could help identify the most vulnerable species and guide conservation efforts by implementing specific measures to protect endangered species.

Secondly, to ensure the sustainability of the "Wildlife of My Street" project, it would be relevant to involve younger generations more actively. Collaborating with schools, youth associations, or neighbourhood groups could be an excellent initiative to educate and mobilise the next generation of citizen scientists. By raising awareness among the youth about the importance of biodiversity and nature conservation in urban environments, it would have a lasting impact and foster a culture of environmental respect from a young age. The young participants could also share their knowledge gained through the "Wildlife of My Street" project with their peers and families, further amplifying the awareness-raising effect of the initiative. Additionally, the use of digital tools such as the "Plantnet" app could make the project even more engaging and enjoyable.

By conducting more in-depth studies on the effects of climate change and involving younger generations, the "Wildlife of My Street" project could not only contribute to a better understanding of urban biodiversity and its evolution in the face of climate change but also create a dynamic of awareness and nature preservation among future members of society. These envisioned steps would help to sustain and enhance the positive impact of this participatory science project.

Challenge and opportunities of CS “Birds in gardens”

project:

The "Birds in Gardens" project, which has been successful among the DHH participants, appears to be interesting to continue birdwatching throughout the year. It would be beneficial to extend the observations over a longer period. By monitoring birds throughout the year, it would be possible to capture seasonal changes, migrations, and species-specific behaviours. This information could help better understand the dynamics of bird populations and highlight potential impacts of climate change on their presence in the region.

Furthermore, to enrich knowledge about avian species, it would be interesting to observe other species in public parks. While the "Birds in Gardens" project focused on birds present in participants' gardens, exploring public parks could reveal the presence of different and complementary species. These parks often offer diverse habitats, such as wooded areas, water bodies, and meadows, which attract a wide variety of birds. By diversifying observation locations, the project could expand its sample of species and provide more comprehensive information on the biodiversity of birds in the region.

Finally, to share the obtained results and raise more awareness, it would be pertinent to develop additional partnerships and give presentations to interested stakeholders. These partnerships could be established with environmental organisations, bird protection associations, nature reserves, or local authorities. By collaborating with these stakeholders, the "Birds in Gardens" project could benefit from their network to disseminate the results more widely and reach a broader audience. Such presentations would also facilitate knowledge exchange, foster new collaborations, and strengthen the momentum of citizen science for avian biodiversity conservation.

Challenge and opportunities of CS “Spider observatory” project:

To further advance the studies on spiders, a follow-up collaboration with arachnology experts from the Museum of Natural History of Reunion could be considered. This new collaboration would enable project participants to further develop their knowledge about different spider species and contribute to the discovery of new ones. The expertise of museum scientists would be invaluable in interpreting the collected data and identifying rare or endemic species in the region. A better understanding of spider biodiversity would also help assess their specific roles in the ecosystem and their interactions with other organisms.

Next, a temporal trend analysis would be essential to study the impact of climate change on spiders. By collecting data over several months of the year and across different seasons, it would be possible to track changes in spider distribution and abundance in response to climate variations. This analysis would provide crucial insights into the population dynamics of spiders in the region and help better understand how they adapt to changing environmental conditions. This knowledge would be valuable in informing conservation and ecosystem management strategies in the context of climate change.

Finally, to raise awareness among a broader audience about the importance of spiders in ecosystems, efforts to communicate and conserve would be intensified. The project's findings could be communicated in a format accessible to the general public, such as visual materials, conferences, or workshops. By demystifying spiders and emphasising their crucial role in maintaining natural balance, the project could help change negative perceptions about these arthropods and promote their preservation. Raising awareness, especially among local communities and schools, about the importance of spiders could also foster increased interest in biodiversity and ecosystem preservation.

Challenge and opportunities of CS “Climate Change and its consequences in the environment” project:

After the end of the citizen science project, DHH asked about a possible continuation or replication of the project, thus manifesting a clear interest in citizen science. As Web2Learn, we remain in contact with the DHH trainers of the Center of Greek Signed Language as both expressed their willingness to further explore citizen science within their regular activities. In particular, DHH trainers referred to the value of citizen science actions in relation to DHH inclusion and participation in society and the proliferation of scientific knowledge.

Therefore, we remain confident that the citizen science project that was set up on the 2nd of September can be a trigger for a future continuation of the project in the context of the educational and learning activities of the DHH community in Thessaloniki.

The implementation of their own citizen science project was an inspiring learning experience for DHH adults who were introduced for the first time in the concept of citizen science. By applying a methodological approach in the project that included both a theory-based part (presentation and video from the CitSci4All Toolkit) and a hands-on part (collection of data by participants), we provided a complete training as well as concrete learning experience to our 11 DHH participants. The citizen science project was co-developed with the DHH trainers, thus we made sure that all needs and challenges are taken into account prior to the project implementation. Thanks to this provision, the project ran smoothly for participants who encountered no difficulties in running the project.



Challenge and opportunities of CS “I am a citizen and I object” project:

Introducing the DHH adults to their very own citizen science project was a transformative educational journey, marking their initial exposure to the realm of citizen science, a concept that they had never heard before. By utilizing the inclusive informative materials of the CitSci project (Toolkit and videos), as well as the practical outdoors session, we managed to deliver a holistic CitSci4All experience and tackle their interest for further participation in Citizen Science initiatives.

CONCLUSION

In conclusion, the participatory science projects conducted in Cyprus, Italy, Greece and France have proven to be valuable and impactful initiatives that highlight the significance of citizen engagement in scientific research and biodiversity conservation. These projects have successfully brought together individuals from diverse cultural backgrounds and empowered them to actively participate in the collection of valuable data and environmental awareness efforts.

One of the key outcomes of these projects is the unique opportunity they have provided participants to explore their local environments and develop a deeper understanding of the plant and insect species present in their surroundings. Through this process, participants have honed their observation and identification skills, allowing them to contribute to the documentation of various species, including magnolias, butterflies, birds, and spiders. By actively involving citizens in these scientific endeavours, the projects have demonstrated that Deaf and Hard of Hearing can play a crucial role in advancing ecological knowledge.

Additionally, the collaborations between researchers and DHH adults in these projects have generated valuable insights into species distribution, ecological interactions, and the impacts of climate change. The data collected by participants has contributed to a more comprehensive understanding of how these ecosystems function and how they are influenced by environmental factors. Such information is essential for designing effective conservation strategies and mitigating the negative effects of climate change on biodiversity.

These participatory science projects have had a positive impact on environmental awareness and the development of environmental responsibility among the participants. By actively engaging with their local ecosystems, individuals have developed a stronger connection with nature and a heightened sense of responsibility towards its preservation. These projects have fostered a sense of ownership and pride in the participants, as they contribute to the collective effort of protecting the environment for future generations.

Another critical aspect of these projects is the emphasis on collaboration and partnership between scientific institutions, environmental organisations, and local communities. These

collaborations have facilitated the exchange of knowledge and expertise, creating a mutually beneficial relationship between scientists and citizens. By working together, these stakeholders have amplified research efforts and promoted data-driven conservation actions. The involvement of local communities has also ensured that conservation efforts are tailored to the specific needs and priorities of the regions involved.

In summary, the participatory science projects "Discovering Magnolias," "Butterflies in Cyprus," "Birds in gardens," "Wild in my street," "Spider observatory", and "Climate Change and its consequences to our natural habitat" have exemplified the potential of citizen science in advancing our understanding of biodiversity, urban ecology, and environmental challenges. By encouraging active citizen participation and fostering collaborative partnerships, these initiatives have not only enriched ecological knowledge but also empowered individuals to be stewards of their local environments. The success of these projects serves as a testament to the power of collective efforts in preserving the planet's rich biodiversity and promoting harmonious coexistence between humans and nature. As these projects continue to evolve and expand, they hold the promise of further shaping environmental conservation for a more sustainable and resilient future.



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