Innovations for migratory bird monitoring along the East Atlantic Flyway (FLYWAY)

Following a request from the Dutch Ministry of Agriculture, Nature and Food Quality (LNV) and its counterparts in Germany and Denmark

D1.3.3 and D1.3.4

1st and 2nd CONSULTATION REPORTS

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SUMMARY

The " Innovations for migratory bird monitoring along the East Atlantic Flyway (FLYWAY)" project is a collaborative effort funded by the European Commission's Directorate General for Structural Reform Support (DG REFORM) in response to a request from the Dutch Ministry of Agriculture, Nature and Food Quality. The project aims to support the development of a comprehensive Roadmap and Implementation Plan for improving bird and habitat monitoring along the East Atlantic Flyway that is specifically relevant to the management of the Wadden Sea area. Key stakeholders, including advisory board members and technology experts, were identified and engaged in a stakeholder consultation to gather input and recommendations.

The consultation process involved three main activities during the first year: a questionnaire, pilot studies and a technology workshop. The questionnaire gathered expert opinions on introducing new monitoring techniques and understanding stakeholder data requirements, while the workshop brought together international experts to discuss innovative monitoring technologies. Results from these activities provided insights into the current status, challenges, and recommendations across three main areas: EAF monitoring governance and policy, management and conduct of monitoring, and innovation and digital techniques.

Regarding governance and policy, stakeholders highlighted achievements in collaborative efforts and identified challenges such as coordination gaps and funding issues. Recommendations included promoting and maintaining the EAF infrastructure, improving interactions between policy and management, monitoring and research and enhancing funding and collaboration mechanisms.

Regarding the management and conduct of monitoring, stakeholders acknowledged the solid foundation of monitoring efforts in European countries but highlighted challenges in accessibility and resource limitations, particularly in African nations. Recommendations included enhancing survey programmes, building capacity, and improving data access.

Experts from the University of Aarhus Denmark, BioConsult SH in Germany, the French Office for Biodiversity, the Alfred Wegener Institute Germany, and BirdEyes, University of Groningen and the Netherlands Institute of Sea Research, among others, provided first-hand experiences and recommendations on the feasibility and effectiveness of technologies such as drones, satellite imagery processing, statistical assessments, digital twins, and individual bird tracking. Recommendations included building capacity for current observers, introducing advanced statistical techniques, and leveraging technologies like remote sensing and drones.

Overall, the consultation process provided valuable insights and recommendations for developing the Roadmap and Implementation Plan, emphasising the importance of collaboration, capacity building, and technological advancements in enhancing bird and habitat monitoring along the East Atlantic Flyway.

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1. INTRODUCTION

Key Project Information

The European Commission's Directorate General for Structural Reform Support (DG REFORM), following the request from the Dutch Ministry of Agriculture, Nature and Food Quality, awarded the Coastal & Marine Union (EUCC) and its experts of the Sovon Dutch Centre for Field Ornithology/Wadden Sea Flyway Initiative (Sovon/WSFI) and EUCC – The Coastal Union Germany (EUCC-D) funding to support the development of the Action entitled *Innovations for migratory bird monitoring along the East Atlantic Flyway (FLYWAY)*.

This Action is intended to support the Dutch Ministry of Agriculture, Nature, and Food Quality (LNV) and its counterparts in Germany and Denmark in developing an instrument that sets the planning foundations and implementation processes for future improvement of bird and habitat monitoring along the East Atlantic Flyway, specifically relevant to the management of the Wadden Sea area. The aim is to create a comprehensive Roadmap and Implementation Plan to introduce certain innovative techniques into the current monitoring programme.

Aim and Objectives of the Consultation

Figure 1 shows the project stakeholder consultation process during year 1, which culminated in a comprehensive state-of-play assessment and recommendations for developing the Roadmap and Implementation Plan.

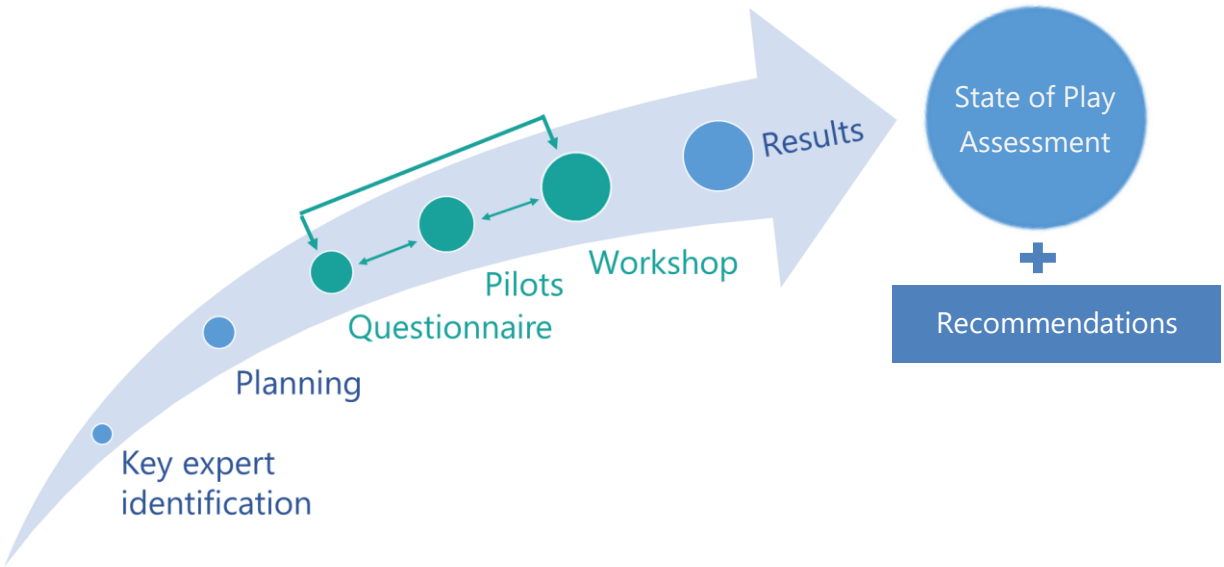

Figure 1. The Stakeholder Consultation process during year 1

The approach to this stakeholder work was designed to meet two main objectives:

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- To raise interest levels and get the full support/participation of key stakeholders who will later be responsible for implementing the Roadmap;
- To obtain and share technical knowledge on innovative techniques to improve bird/habitat monitoring.

Stakeholder identification and mapping

Relevant details and the journey of all identified stakeholders during phase 1 were compiled into a shared, accessible document to ensure that the project team and Steering Group had an overview of roles/responsibilities and to keep everyone informed regarding engagement. This Stakeholder Directory is a working document that will be updated throughout the project. It helps track a long list of people and their involvement in project activities. The stakeholders are categorised in the directory following the list below (Box 1). It is recognised that stakeholders often fall into two or even more categories. In these cases, their primary professional role has been used for categorisation.

A – Regulators (Governance and policy)
A – 1 Trilateral regulatory bodies (ministry level), EU level bodies
A – 2 National public offices and county/municipal authorities (Wadden Sea area)
A – 3 Public authorities from other East Atlantic Flyway regions

B - User groups and administrators
B – 1 National Park management (Wadden Sea)
B – 2 Bird /habitat management & monitoring organisations (Wadden Sea)
B – 3 Bird /habitat management & monitoring organisations (other areas)

C - Knowledge brokers
C – 1 Technology experts/developers
C – 2 Academic/Research institutes

D - Society
D – 1 Interest groups, NGOs and bird societies
D – 2 General public & community groups

Box.1

The key stakeholders come from a broad spectrum of organisations along the East Atlantic Flyway. The organisation list can be found in Annex 1.

1.1.1. The Advisory Board

The project's Advisory Board (AB) members were identified and agreed upon by the Steering Group as being key pivotal organisations and actors (strong influence and high interest) that were needed to develop the State of Play Assessment and recommendations for the Roadmap and Implementation Plan. These key stakeholders, mainly from Stakeholder Categories A and B, listed in Box.1, were prioritised for initial engagement during this consultation process as the subject matter of the FLYWAY Roadmap does not only affect their line of work or sector, but it encroaches on policy areas to which they actively and directly contribute through their policy initiatives and implementation. The Steering Group recognised the need for close

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coordination with the AB to avoid overlap and to capitalise on synergies. The proposed approach was to engage with this group of actors directly as a group and, if necessary, through one-to-one communication during year 1 of the consultation process.

1.1.2. Monitoring & Technology Experts

Technology experts represent a crucial stakeholder group whose knowledge and input are pivotal for preparing the State of Play Assessment and accompanying recommendations. They include researchers, scientists, and private sector individuals with specialised knowledge and skills in the various technologies and digital techniques being considered. The project team invited several chosen experts to test and report on the potential of certain techniques, including:

- The University of Aarhus, Denmark, on collecting information using drone techniques
- BioConsult SH in Germany looking at solutions using remote sensing satellite imagery processing techniques;
- The French Office for Biodiversity (Office Français de la Biodiversité) providing statistical assessments for improvements in the Flyway monitoring;
- The Alfred Wegener Institute in Germany provides knowledge about combining different kinds of data in an information system (Digital Twins), which could act as an early-warning system for conservationists and policymakers; and finally
- The BirdEyes group (from NIOZ and the University of Groningen, Netherlands) regarding the combination of information from individual bird tracking with other sources of information.

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2. Invitations made to stakeholders

During year one, there were two main consultation activities with differing objectives. Stakeholders were invited to complete a questionnaire and to attend a technology-focused workshop (physical meeting). Since the information gathered from the questionnaire and workshop are complementary, it was deemed appropriate to combine the two consultation reports (D1.3.3 and D1.3.4).

2.1 Questionnaire

The questionnaire was designed by EUCC in cooperation with Sovon to gather expert opinions on the practicalities and benefits of introducing new techniques into the East Atlantic Flyway monitoring programme and to understand key stakeholder data requirements. It was conducted online using the SurveyMonkey programme and consisted of 'closed-ended', quantitative, and qualitative questions. The questionnaire was split into three sections: (1) Techniques for bird monitoring, (2) Techniques for habitat monitoring, and (3) Data/information needs. The questionnaire can be found in Annex 2. An invitation to fill in the questionnaire was sent to two stakeholder groups: 1) Project Advisory Board and 2) Technology Workshop Participants. In total, 32 key stakeholders received the questionnaire, to which 19 responded. Figure 2 shows that from the 19 respondents, most are involved in water bird counts, and five were from policy areas. Multiple answers were possible.

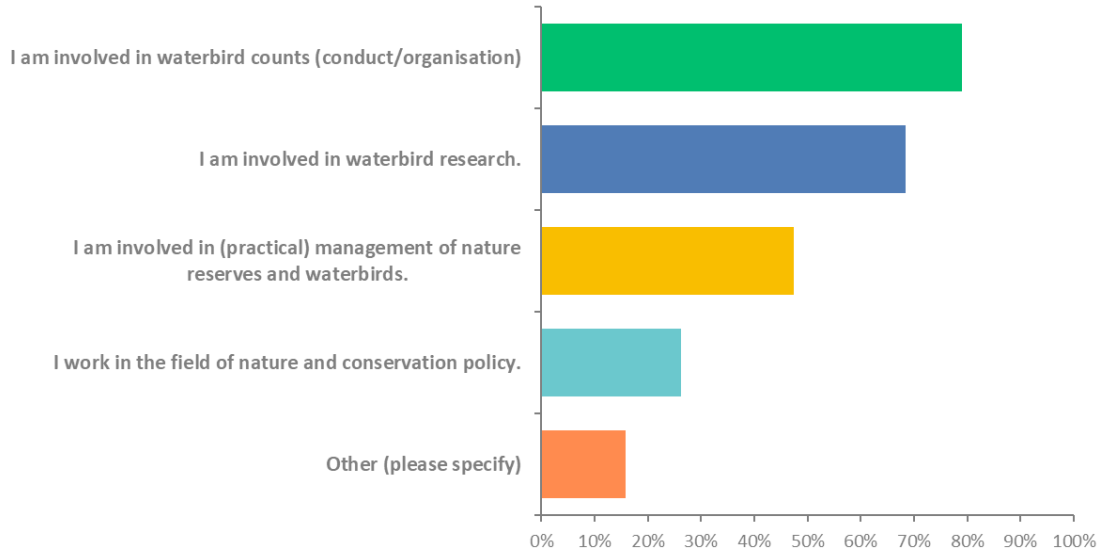

Figure 2. Percentage of respondents from the different key work areas

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2.2 Technology Workshop

Over forty international experts gathered for the event in Wilhelmshaven on 20 and 21 November 2023 to discuss innovative techniques to help improve migratory bird monitoring along the entire East Atlantic Flyway. The event was organised by the project team and hosted by the Common Wadden Sea Secretariat and the Lower Saxon Wadden Sea National Park. The event was opened with a recorded welcome by Mr Mario Nava, Directorate-General for Structural Reform Support at the European Commission. The agenda included specialist sessions on the potential of introducing certain technologies, including drones and high-definition observations, satellite remote sensing, tagging and satellite tracking, and unexplored statistical methods to analyse the data. Representatives from organisations involved in monitoring along the East Atlantic Flyway, from the Arctic to South Africa, also discussed common challenges such as funding, volunteer numbers, and training programmes to raise observer skills. The workshop was a milestone consultation event in the project, which allowed experts to discuss and exchange views on the potential of different techniques. The overall feeling among participants was that this was a long overdue meeting in which scientific and technical specialists came together.

Figure 3. Drone photograph of participants attending the Technology Workshop in Wilhelmshaven, Nov '23

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Figure 4. Participant involvement at the Technology Workshop in Wilhelmshaven, Nov' '23

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3. Results from the Consultation process

This section is an amalgamation of all findings from the stakeholder consultations in year 1 of the project. In line with the requirements of the General Data Protection Regulation (GDPR) 2016, this report does not disclose the personal data of the stakeholders engaged during this period. All stakeholder input, including their opinions and recommendations gained from the questionnaire and the workshop, has been included anonymously to provide a comprehensive expert overview of the current situation and recommendations for the future. Findings and recommendations deduced from the basic questionnaire analysis are annotated and described as such. The other findings and recommendations are direct statements and comments from the workshop participants. The consulted stakeholders were all experts in their field and identified as people whose opinions are essential for developing the Roadmap and Implementation Plan (see section 1.3 Stakeholder identification and Mapping). The consultation findings cover three main areas:

1) EAF monitoring governance and policy

2) Management and conduct of monitoring

3) Innovation and digital techniques.

The results in this report will be transferred appropriately into the structure of the State of Play Assessment and Recommendations Reports. EAF monitoring governance and policy

3.1.1 Current status

- The work done across the flyway via a network of contributors (academic institutions, governmental agencies, NGOs, volunteers) acting as observers and national coordinators and internationally coordinated by the Wadden Sea Flyway Initiative, Wetlands International, and BirdLife International is a major achievement and not easily built.
- Monitoring water birds and their sites along the East Atlantic Flyway contributes to a variety of policy instruments, including Ramsar, African Eurasian Waterbird Agreement, and Natura 2000 (EU Birds and Habitat Directive), among others
- The world of flyway knowledge (monitoring and research) has grown apart from the world of policy development and policy implementation.
- There is tremendous expertise and will between parties.
- Generally, there is a low level of integration into national schemes/plans/policies between policy, management, monitoring and research.
- The implementation of the Nature Recovery Act will have various effects on nature policy, amongst other additional monitoring demands. The East Atlantic Flyway is a global cooperation offering valuable viewpoints for better protecting global bird populations.
- The deficiencies result mainly from financial sustainability. The implementation of conservation and management strategies and governance are sustained by projects

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that jeopardise the short, medium and long-term conservation strategies of protected areas.

- Funding is a general challenge. This Flyway cooperation is mainly funded by three countries (Netherlands, Germany, and Denmark).
- Especially in Africa, it is often hard to produce continuity in the research and monitoring work because of a lack of (long-term) funding.
- Funding is complex because there is no legal obligation to provide funds.
- African countries face challenges on an entirely different level.
- The priority of southern EAF governments is to improve their populations' health and educational conditions of their human populations rather than nature conservation, even if they have ratified international conventions.
- Despite the good quality and long-term monitoring of migratory water birds in Ghana and many wetlands being labelled as Ramsar sites for example, ongoing urban developments and land use change threaten many wetlands and have already caused the disappearance of essential wetlands in this country. This is likely to be happening across much parts of East Atlantic Africa.

3.1.2 Recommendations

- The EAF infrastructure should be promoted and maintained. A coordinating body needs to be maintained and funded.
- Additional support would help to advance the monitoring. There is a need for expert break-out groups with complementary expertise to discuss the problems and solutions.
- Seed funding is required to prepare a grant proposal to programmes such as BioDiversa+, Horizon, or ERC, which could then help build infrastructure for more robust monitoring.
- Improved policy and protection of sites with an already existing Ramsar (or EU Natura 2000) label are needed.
- Active bodies like the national governments, EU-level task forces, Ramsar and AEWA dignitaries need to take the outcomes of this meeting seriously and re-engage with the scientific analysts and storytellers for much better results.
- To maintain the bird populations that use the Wadden Sea, supporting protection in African countries is important. Consequently, nature policy in the EU should be linked to European development aid policy.
- Build a knowledge & management/policy hub where organisations can meet regarding more minor issues. Small and frequent interactions/meetings are also important.

Management and conduct of monitoring

3.1.3 Current status

Results from the questionnaire:

- According to the questionnaire, the data and information most in use from the EAF monitoring programme areas are 1) Non-breeding (January) water bird numbers and trends, 2) threats and pressures on birds, and 3) bird distributions. However, it is

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important to point out that other data, such as survival rates, may not be being used as they are more difficult to collect (and hence not available).

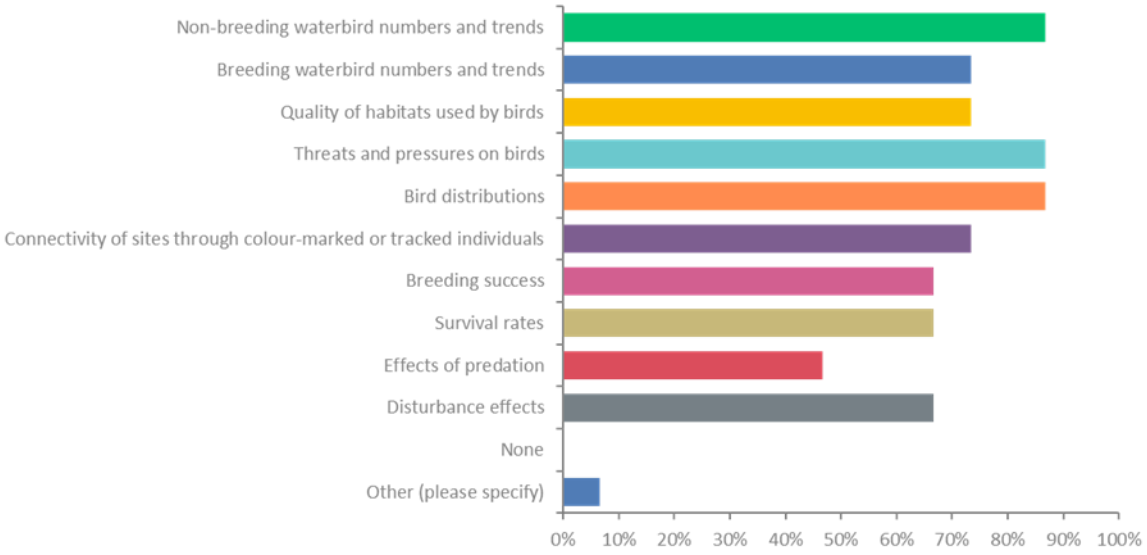

Figure 5. Percentage of questionnaire respondents who say they use specific data and information collected along the EAF. Multiple answers were possible.

- 44% of questionnaire respondents said that they have data requirements that are currently unmet by the EAF monitoring programme. For the Wadden Sea area, the data requirements mentioned included breeding success, mortality rates, predation and connectivity, plus reliable data on threats and pressures as well as information regarding habitat quality. A better connection to other monitoring programmes was also mentioned alongside the need for a centralised databank and better access.
- For Africa, the data requirements mentioned included further information regarding migratory bird distribution along the EAF.
- The majority (over 70%) of questionnaire respondents believe that EAF data collected on migratory birds and habitats can be improved.
- A questionnaire respondent commented that data from the EAF is not always easy to access, e.g. for regional analyses. Only limited organisations that are managing / collating data have access[1].

Feedback from the technology workshop:

- Monitoring in the European countries is mostly solid. But also there, challenges remain and national programmes are sometimes not funded, resulting in deficiencies in coordination and data availability.
- International NGOs are mobilising funds to monitor migratory birds along the Atlantic flyway, such as the Wadden Sea Flyway Initiative (WSFI) with Sovon, which has forged partnerships with Wetlands International and BirdLife International to bring together

[1] *Source: Expert questionnaire (see Annex 2).*

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government agencies, conservation NGOs, civil society, and local wetland communities.

- The main challenges in delivering a comprehensive monitoring programme for the entire East Atlantic Flyway are limited resources and accessibility.
- Different research groups already use state-of-the-art and innovative techniques for studying/monitoring bird populations with good international collaboration on several species. However, there is insufficient capacity for carrying out these innovative techniques in most African countries.
- African sites are significantly underrepresented in terms of frequency of counts and spatial coverage. Reasons include lack of good standard equipment, accessibility to remote areas, lack of tradition and affordable volunteer involvement and long-term funding. Strategic Coverage of sites/site monitoring plans are often missing.
- Whilst technological advances are important, 'old school' methods are still vital! The importance of binoculars, boots, a form to fill in and a field guide cannot be underestimated.
- For most countries (e.g. that have signed AEWA), it is an obligation to monitor water birds and their sites; however, many countries (governments) only do it when either some or all resources, external experts, financial support, volunteers, etc., are available. Many governments do not accept monitoring on board without external influence, support or 'pressure'. Yet, it should be built into government planning and, e.g. site management protocols.
- Data on national level/site level is owned by the organisation providing the national coordinator and organizing the national monitoring. This organisation needs to be consulted for permission to share data from national/site level.
- The integrative counts along the entire flyway are done during midwinter (in January) every three years. This frequency, combined with the (unknown, but likely high) error rates associated with these count data, is too low to detect relevant changes in population trends.
- The Arctic is large, and only little is known about reproduction. The lack of knowledge makes it difficult to understand why populations change in size and distribution, so it is challenging to develop efficient management.

3.1.4 Recommendations

Comments from the questionnaire respondents:

- 'Standard' monitoring needs to be strengthened whilst innovations are explored, trialled and put into practice[2].

[2] *Source: Expert questionnaire (see Annex 2).*

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- Monthly or even half-monthly (spring-tide) counts should be conducted in as many areas as possible, mainly in easily accessible counting areas, covered by local counters/wardens by walking or cycling (low budget)[3].

Feedback from the technology workshop:

- International monitoring could be improved with more infrastructure and continuity in survey programs.
- Some of the survey designs could be improved with slight modifications, more repeated counts or the use of double-observer methods to have better control over problems with imperfect detection. Collection of additional data such as ratios of marked to unmarked birds or age composition of wintering flocks could provide additional ecological indicators for migratory water birds.
- African nations need additional funding and support to provide field workers with basic monitoring equipment (telescopes, binoculars, digital cameras, drones, ID guides etc.). Site coordinators there need capacity building in statistics, database management and Geographical Information Systems (GIS) to coordinate the International Waterbird Census.
- There is a need to transfer knowledge across the EAF and for training programmes to enhance local, national, regional and international understanding.
- Use of standardized mobile applications to collect data (Android or iOS) is required and needs to be encouraged.
- Better access to data portals is needed.
- Triannual EAF events, and regular regional water bird counting workshops in West Africa would be beneficial.
- The network of research institutions and universities along the EAF needs to be strengthened.
- Capacity-building should be considered in the same way as monitoring, i.e. it needs to be continuous/regular because new people always need to be involved. Building enthusiasm is an essential component for field observers and at the policy level.
- It is important to adapt new methodologies according to the reality on the ground. This exercise should include technicians from all countries, particularly those from Africa, and not just northern EAF nations.
- Research and concrete conservation projects and targets need to be more connected with monitoring.
- There is a great need for joining multiple efforts in terms of collected data in one central database, which can be accessed by researchers, conservationists and policymakers.
- There needs to be positions funded to work on the flyway project, e.g. for harmonizing data, analyzing data in terms of potential bias and giving all researchers feedback on the quality of their data.
- More coordination, integration and continuity are required between different levels of work organisations - between countries, researchers and managers, and politics.

[3] *Source: Expert questionnaire (see Annex 2).*

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- Capacity building needs to be funded and help given to organisations along the African seaboard. Train people to train others.

Innovation and digital techniques

3.1.5 Current status

- There are specific data shortcomings for which technologies may help:
  - overwintering distributions and prey choice of shorebirds
  - foraging ecology of terns and gulls
  - high tide roost counts (and thus population size estimates)
  - migration patterns.
- The workshop showcased how current innovations in monitoring can be helpful in better determining the need to protect bird populations. Techniques such as drones and tracking devices can provide information on overlooked habitats that are permanently and temporarily important for bird species.
- A lot of options already exist to strengthen the counts using digital solutions (especially drones and satellites). Using such solutions improves reliability. But, the question remains: How can we organise monitoring to incorporate them and strengthen reliability?
- Flyway monitoring is also about social support and involvement. Different digital techniques can help strengthen people's participation.
- Technology such as tracking devices, remote sensing, drones, etc., can help speed up knowledge generation.
- To assess e.g. migratory connectivity even better, more satellite tracking data will be needed. However, satellite tags are expensive and still too heavy for some species.

3.1.6 Recommendations

Results from the questionnaire:

The most popular technique among experts when it comes to improving migratory bird monitoring along the EAF is building the capacity of current observers. Other popular choices include 1) introducing tracking and 2) introducing advanced statistical techniques. Figure 6 shows that the most popular technique choice of respondents from the Wadden Sea is also the building of the capacity of current observers, introducing advanced statistical techniques as well as introducing remote sensing. Respondents from Africa have also chosen the building of capacity of current observers as the best technique as well as the option of tracking. This indicates again the different needs in the regions of the EAF. Popular among the group 'International' are techniques such as satellite, tracking and building of capacity of current observers. Other suggestions include the mentioning of drones and mobile applications as well as network building and the better integration of monitoring into national and international organisations.

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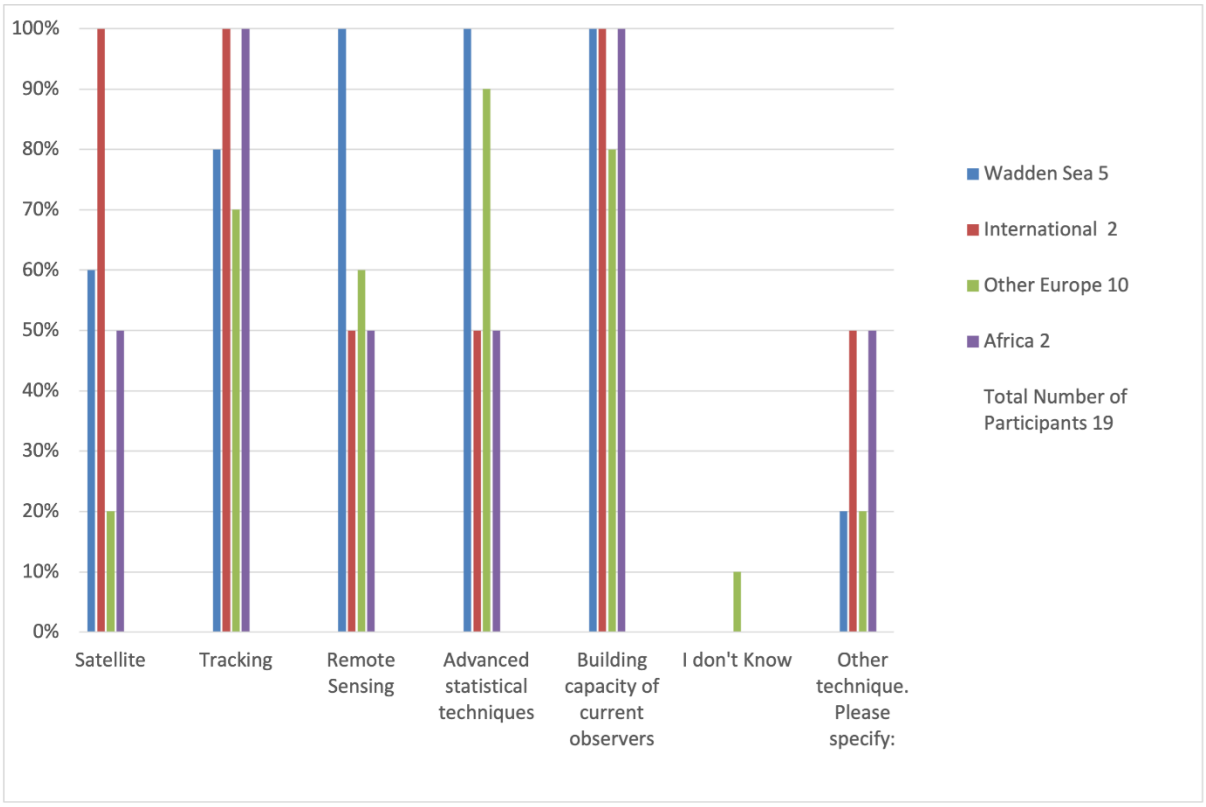

Figure 6. The percentage of questionnaire respondents, divided into regional categories, who chose specific techniques to improve current migratory bird monitoring. The number of respondents for each category has been included.

The most popular technique to improve habitat monitoring is the introduction of satellite imagery. Figure 7 shows that for the Wadden Sea area, the most popular techniques are the introduction of satellite imagery and remote sensing in general, while for Africa, the introduction of satellite imagery and the building of capacity of current observers have been the most popular. Within the International respondents, all three mentioned techniques have been popular: satellite imagery, remote sensing and building of capacity of current observers. This highlights the different needs for techniques to improve the habitat monitoring between regions of the EAF. The 'other' techniques mentioned include capacity building of fieldwork in parks.

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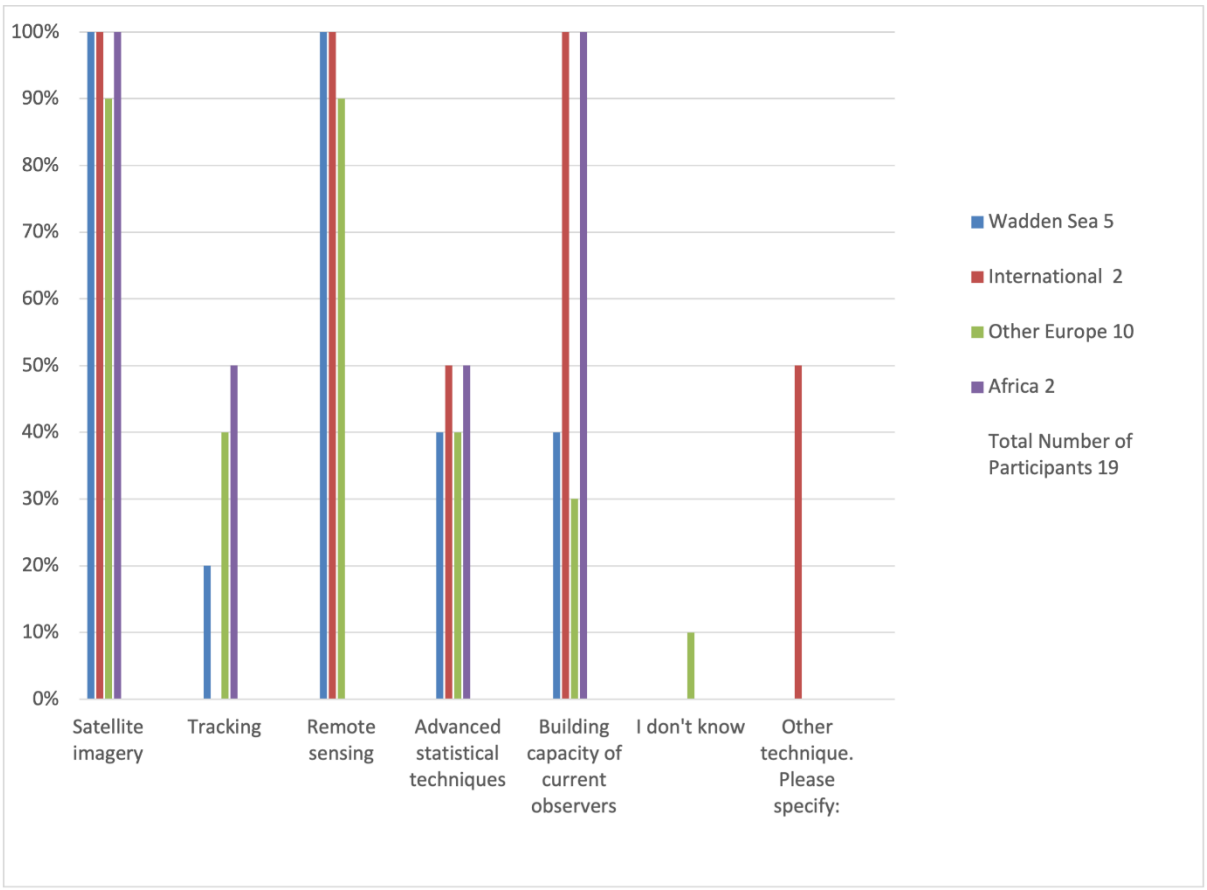

Figure 7. The percentage of questionnaire respondents, divided into regional categories, who chose specific techniques to improve current habitat monitoring. The number of respondents for each category has been included.

Feedback from the technology workshop:

- Remote sensing technology, as well as drone and AI techniques, are promising tools to improve the monitoring for the estimation of population sizes. Mark-recapture and (novel) tracking techniques allow for improved estimates of population size and pinpoint the areas where species are getting into trouble.
- Use of drones to monitor large flocks of birds in remote, inaccessible open spaces, e.g. wetlands, from above could be good. Still, some species get easily disturbed by drones, and others are found under vegetation so they wouldn't be visible.
- Deeper insights into migratory connectivity would help us to extend our knowledge about stopover sites that might have more importance (data).
- Remote sensing helps monitor key sites, and tagging birds helps understand when and how different sites are used. Drones can be employed locally and are helpful to improve knowledge on the site level. They are especially useful for monitoring breeding birds.

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- Drone Mapping is time-consuming, and it isn't easy to analyse the imagery. AI can help, and models are there (and can/should improve), but this would require a platform (data portal/viewer with AI), and a bit of a network to arrange.
- If drone programs are developed, using them to get morphological information about the habitat would be beneficial. This information helps monitor sedimentation/erosion and the risk of flooding. It can be done with drones that have RTK capacity. These drones are a bit more expensive, and the fieldwork/mapping would need to be adjusted.
- Mark-recapture or tracking should be used to assess stop-over duration, allowing us to estimate the number of birds using a stopover/staging site. They will also explain when and where problems arise in the annual cycle.
- A transfer of expertise is needed for using drones, telemetry for monitoring bird dynamics, mapping, teledetection for habitat monitoring and statistics for analysing and processing data collected in the field.

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4. Conclusion

The stakeholder consultation phase covered in this double report spans 12 months between Dec 2022 and Nov 2023. During this time, two main stakeholder engagement activities were conducted: Firstly, a questionnaire was sent out to the project's Advisory Board, and secondly, a coming together of technology experts at a workshop in Wilhelmshaven, Germany. In line with the goals of the FLYWAY project, the findings from these activities show that experts working in policy, monitoring, research, and nature protection/management along the entire EAF are calling for improvements in bird/habitat monitoring data and their analysis. There is a unanimous but at the same time measured and cautious call for new technologies and digital techniques to be rolled out across the whole EAF monitoring programme.

However, there is seemingly a distinct requirement for 'levelling up' capacities between the northern European countries and the reality for the African nations, who highlighted other grievances and challenges of a more structural and fundamental organisational nature. The stakeholders' input underscores the urgent need for coordinated action to address these challenges and bridge the gap in monitoring capabilities between regions. While there is enthusiasm for the potential of new technologies, it's clear that their successful implementation hinges on addressing fundamental issues such as long-term funding, capacity building, and access to data.

Moving forward, the recommendations provided by stakeholders offer suggestions for a roadmap to advance bird and habitat monitoring along the East Atlantic Flyway. Key actions include promoting stakeholder collaboration, securing sustainable funding mechanisms, enhancing capacity-building initiatives, and leveraging technological innovations to improve data collection and analysis.

The stakeholder consultation phase of the FLYWAY project concluded with stakeholders testing various innovative techniques, including drones, satellite imagery processing, and individual bird tracking. Their feedback highlighted the potential of these technologies to enhance bird and habitat monitoring along the East Atlantic Flyway (EAF). Challenges such as data accessibility and capacity building were also identified. Despite these hurdles, stakeholders are optimistic about the transformative impact of technologies like drones and satellite imagery in providing comprehensive and real-time insights into bird populations and their habitats.

As the project progresses, it will be essential to continue engaging with stakeholders and refining the Roadmap and Implementation Plan based on feedback and emerging insights. By working together and embracing innovation while addressing underlying challenges, the FLYWAY project has the potential to make significant strides in advancing the conservation and management of migratory bird populations and their habitats across the East Atlantic Flyway.

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ANNEX 1 LIST OF KEY ORGANISATIONS

List of Key Organisations during Consultation Phase 1 (last revised by EUCC-D – 19.12.2023)			
Category	**Name**	**Short name**	**Country**
A-1	Dutch Ministry of Agriculture, Nature and Food Quality	LNV	NL
A-1	Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection, Germany	BMUV	DE
A-1	Environmental Protection Agency at the Ministry of the Environment and Food, Denmark	MST	DK
A-1	Federal Agency for Nature Conservation, Germany	BFN	DE
A-1	Lower Saxony Ministry for the Environment, Energy and Climate Protection		DE
B-1	The Common Wadden Sea Secretariat	CWSS	Int
B-1	Wadden Sea National Park Schleswig-Holstein		DE
B-1	Wadden Sea National Park Hamburg		DE
B-1	Wadden Sea National Park Lower Saxony		DE
B-1	National Park Vadehavet		NL
B-2	Sovon Dutch Centre for Field Ornithology	Sovon	NL
B-2	Birdlife International		Int
B-2	Wetlands International		Int
B-2	Nature And Biodiversity Conservation Union, Germany	NABU	DE
C-1	Royal Netherlands Institute for Sea Research	NIOZ	NL
B-1	Danish Wadden Sea National Park		DK
C-1	Aarhus University		DK
B-2	Birdlife International		Int
B-2	Wetlands International		Int
B-1	Schutzstation Wattenmeer e.V.		DE

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List of Key Organisations during Consultation Phase 1 (last revised by EUCC-D – 19.12.2023)			
B-1	Banc d'Arguin National Park		MR
B-2	French Office of Biodiversity		FR
B-2	Centre For Biodiversity Conservation Research		GH
C-1	University of Aveiro		PT
C-1	University of Dakar		SN
B-2	British Trust for Ornithology		GB
A-1	German Federal Agency for Nature Conservation		DE
B-2	Wadden Sea Flyway Initiative	WSFI	Int
B-2	LPO France (BirdLife International France)		FR
B-2	Institute of Biodiversity and Marine Protected Areas (Guinea-Bissau)		GW
B-2	International Wader Study Group		DE
B-2	The Fieldwork Company		NL
C-1	BioConsult SH GmbH & Co.		DE
C-1	BirdEyes		NL
C-2	University of Groningen		NL
C-2	Norwegian Institute for Nature Research		NO
C-2	University of Amsterdam		NL
D-1	WWF Germany		DE

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ANNEX 2 EXPERT QUESTIONNAIRE

1. In what capacity are you filling in this questionnaire? *Multiple selections are possible.*

- [ ] I am involved in waterbird counts (conduct/organisation)
- [ ] I am involved in waterbird research.
- [ ] I am involved in (practical) management of nature reserves and waterbirds.
- [ ] I work in the field of nature and conservation policy.
- [ ] Other (please specify)

2. Please enter your name and title

3. Please enter the name of the organisation that you work for

4. Please enter your position within the organisation

Bird monitoring techniques

5. In your opinion, could the data collected on migratory birds along the East Atlantic Flyway be improved?

- ( ) Yes
- ( ) Maybe
- ( ) No
- ( ) I don't know

Bird monitoring techniques

6. Which of the following techniques would improve migratory bird monitoring along the East Atlantic Flyway? *Multiple answers are possible.*

- [ ] Satellite imagery
- [ ] Tracking
- [ ] Remote sensing
- [ ] Advanced statistical techniques
- [ ] Building capacity of current observers
- [ ] I don't know
- [ ] Other technique. Please specify:

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7. How would the following techniques improve migratory bird monitoring along the East Atlantic Flyway? *Multiple selections for each technique are possible.*

	Enhancement of data abundance	An increase in coverage	Enhancement of data quality and reliability	Enhancement of data analysis and results	Better integration of datasets	A decrease in bird disturbance
Satellite imagery	☐	☐	☐	☐	☐	☐
Tracking	☐	☐	☐	☐	☐	☐
Remote sensing	☐	☐	☐	☐	☐	☐
Advanced statistical techniques	☐	☐	☐	☐	☐	☐
Building capacity of current observers	☐	☐	☐	☐	☐	☐
I don't know	☐	☐	☐	☐	☐	☐
Other technique. Please specify:	☐	☐	☐	☐	☐	☐

Comment

Habitat monitoring techniques

8. In your opinion, could the data collected on habitats along the East Atlantic Flyway be improved?

- ◯ Yes
- ◯ Maybe
- ◯ No
- ◯ I don't know

Habitat monitoring techniques

9. Which of the following techniques would improve habitat monitoring along the East Atlantic Flyway? *Multiple answers are possible.*

- ☐ Satellite imagery
- ☐ Tracking
- ☐ Remote sensing
- ☐ Advanced statistical techniques
- ☐ Building capacity of current observers
- ☐ I don't know
- ☐ Other technique. Please specify:

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Habitat monitoring techniques

10. How would the following techniques improve habitat monitoring along the East Atlantic Flyway? *Multiple selections for each technique are possible.*

	Enhancement of data abundance	An increase in coverage	Enhancement of data quality and reliability	Enhancement of data analysis and results	Better integration of datasets	A decrease in bird disturbance
Satellite imagery	☐	☐	☐	☐	☐	☐
Tracking	☐	☐	☐	☐	☐	☐
Remote sensing	☐	☐	☐	☐	☐	☐
Advanced statistical techniques	☐	☐	☐	☐	☐	☐
Building capacity of current observers	☐	☐	☐	☐	☐	☐
I don't know	☐	☐	☐	☐	☐	☐
[Insert text from Other]	☐	☐	☐	☐	☐	☐

Comment

Bird and habitat monitoring techniques

11. Do you have experience with any techniques listed below for either migratory bird or habitat monitoring? *Please give details of your experience next to each technique. Leave blank if you have no specific experience or you don't wish to answer.*

Satellite imagery	
Tracking	
Remote sensing	
Statistical techniques	
Building capacity of current observers	

12. What potential issues or practical challenges do you think might arise and, therefore, should be considered when introducing the techniques listed below for bird and habitat monitoring along the entire EAF? *Please enter details for each technique. Leave blank if you do not know or do not wish to answer.*

Satellite imagery	
Tracking	
Remote sensing	
Advanced statistical techniques	
Building capacity of current observers	

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Data and information needs

13. Do you use the data or information on migratory birds or habitats currently collected from the East Atlantic Flyway monitoring programme in your professional work?

- ◯ Yes, regularly
- ◯ Sometimes
- ◯ No
- ◯ I don't know
- ◯ I don't wish to answer

Comment:

Data and information needs

14. For what do you use the data or information? *Multiple answers are possible.*

- ☐ Development of nature conservation legislation or policy
- ☐ Preparation of national biodiversity or habitat strategies/action plans
- ☐ Local species conservation /management
- ☐ Local site conservation /management
- ☐ Other (please specify)
- ☐ National reporting of biodiversity status or levels of site protection
- ☐ Reporting for multilateral Environmental Agreements
- ☐ Research & scientific publications
- ☐ Education or awareness raising

Data and information needs

15. What specific data and information on migratory birds and their habitats along the East Atlantic Flyway do you need to do your work effectively? *Multiple answers are possible*

- ☐ Non-breeding waterbird numbers and trends
- ☐ Breeding waterbird numbers and trends
- ☐ Quality of habitats used by birds
- ☐ Threats and pressures on birds
- ☐ Bird distributions
- ☐ Connectivity of sites through colour-marked or tracked individuals
- ☐ Other (please specify)
- ☐ Breeding success
- ☐ Survival rates
- ☐ Effects of predation
- ☐ Disturbance effects
- ☐ None

Data and information needs

16. Do you have data or information needs that are currently unmet by the East Atlantic Flyway monitoring programme?

- ◯ Yes
- ◯ No
- ◯ I don't know
- ◯ I don't wish to answer

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Data and information needs

17. What information/data needs do you require? *Please be as specific as possible.*

18. If you have any further comments on how to improve migratory bird/habitat monitoring (techniques and technologies) along the East Atlantic Flyway, please insert them below.

Thank you for your time and participation.

The European Commission's Directorate General for Structural Reform Support (DG REFORM), following the request of The Dutch Ministry of Agriculture, Nature and Food Quality (LNV) and the German and Danish counterparts of The Trilateral Wadden Sea Cooperation, awarded the FLYWAY project to the Coastal & Marine Union (EUCC) and experts from Sovon Dutch Centre for Field Ornithology/Wadden Sea Flyway Initiative (Sovon/WSFI) and EUCC – The Coastal Union Germany (EUCC-D).

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ANNEX 3 WORKSHOP AGENDA

European Commission

TAIEX TSI Workshop

on Digitalising monitoring of the East Atlantic Flyway

Organised in co-operation with the

- *Directorate General for Structural Reform Support* ***DG REFORM, European Commission***
- *Ministry of Agriculture, Nature and Food Quality (LNV),* ***The Netherlands, and its counterparts in Germany and Denmark***

TAIEX
MOVING FORWARD TOGETHER WITH EU EXPERTISE

Technical Support Instrument
Supporting reforms in 27 Member States

20-21 November 2023

Venue: *Senckenberg Institute, Wilhelmshaven, Germany*

Beneficiaries:
The Netherlands, Germany and Denmark

Aim of the Workshop

The aim of this workshop is to bring experts together to discuss the potential of innovative migratory bird and habitat monitoring techniques for the entire East Atlantic Flyway. The workshop agenda includes presentations and discussions on how state-of-the-art technologies and statistical methods can help meet long-term information needs and explores the practicalities of such techniques. The project Innovations for migratory bird monitoring along the East Atlantic Flyway explores technologies that can be realistically implemented into . Chosen techniques will be tested and validated. A Roadmap and an Implementation Plan for the introduction of the validated techniques into the EAF monitoring programme will then be developed.

The workshop will be hosted by the Common Wadden Sea Secretariat and Lower Saxon Wadden Sea National Park in Germany.

The TSI (Technical Support Instrument) is operated by the European Commission's Directorate General for Structural Reform Support (DG REFORM). TAIEX TSI events are organised by DG NEAR in agreement with DG REFORM for the benefit of Member States that are receiving technical support through the TSI.

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Day 1: 20th November 2023

Venue: Senckenberg Institute, Wilhelmshaven, Germany

Local time		
8.45h		*Arrival of participants onsite*
9.15h		**Welcome address** • Mr. Mario Nava, Director-General EC DG REFORM • P. Südbeck, National Park WS Niedersachsen and steering group WSFI, Germany • Mr. K. Jaarsma (LNV-NL) • M. Ferreira (Coastal & Marine Union - EUCC)
9.40h		**Data and information needs about waterbirds** 1. K. Jaarsma – Information needs for policy of the Wadden Sea and East Atlanti Flyway 2. G. Scheiffarth – Beyond local bird numbers: information needs for site assessment as a basis for management 3. S. Nagy – Information needs of international conservation treaties 4. T. Piersma – A plea for broadened scientific underpinning of the global protection of wetlands and migratory waterbirds
11.00h		*Coffee and tea -break*
11.30h		**Current flyway monitoring and monitoring of sites** • M. van Roomen – Overview of current East Atlantic Flyway monitoring • A.R Pires – Practical issues in the monitoring of Bijagos, Guinea-Bissau • A. Kidé – Practical issues in the Monitoring of the Banc d'Arguin, Mauritania • K. Günther – Monitoring of migratory birds in the Wadden Sea of Schleswig-Holstein, Germany
12.30h		**Innovations for migratory bird monitoring along the East Atlantic Flyway** 5. J. Reneerkens – Introduction on possible innovations for migratory bird monitoring along the East Atlantic Flyway
12.45h		*Lunch*
14.00h		**Drones and HD observations of waterbirds** 6. T. Bregnballe – Overview of current knowledge, possibilities and challenges i the use of drones 7. E. Folmer – Monitoring colonial breeding seabirds in West Africa using drone and Machine Learning 8. G. Nehls – Digital aerial surveys to monitor birds and habitats
15.30h		*Coffee and tea -break*

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16.00h		**Remote sensing by satellites of habitat availability and anthropogenic pressures** 1. A. Kersten – An introduction to monitoring of habitats and anthropogenic pressures via Satellite Remote Sensing 2. T. Piersma & M. Henriques – Can we assess habitat quality through the eyes o shorebirds? 3. O. Crowe – Information collection about habitats and pressures within IBA/KBA monitoring
17.15h		Wrap up of day 1
17.30h		End of the day 1
19.00h		**Group dinner hosted by DG REFORM**

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Day 2: 21st November 2023

Venue: Senckenberg Institute, Wilhelmshaven, Germany

Local time		
8.45h		*Arrival of participants onsite*
9.00h		*Recap of day 1, unanswered questions and other remarks*
9.15h		**Improving monitoring skills and capacity of field observers** • G.Citegetse – Capacity needs to improve monitoring • Y. Ntiamoa Baidu – Challenges and opportunities in maintaining a long-term monitoring programme in Ghana • A. de Jong –Digital tools to improve training of bird counters and their data processing
10.15h		*Coffee and tea -break*
11.00h		**Statistical optimalisation of monitoring design** • A. Bijleveld – Challenges and possible statistical solutions to • P. Defos du Rau – East Atlantic Flyway waterbird monitoring: some statistical issues and suggestions 1. B. Stolze – Improving monitoring and conservation efforts with the development of a Flyway Digital Twin
12.00h		*Lunch break*
13.00h		**Colour marking and population dynamics** • B. K. Sandercock – Estimation of bird numbers from mark-recapture models for mixtures of marked and unmarked individuals • J. Reneerkens – Identifying demographic bottlenecks in a long-distance migratory Arctic-breeding shorebird 2. T. Lok – Assessing population dynamics and migration in Spoonbills
14.00h		*Coffee and tea -break*
14.30h		**Tracking of individual birds** 3. M. Henriques – Making counts count even more. How can tracking birds improve count-based monitoring in the East Atlantic Flyway? 4. J. Alves – From individual tracking to population connectivity: assessing site use at flyway scale 5. J. Karagicheva – Combining bird tracking and remote sensing for in-depth monitoring of Arctic habitats
15.30h		**Final discussion** Chaired by Anthony Fox
17.00h		End of the technical workshop

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