Developing metrics and instruments to evaluate citizen science impacts on the environment and society

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Abstract (for dissemination)	Deliverable 4.4 explores the set-up of hands-on citizen science activities for monitoring the water and environmental quality associated with the restoration of Carasuhat Wetland, on the Danube Delta in Romania. This deliverable describes the context of the nature-based solution and co-design of citizen science activities in the MICS Romanian case study.			
Keywords	Wetland creation, co-design, citizen science, water quality monitoring			

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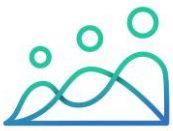

Executive Summary

The MICS project is developing metrics and tools to measure the impacts of citizen science which are validated in hands-on citizen-science activities in four case study sites in Europe. Deliverable 4.4 provides a description of the site and set up of citizen science activities in the Romanian case study where the MICS impact assessment will be applied. The MICS Romanian case study explores the set-up and impact of hands-on citizen-science activities for monitoring the water and environmental quality associated with the restoration of Carasuhat Wetland. Historically, the Carasuhat Wetland was drained and converted to agricultural land. The objective of the restoration project was to create hydrological conditions suitable for the development of at least 18 habitats of community importance by re-establishing the hydrological regime that existed in the Carasuhat area prior to impoundment. In total, 924 ha of land owned by the local authority was 're-flooded' to restore Carasuhat Wetland, the nature-based solution was completed in 2016. The ambition for the citizen-science activities in the Romanian case study is to set up the base for continuous citizen-science monitoring of the wetland water and environmental quality.

The Romanian case study is led by GeoEcoMar with support from the World Wide Fund for Nature (WWF). Bilateral communications with the citizens and interested local authorities with GeoEcoMar and WWF have been ongoing since the inception of the Carasuhat Wetland restoration project. Building on these discussions the Ground Truth 2.0 Light (MICS deliverable D4.6, based on Wehn and Pfeiffer, 2020) methodology was adopted to guide the best practice set up of citizen-science activities for monitoring the environmental and water quality. In total 9 people attended the co-design workshop. The objective of the event was to identify the parameters for monitoring (water quality, water level, dyke stability and biodiversity) on the Carasuhat Wetland. A training workshop has been run which involved teaching the citizen scientists how to use FreshWater Watch kits and set up the frequency and duration of citizen science monitoring activities.

1 Introduction

1.1 Background on MICS

The MICS project develops approaches and tools to assess citizen science impacts. These approaches and tools can help to plan and implement projects in ways that lead to more robust results. The MICS project specifically aims to:

- provide comprehensive, participatory and inclusive metrics and instruments to evaluate citizen science impacts;
- implement an impact-assessment knowledge-base through toolboxes for methods application, information visualisation, and delivery to decision makers, citizens and researchers;
- improve the effectiveness of nature-based solutions through test-site development and citizen-science tool validation;
- generate new approaches that strengthen the role of citizen science in supporting research and development;
- foster a citizen-science approach to increase the extent to which scientific evidence is taken up by policy makers through recommendations and guidelines.

The result is an integrated platform where these metrics and instruments are available for use by anyone involved in a citizen science project wanting to understand its impact, whether at the planning stage or several years after the project's conclusion. This platform is validated by pilot testing in test and validation sites across Europe. The test and validation sites are in the UK, Italy, Hungary and Romania. These sites explore the applicability of MICS impact-assessment tools in regions with differing needs, contexts, and approaches to nature-based solutions, and with various levels of citizen-science application. For example, in Western Europe, river restoration is increasingly carried out within an ecosystem-based management framework at river or catchment scale; in Southern Europe, river restoration tends to be issue-specific with some ecosystem relevance; in Central and Eastern Europe, river restoration is about ecosystem protection and related to existing infrastructure.

1.2 Purpose

The MICS project is tasked with setting up and implementing an Impact Assessment framework, tools and metrics for citizen-science projects that serve to capture impacts in five distinct domains: society, science, environment, economy and governance. This report is a deliverable of Work Package 4 (WP4) – 'Test-site development and tool validation' which will develop and organise the pilot testing of the MICS Impact Assessment framework and tools in the test and validation sites in the UK, Hungary, Romania and Italy. The purpose of Deliverable 4.4 is to provide a description of the Romanian case study and the set-up of citizen science activities in which the MICS impact assessment will be tested on and reported on in the comprehensive evaluation report (deliverable 4.5) in 2021.

1.3 Structure of the report

The document is structured as follows: Section 2 provides a description of the Romanian case study, including its location and NBS; Section 3 provides a description of the set up and outcomes of the co-design workshops and citizen science activities; and Section 4 the next steps for the case study.

2 Romanian Case study - Carasuhat Wetland

2.1 Introduction

The Romanian Case study is led by GeoEcoMar with support from WWF. The case study sets up citizen science monitoring of environmental quality on the recently restored (2016) Carasuhat Wetland, part of Danube Delta Biosphere Reserve.

2.2 Location of Carasuhat Wetland, Romania.

Carasuhat Wetland is located in the Danube Delta (45°06'25.3"N 29°06'33.9"E) being connected to the Saint George Arm of the Danube River, Romania (Figure 1 & 2).

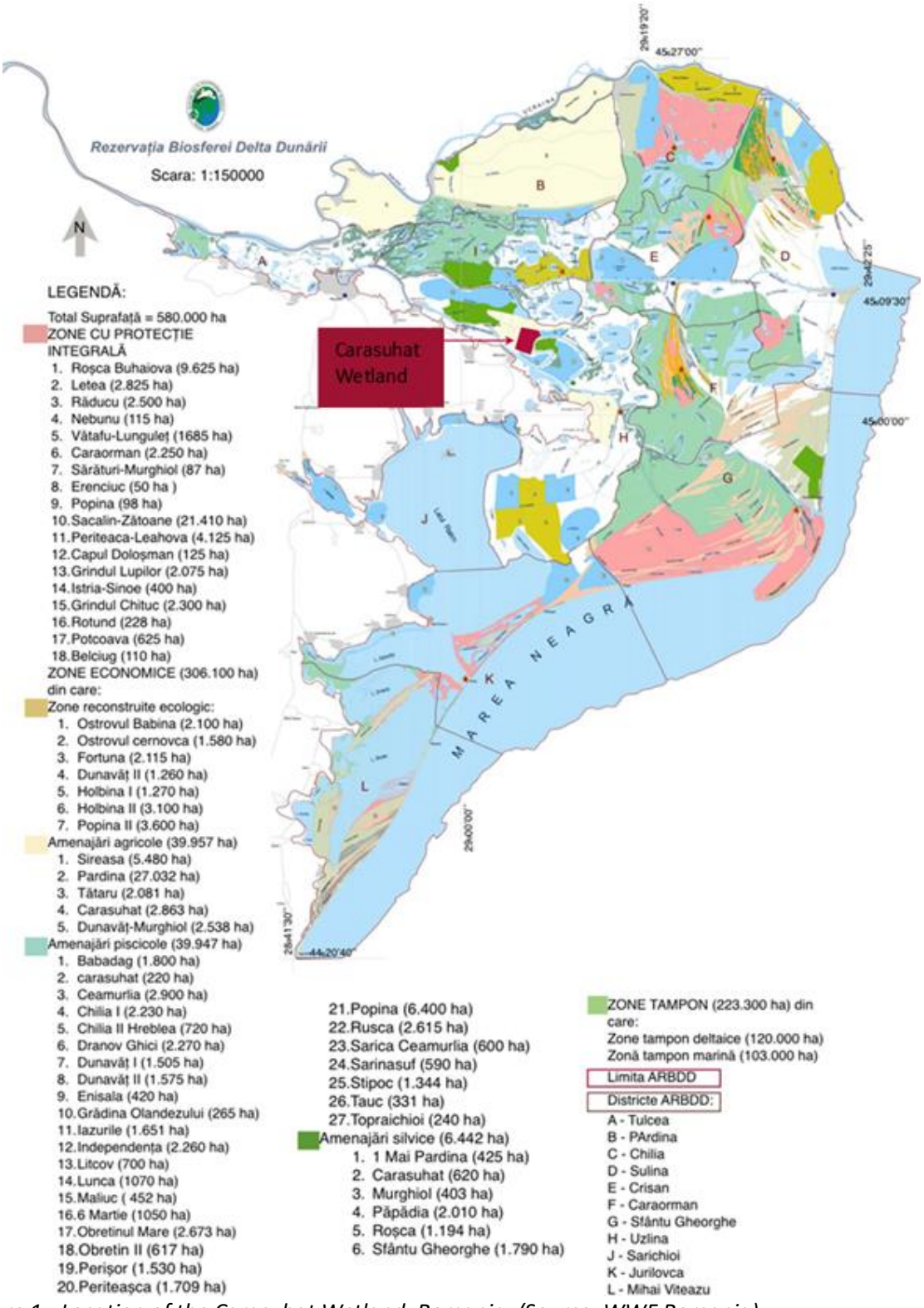

Figure 1 - Location of the Carasuhat Wetland, Romania. (Source: WWF Romania)

Figure 2 - Carasuhat Wetland, view from above. (Source: Albert Scrieciu)

2.3 Nature-based solution summary

Carasuhat Wetland, part of Danube Delta, has been subject to human intervention in the form of drainage for agriculture. The drainage project was abandoned in 1989 and the area became local pasture. WWF Romania, Local Council Mahmudia and the Danube Delta Biosphere Reservation Administration (DDBRA) initiated the "*Ecological restoration of the land from the Carasuhat polder, part of Danube Delta, belonging to the public domain of Mahmudia Local Council*". The objective of the restoration project was to provide suitable hydrologic conditions for the development of at least 18 habitats of community importance. This was achieved by re-connecting the area of local pasture with the Danube through dyke breaching (Figure 3), re-establishing the hydrological conditions that existed in the Carasuhat area prior to impoundment. The restoration of the wetland started in 2014 and was finalised in 2016. In total, 924 ha of land owned by the local authority was 're-flooded' to restore the Carasuhat Wetland. The wetland restoration contributed to a reduction in agricultural land in the Danube Delta of 2.3%, and provides suitable conditions for 18 habitats of community interest.

Alongside the flooding of the agricultural land, an area of 10 ha was planted with species native to the Danube Delta with a high ecological value in Europe (white poplar, willow and ash).

The restored wetland supports local fisherman by reducing the long detour they previously had to take to reach fishing areas (approx. 10 km). In addition, the restoration project will support the sustainable socio-economic development of the local community by channelling the local economy to sustainable use of resources (agri- and eco-tourism such as: sports fishing and birdwatching). The wetland also helps to reduce flood risk as the water retention area is increased.

After the restoration of the wetland in 2016, no monitoring of water quality or biodiversity has taken place and there is no dedicated management plan for the wetland.

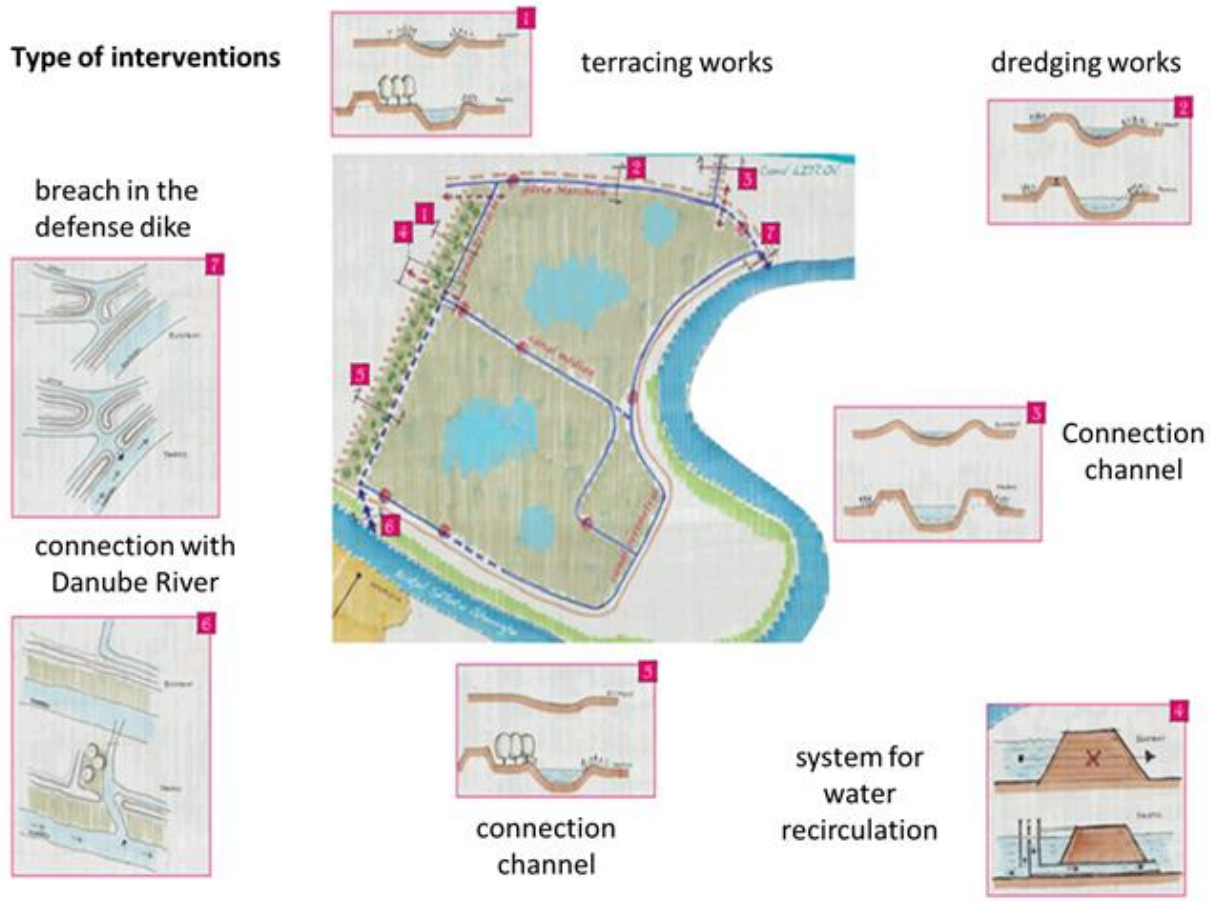

Figure 3 - Types of measures implemented in the restoration of Carasuhat Wetland.

Source: WWF Romania

The restoration project was initiated by WWF Romania, as an opportunity to restore local pasture to its initial condition (prior to the drainage project). The idea was supported by the local citizens, in favour of improving the local biodiversity and improving access to fishing areas. The involvement of the local volunteers started from the inception phase, embracing the project proposal and continued within the public consultations for designing the best solutions. Some of the volunteers have also been involved in the implementation phase as a part of their current jobs.

2.4 Impact of COVID-19 on case study

Due to the COVID-19 pandemic, our citizen-science activities and interactions with our citizens have been severely affected. Our co-design workshop had to be postponed after the lockdown and was re-organized respecting the Romanian legislation (limited number of participants, social distance, wearing masks, using disinfectant, etc.). We have taken all the necessary measures to avoid any unwanted cases of COVID-19, by providing masks, disinfectant and respecting the legislation. The same procedure has been applied for the citizen-science activities that were defined during the co-design workshop and implemented afterwards. We have organised the training for our Fresh Water Watch monitoring in an open space, respecting the legislation and we have limited the number of

people in the boats that we use for our monitoring activities. Most of the interaction with our stakeholders has been moved to online in order to sustain their interest in our project.

3 Co-design of Citizen Science Activities

3.1 Introduction

Bilateral discussions have been ongoing between GeoEcoMar, WWF and the stakeholders involved with the wetland restoration. Therefore, the case study lead (GeoEcoMar) had a strong understanding of the societal context, with knowledge of the different stakeholders involved in the monitoring of environmental quality. The stakeholders involved in the NBS and citizen science activities are documented in Table 1. Building on these discussions the Ground Truth 2.0 Light (MICS deliverable D4.6, based on Wehn and Pfeiffer, 2020) methodology was adopted to guide the best practice set up of citizen science activities for monitoring the environmental and water quality.

Table 1 - Stakeholders involved in the citizen science monitoring of the Carasuhat Wetland.

Stakeholder type	**Examples**
Citizens	Local stakeholders actively involved in the previous stages of the project (design and implement the NBS), local NGO's
Scientists	NIRD GeoEcoMar, Ovidius University of Constanța, Danube Delta National Institute for Research and Development
Public sector actors – legislative (policy makers)	Danube Delta Biosphere Reserve Administration (DDBRA), Tulcea County Council
Public sector actors - executive (local authorities; RBO; implementing agencies)	Mahmudia Local Council
Industry/Private sector	Fisherman, landowners, farmers, tour operators

3.2 Ambition of Citizen Science for NBS

The ambition of the citizen science involvement in the NBS in the Carasuhat Wetland is to:

1. Raise awareness about the role of the NBS among local stakeholders.

   The local stakeholders play an important role in maintaining and promoting NBS in order to increase local biodiversity and to reduce flood risk, therefore it is important they are aware of the restoration project and the benefits it can provide.

2. Set-up the base for a continuous monitoring scheme for the NBS

   No monitoring or management of the wetland has taken place since wetland restoration. Therefore, we will develop a network of volunteers that can contribute to establishing a baseline for the Monitoring Project by sampling and observing the evolution of the

implemented NBS. The monitoring scheme set up will be further taken/continued by DDBRA, WWF and SOR after the MICS project.

3.3 Co-design workshops

The process of involving citizens started with a series of informal meetings with small groups of local stakeholders in order to present the MICS project and to explain the benefits of citizen science. The informal meetings have been organised with the support of WWF Romania and Mahmudia Local Council. We organised a formal co-design workshop with all stakeholders to agree the challenge and objectives for citizen science monitoring in the Carasuhat Wetland.

3.3.1 Co-design workshop 1

GeoEcoMar organised a co-design workshop on 22/07/2020 in Mahmudia Town (Hotel Mon Jardin) which is on the edge of the Carasuhat wetland. In total, 9 stakeholders attended the workshop the attendees were: scientific advisors, a school director, policy decision maker and citizens. The workshop's aim was to define the Citizen Science activities, together with the participants. The workshop was facilitated by MICS case study lead at GeoEcoMar and WWF Romania and involved a series of presentations and break out activities with the stakeholders who attended.

The workshop format consisted of:

1. Participants short introduction
2. MICS Project – Short Introduction (presentation)
3. LIDL Project – Short introduction (presentation)
4. Understand the necessity of monitoring (presentation and free discussions)
5. Involving the local community in "monitoring activities" (presentation and free discussions)
6. Problems addressed by the ecological reconstruction (presentation and free discussions)
7. What are the problems that the Carasuhat Wetland is facing? – interactive activity (writing on post-its)
8. How can we address these problems? – interactive activity (writing on post-its)
9. Classic methods of monitoring (presentation)
10. Alternative methods (presentation)
11. Next steps (free discussion):
    a. Identify the locations for monitoring
    b. Define the monitoring frequency

The participants were actively involved in all stages of the co-design workshop. These workshops were held during the holiday period (after the Spring – Summer 2020 COVID-19 lockdown) and the number of participants was smaller than desired. However, this was a calculated risk, taking advantage of the short period of time between lockdowns when restrictions on movement and face-to-face meetings were relaxed. In the future, a more flexible approach will be adopted, with more events consisting of smaller groups to enable a higher total number of participants.

Figure 4 provides photographs of the co-design workshop.

Figure 4 - Photographs from the co-design workshop with various stakeholders in Mahmudia in July 2020. (Source: Alexandra Damian, WWF Romania)

3.4 Co-design outputs

The aims and objectives of the citizen science monitoring programme were agreed by stakeholders during the co-design workshops and bilateral discussions. Challenges and mitigating strategies were also discussed. Firstly, it was agreed that a lack of resources and institutional restrictions meant that there is no management or monitoring plan for Carasuhat Wetland. The development of a management and monitoring plan for Carasuhat Wetland relies upon resources and monitoring activities and results, among others.

The local community were aware of the benefits of the wetland restoration project and they expressed an interest in helping to monitor the effects/results of the implemented solution. In particular, the local community expressed an interest in monitoring the following elements: water quality, bio-fauna and infrastructure (dyke) stability. The stakeholders are willing to be involved in the 'data collection process' that will feed into the 'monitoring program' and further into the 'management and exploitation plan' for specific parameters.

During the co-design workshop the following research questions were agreed:

1. What is the water quality during the year?

2. How does the Danube's water influence the water quality inside the wetland?
3. What is the evolution of bio-fauna (birds, aquatic fauna)?
4. Has the dyke become stable?
    a. What is the status of dyke erosion?
    b. What processes are affecting dyke erosion?
5. To what extent is sediment quantity changing inside the wetland?

3.5 Citizen Science Activities

After the bilateral discussions and co-design workshop, parameters were agreed between the stakeholders for citizen science monitoring: water quality, water levels, dyke stability and wetland biodiversity. The citizen-science activities will provide the baseline data of a continuous monitoring program by sampling and observing the evolution of the implemented NBS. After the implementation of the restoration project, the administrator of the newly created wetland did not implement a monitoring programme or dedicated Management Plan. The stakeholders are willing to be involved in the 'data collection process' that will feed into the 'monitoring program' and further into the 'management and exploitation plan'.

Apart from the citizen-science activities defined within MICS project, WWF Romania is also coordinating a project financed by LIDL that will engage with local citizens to monitor biodiversity. The preparation for these activities was delayed due to the restrictions associated with the COVID-19 pandemic. However, two field campaigns have been organised by WWF Romania to train local citizens and to initiate the biodiversity monitoring activities.

The monitoring activities are being performed with the support of FreshWater Watch (FWW) who have provided FWW Kits for the monitoring of water quality. The monitoring scheme should be further taken/continued by DDBRA, WWF and SOR.

3.5.1 Citizen Science training 1: Assessing Water Quality using Freshwater Watch

The citizen-science activities started with a 'train the trainer session' organised by Earthwatch in order to instruct the attendees (colleagues from GeoEcoMar, WWF Romania) on how to use the FWW platform and FWW kits. Prior to this, the FWW platform and the "'support materials' had been translated into Romanian.

The first citizen-science activities took place between 4th and 7th November 2020, coordinated by two team members from GeoEcoMar and one member of WWF Romania. Ten participants in total attended the training session and interactive activities. The workshop was delivered through presentations, demonstrations, free discussions and interactive activities. The structure is as follows:

1. *Training sessions on how to use the FWW platform and FWW kits;*
2. *Help the participants in creating accounts for the FWW platform;*
3. *Perform the citizen science activities (monitoring activities);*
4. *Perform a set of DGPS measurements in order to identify the best locations for installing gauging stations that will be used by our stakeholders to monitor the water level and bank stability*

The training session began with an introduction of how to use the FWW platform and the FWW Kits, including creating accounts for the participants. Field activities were performed with the support of two boats belonging to the stakeholders. The boats were required to transport volunteers to locations where water samples would be collected. It should be noted that the entire set of measurements must be performed from the boats since there is no access to the sampling locations on foot.

We have also performed a set of differential GPS (DGPS) measurements to identify the best locations for installing gauging stations. After the installation of the gauging stations, citizens will monitor water levels using these stations by themselves (after training). The stakeholders were all actively involved in the workshop (Figure 5).

Training session in open-space

Training session in open-space

Water quality measurements

Water quality measurements

Turbidity measurements

Confirming the results

Figure 5 – Photographs from the training using Freshwater Watch kits on the Carasuhat Wetland. (Source: Albert Scrieciu & Andrei Prodan)

4 Next steps

4.1 Citizen Science Activities

The planned citizen-science activities (water quality monitoring, bank stability, water level) will continue next year. During the winter and spring time, the frequency of the monitoring activities will be once per month and during the summer and autumn, the frequency of these activities will increase at two times per month.

After the installation of the gauging stations, a training session will be arranged to instruct citizens on how to perform water level and bank stability measurements.

To prevent citizens losing interest in monitoring and the project in general regular contact will be maintained. This will entail periodic phone calls and face-to-face meetings to discuss progress and plan upcoming activities. A representative from either GeoEcoMar or WWF Romania will join our citizens while performing the citizen-science activities until volunteers are confident and can conduct the activities unsupervised. The outcomes of our activities will be shared with volunteers involved during periodic meetings

4.2 Impact Measurement

We will begin to identify indicators to measure impact related to the case study's aims and objectives. This will be achieved through workshops with all stakeholders involved or through discussions with project managers. Once indicators have been selected, we will measure the impact of the citizen science activities on the five MICS domains: environment, society, economy, governance, science & technology. We will review the usability of the impact assessment and produce guidance and training so the MICS tools and metrics can be applied to any type of citizen science project. The results from these activities will be reported on in the comprehensive evaluation report (deliverable 4.5) in 2021.

5 References

Wehn, U. and Pfeiffer, E. (2020) Guidelines for Citizen Observatories and Future Recommendations, Ground Truth 2.0 Deliverable D1.13, February.