8th SESSION OF THE MEETING OF THE PARTIES
5 - 9 October 2021, Budapest, Hungary

DRAFT MONITORING FRAMEWORK FOR THE AEWA FLYWAY SITE NETWORK

Introduction

Objective 3 of the AEWA Strategic Plan 2019-2027 sets out "*To establish and sustain a coherent and comprehensive flyway network of protected areas and other sites, managed to maintain – and where necessary restore – their national and international importance for migratory waterbird populations*".

Target 3.2 under this objective foresees that "*The status of, the threats to, and the effectiveness of conservation measures implemented at flyway network sites are being assessed at flyway scale, using data provided by at least three-quarters of Contracting Parties*".

Action (a) to this target foresees that a framework for the AEWA flyway site network is developed by MOP8 (i) building on the preliminary Site Network Review presented to MOP5 and (ii) coordinated with similar reporting processes under multilateral processes, notably the Ramsar Convention on Wetlands, the EU Birds Directive and the Bern Convention Emerald Network.

Based on this framework, Parties are expected to assess and report on the state of their flyway network sites by MOP9 and that the Technical Committee and the Parties produce a flyway-level assessment of the conservation state of flyway network sites by MOP10.

In response to this mandate, MOP7 established task 3.2 of the Technical Committee workplan 2019-2021 requesting the development of a monitoring framework for the flyway network of sites. The Technical Committee at its 15th meeting in April 2019 agreed on Terms of Reference for outsourcing this task.

With the financial support from the Governments of Switzerland and the Netherlands, the Secretariat commissioned to BirdLife International the compilation of a document to address the task at hand in cooperation with Wetlands International and SOVON (Dutch Centre for Field Ornithology).

The first draft of the proposed site monitor framework was discussed at length at the 16th meeting of the Technical Committee in January 2021. Following this constructive feedback, the proposal was significantly simplified and stronger aligned with other existing monitoring and reporting frameworks, in particular under the EU Nature Directives. The revised proposal was reviewed by the Technical Committee and approved with minor adjustments and then submitted to the 16th Meeting of the Standing Committee (StC16) on 4-6 May 2021.

At StC16 the Standing Committee decided to further review the document after the meeting and bring up specific comments to the Secretariat. Following the submission of comments from StC members and observer Parties, the document was further revised and resubmitted to the 18th meeting of the Standing Committee on 28 July 2021 where it was approved for submission to MOP8.

Action Requested from the Meeting of the Parties

The Meeting of the Parties is requested to review the proposed site monitoring framework and adopt it for implementation.

Draft Monitoring Framework for the AEWA Flyway Site Network

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Executive summary

The AEWA Strategic Plan 2019-2027 lists many targets under five key objectives, including one (Target 3.2) which sets out that "*The status of, the threats to, and the effectiveness of conservation measures implemented at flyway network sites are being assessed at flyway scale, using data provided by at least three-quarters of Contracting Parties*". The corresponding action needed for this is that a monitoring framework for the AEWA flyway site network is to be developed.

Monitoring of key sites is a typical example of synergies between site, national and international conservation strategies. It helps individual site management authorities to measure their progress towards the conservation objectives of a site. Having a robust and sufficiently resourced site monitoring system that is regularly updated also helps national authorities in monitoring the collective performance of their national site networks and identify successes and sites or policy areas where improvements would be needed. Bringing the national results together enables analyses on international level working towards the conservation and management of flyway populations which is especially needed for migratory species in which individual birds and populations make use of many different sites in different countries during their life cycle.

This monitoring framework makes use of the earlier work in the AEWA Technical Committee and the recommendations for the improvement of the monitoring priorities for AEWA populations. It is aligned with similar reporting processes under multilateral processes, notably the Ramsar Convention on Wetlands, the EU Birds Directive and the Bern Convention Emerald Network. Our aim is to prevent double work and make use of reporting and systems which is already there and can be used as well in the AEWA context. In this report, we review these site monitoring frameworks within the AEWA region, principally on those with reporting processes underway, with a view to identifying a site monitoring scheme that is appropriate for the AEWA flyway site network (Chapter 2).

We explore and propose options for developing indicators of *State*, *Pressure* and *Response* for sites identified by AEWA Focal Points that are of national and international importance, and the potential application of remote sensing data in supporting these assessments. We propose a relatively simple framework, based on a selection of data fields from the Natura 2000 (and Emerald Network) Standard Data Forms (Chapter 3). This framework represents the best opportunity of getting regular (periodic) state, pressure and response data for a relatively large sample of AEWA sites, given that a large proportion of the sites within the AEWA network are already monitored by this scheme. We identify a selection of the relevant data fields that specifically inform monitoring, and that should form the basis for gathering monitoring data from other sites and countries.

Implementing this system requires implementation on national and international level. In Chapter 4, we make some recommendations how such a site monitoring system could be rolled out at national and at the Agreement level. However, it is far from a completely new and additional system. It pieces together existing obligations and makes use of already existing wishes for improvement. It brings national and international data together for an appropriate assessment of conservation priorities against aims.

1. Background

Rationale – AEWA action plan implementation

The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) has important provisions for the identification, protection, management and restoration of important sites for migratory waterbirds (Article III.1.c) and to coordinate efforts across the flyway to ensure that a network of suitable habitats is maintained or restored throughout the range of migratory species (Article III.1.d). To achieve these goals, Parties shall establish protected areas and develop and implement management plans (Paragraph 3.2.1 of Annex 3 of the Agreement).

According to the provisions of Paragraphs 7.4.c and 7.5 of Annex 3 of the Agreement, the Secretariat shall prepare an international review on "*the networks of sites used by each population, including reviews of protection status of each site as well as of the management measures taken in each case*" for every second session of the Meeting of Parties.

So far, only a preliminary site network review was produced for MOP5 in 2012 (Nagy *et al.*, 2012) based on information available on internationally important sites. That report remained a preliminary report because of concerns of data quality in particularly related to information on management. Therefore Resolution 5.2 requested the Secretariat and the Technical Committee to develop a module for the national report format on the designation and management of important sites to be used for informing the next editions of the site report. A limited set of questions were included into the subsequent national reporting formats, but these did not allow the production of a report that would satisfy the requirements set out in Paragraph 7.4.c of Annex 3.

The AEWA Strategic Plan 2019-2027 includes five key objectives, with Objective 3 setting out "*To establish and sustain a coherent and comprehensive flyway network of protected areas and other sites, managed to maintain – and where necessary restore – their national and international importance for migratory waterbird populations*".

Target 3.2 under this objective foresees that "*The status of, the threats to, and the effectiveness of conservation measures implemented at flyway network sites are being assessed at flyway scale, using data provided by at least three-quarters of Contracting Parties*".

Action a) to this target requested the AEWA Technical Committee to develop a monitoring framework for the AEWA flyway site network by MOP8 (i) building on the preliminary Site Network Review presented to MOP5 and (ii) coordinated with similar reporting processes under multilateral processes, notably the Ramsar Convention on Wetlands, the EU Birds Directive and the Bern Convention Emerald Network.

Action b) to this target foresees that "*By MOP9, Parties are assessing and reporting on the status of their flyway network sites*" and action c) foresees that "*By MOP10, the Technical Committee and Partners produce a flyway-level assessment of the conservation status of flyway network sites*".

This report presents a proposal for such a monitoring framework.

Why monitor the AEWA flyway site network?

The preamble to the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) recognises "*...that migratory waterbirds are particularly vulnerable because they migrate over long distances and are dependent on networks of wetlands that are decreasing in extent and becoming degraded through non-sustainable human activities, as is expressed in the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1971*". Therefore, the conservation of key sites individually and collectively as flyway network sites is a key component of the conservation strategy of migratory waterbirds both at national and at flyway level. Maintaining or restoring waterbird populations to favourable conservation status, which is the ultimate conservation goal of AEWA, rely on protecting their habitats, reducing disturbances and avoiding their unsustainable exploitations. Site protection is an important tool in all of these efforts.

According to Paragraph 3.2.1 of Annex 3 of the AEWA Agreement (the AEWA Action Plan) Parties should establish protected areas to conserve habitats important for populations listed in Table 1 and to develop and implement management plans for these areas and according to Paragraph 3.2.2, Parties shall give special protection to the wetlands which meet internationally accepted criteria of international importance.

By adopting Objective 3 of the AEWA Strategic Plan 2019-2027, Parties have committed themselves to establish and sustain a coherent and comprehensive flyway network of protected areas and other sites, managed to maintain – and where necessary restore – their national and international importance for migratory waterbird populations.

This process aims to implement the provisions of Paragraph 7.4.c of the AEWA Action Plan concerning the preparation of international reviews concerning the networks of sites used by each population, including reviews of protection status as well as the management measures taken in each case. Based on Paragraph 7.5, it is foreseen that such reports are to be updated in every 6 years.

At its 9th meeting, the AEWA Technical Committee defined the purpose of the site review as to provide the Meeting of the Parties collectively and the national administrative authorities of AEWA individually with a strategic overview of:

a) the knowledge of the extent and distribution of sites of international importance for and used by each of the species on the Agreement;
b) the extent to which these sites of international importance are statutorily or otherwise designated under relevant international processes;
c) the extent to which internationally important sites are subject to directed management for the purposes of the conservation of the waterbirds for which they are internationally important; and
d) instances where populations of waterbirds depend on key unprotected sites of importance, the loss of which would be of significance for the population concerned (for example unprotected 'bottleneck' sites, or unprotected sites in migration corridors of restricted geographical extent).

Monitoring of key sites is a typical example of synergies between national and international interests. It helps individual site management authorities to measure their progress towards the conservation objectives of a site. Having a robust and sufficiently resourced site monitoring system that is regularly updated also helps national authorities in monitoring the collective performance of their national site networks and identify successes and sites or policy areas where improvements would be needed. Generating flyway level overviews on what sites are used by a population, what their ecological function are, how these sites are connected, what pressures threaten and what are the constrains on the usage of each site and what conservation measures are taken at is each site are needed to put in place effective flyway conservation (Davidson *et al.*, 1998), which is the very essence of AEWA (e.g. Box. 1).

Box 1. Potential headline indicators for the future AEWA site report

Examples in Figure 1 illustrate how site monitoring data could be used to assess and communicate information in the state, pressure and response framework. Panel A gives information on the comprehensiveness of the site network, which is one aspect of state. Panel B shows the frequency and impact of various threat categories. Unpacking the most frequently reported categories can inform identifying policy areas AEWA should be focusing on. Panel C is an example for response measures and how the report can help identifying regions that require more support in respect of implementing the site protection provisions of AEWA.

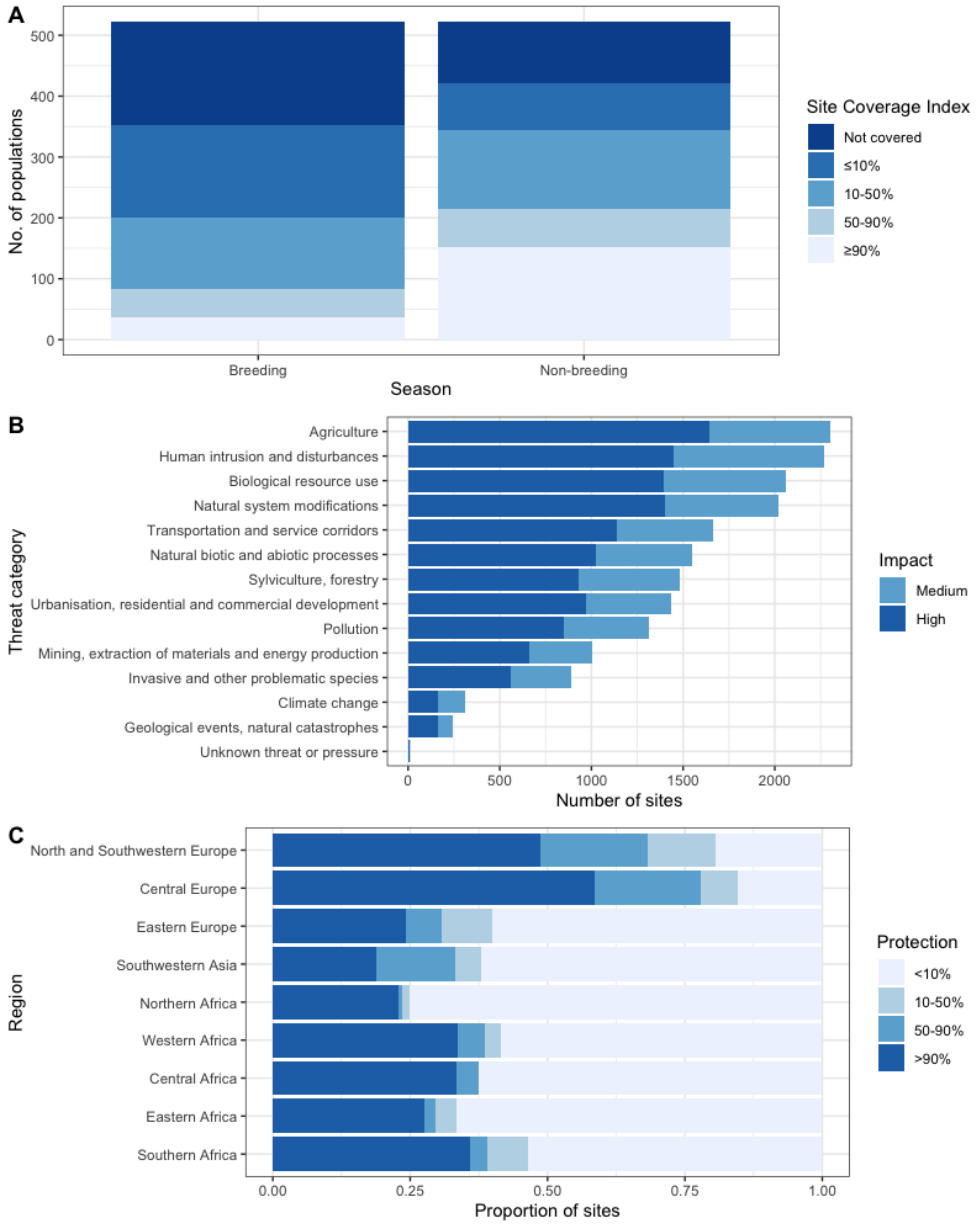

Figure 1. Examples of headline indicators for the future AEWA site report. **A.** AEWA populations by their Site Coverage Index. **B.** Number of sites affected by Level 1 threats. **C.** Proportion of network sited by the degree of their protected area coverage.

Objectives of this report

In their preliminary review of the AEWA site network, Nagy *et al.* (2012) recommended that Parties should implement monitoring schemes that monitor the state, pressure and responses at internationally important sites for

waterbirds, maximising the synergies with the monitoring of sites designated under the Ramsar Convention and the EU Birds Directive.

The overarching objective of this report is to propose a robust framework that enables the Parties to track the status of sites across the AEWA network, including:

- State of species;
- Pressures and threats present, with an emphasis on those affecting the species for which the site is important;
- The effectiveness of responses, through assessments of:
    - Protected area coverage;
    - Conservation actions implemented with an emphasis on those that are positively impacting on species;
    - Status of management planning.

In this report, we report on other existing site monitoring frameworks within the AEWA region, principally on those with reporting processes underway, such as the Ramsar Convention, the EU Birds Directive, the Bern Convention Emerald Network and the World Heritage Convention, and others (Chapter 2). We explore options for developing indicators of state, pressure and response for sites identified by the Parties. This information is brought together to inform our proposed framework for monitoring state, pressure and response across the AEWA flyway site network. An important aim of this proposal is that we collect information which is already collected in other site monitoring frameworks and prevent, as much as possible, double work (Chapter 3). Finally, we make some recommendations for setting up site monitoring at national and Agreement level (Chapter 4).

2. Overview of relevant existing site monitoring frameworks

2.1 Existing Global monitoring frameworks

A broad diversity of methodologies has been designed to monitor the status of site networks, many of them under the Protected Area Management Effectiveness (PAME) framework and based around the IUCN World Commission on Protected Areas (WCPA) framework for PAME (Hockings *et al.* 2006) and whose requirements extend beyond, yet include, measures of state, pressure and response. The larger PAME methods (such as METT and RAPPAM) are designed to address all six key elements: context, planning, inputs, process, outputs and outcomes, and include mechanisms for assessing a diversity of relevant factors such as staffing levels, budgets, adequacy of the road networks within the sites (enabling access), quality of visitor centres etc. Most of the sites within the AEWA site network are not actively managed, so many of these measures are much less relevant.

Some of these international treaties and initiatives have developed their schemes from a combination of others (e.g. the Ramsar Convention has adopted its monitoring protocol using a combination of indicators from METT and RAPPAM). However, some site monitoring programmes have been tailored to their specific needs, e.g. the European Union Natura 2000 Standard Data Form for example is focussed on gathering detailed information on the abundance and distribution of the qualifying species within the site, including all species listed on Annex 1 of the Birds Directive and on migratory species, and on the pressures using a bespoke scheme designed for the European Directives. To date there has been less of an emphasis on quantifying the extent of conservation actions taking place within the sites. The Natura 2000 Standard Data Form is under review and may in time become more comprehensive.

Further details about these and other monitoring frameworks are summarised below.

2.2 Appraisal of a selection of monitoring frameworks

Ramsar Convention on Wetlands

Under the Convention on Wetlands (Ramsar, 1971), each Contracting Party undertakes to designate and include priority wetlands within their territories' List of Wetlands of International Importance, and to ensure their long-term management and conservation[1]. Parties need to fill in a Ramsar Information Sheet[2] when nominate a Ramsar Site and have to update it once in every six years. The Parties are encouraged to undertake regular assessments of the

[1] https://rsis.ramsar.org/

[2] https://www.ramsar.org/sites/default/files/documents/pdf/cop11/res/cop11-res08-e-anx1.pdf

effectiveness of their management. The Ramsar Convention has adopted one of the longest standing PAME tools, the Management Effectiveness Tracking Tool (METT) with some modification, and since 2015, R-METT, a standard Ramsar-adapted version of the METT[3] is recommended for monitoring Ramsar sites.

EU Birds and Habitats Directives

The Birds and Habitats Directives are the pillars of European Union nature legislation[4]. Sites of significant importance for wild animal and plant species and natural habitats of community importance within the European Union have been designated across Europe under these Directives over the past 20 years, forming the Natura 2000 network, which covers almost 20% of the EU's land area and more than 6% of its seas.

There is a legal basis, outlined in both the Birds and Habitats Directives, that places a requirement on Member States to provide data relating to Natura 2000 sites also. Specifically, under Article 4 paragraph 3 of the Birds Directive, Member States are required to 'send the Commission all relevant information so that it may take appropriate initiatives with a view to the coordination necessary to ensure that the areas provided for in paragraph 1 and 2 (of Article 4) form a coherent whole which meets the protection requirements of these species in the geographical sea and land area where this Directive applies'.

The details relating to Natura 2000 sites are required through the *Natura 2000 Standard Data Form* (SDF), which compiles information relating to the site, including name, location, extent, ecological information including criteria used for site selection, and a map (EC 2011). The data are stored and made available in a dedicated database[5]. The SDF and database serve a number of functions (EC 2011), chiefly to enable the Commission, along with Member States, to coordinate and maintain a coherent Natura 2000 network and evaluate its effectiveness in nature conservation. It is recommended that the content is updated regularly and based on the best available information for each site.

Emerald Network of Areas of Special Conservation Interest

The Emerald network is a network of areas of special conservation interest (ASCIs)[6], which is to be established in the territory of the contracting parties and observer States to the Bern Convention on the Conservation of European Wildlife and Natural Habitats, including, among others, central and east European countries and the EU Member States. For EU Member States, Emerald network sites are those of the Natura 2000 network.

The aim of the Emerald Network is to ensure that all high biodiversity areas of European importance are identified, their ecological inventories completed, and their importance recognised legally. The sites can then benefit from protection, while allowing sustainable social and economic activities. The countries covered include Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine, Switzerland and Norway.

The Emerald Network is the equivalent of Natura 2000 in non-EU European countries, and it was created to integrate the European network. Unlike the EU-directives, it is not legally binding. The importance of reporting to be conducted in a manner that is as consistent as possible amongst all parties was recognized as essential for gaining meaningful insight into pan-European trends of species' and habitats' conservation status. A pan-European approach to reporting is also important to enable the Standing Committee to adequately evaluate progress towards meeting the Convention's aims. Similar to the EU Directives (described above), SDFs are required for each site.

World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage is an international agreement that was adopted by the General Conference of UNESCO in 1972[7]. It is based on the premise that certain places in the world are of outstanding universal value and should form part of the common heritage of humankind. Parties have an obligation to regularly prepare reports about the state of conservation and the protection measures put in place at their sites. These reports allow the World Heritage Committee to assess the conditions at the sites and to decide on the necessity of adopting specific measures to resolve recurrent problems.

[3] https://www.ramsar.org/sites/default/files/documents/library/cop12_dr15_management_effectiveness_e.pdf
[4] https://ec.europa.eu/environment/nature/natura2000/index_en.htm
[5] E.g. https://www.eea.europa.eu/data-and-maps/data/natura-11
[6] https://www.coe.int/en/web/bern-convention/emerald-network
[7] https://whc.unesco.org/en/about/

The Periodic Reporting process provides an assessment of the application of the World Heritage Convention by the Parties. It also provides updated information about the sites to record possible changes in the state of conservation of sites. The reports are prepared on a regional basis and are examined by the World Heritage Committee on a pre-established schedule based on a six-year cycle. The results are included in the report of the World Heritage Committee to the General Conference of UNESCO. There are two sections to the questionnaire – the first is focused on the national implementation of the programme and is completed by the national focal point, while the second is completed for each site. Completing the questionnaire is a consultative and participatory process, and while the bulk of the details are compiled by the Site Managers, the engagement of all relevant stakeholders is recommended, including local communities and civil society.

Other monitoring protocols have been developed from the IBA protocol – e.g. the East Atlantic Flyway Monitoring project, which was initiated in 2013. This is a cooperation between the Wadden Sea Flyway Initiative, Wetlands International and BirdLife International (van Roomen *et al*. 2013), that aims to gather details on waterbird numbers environmental conditions, human use, pressures and conservation responses taking place on flyway scale and at the wetland sites.

Other schemes

Other monitoring frameworks of interest include:

- The IUCN Green List of Protected and Conserved Areas[8]: the first global standard of best practice for area-based conservation that aims to improve the performance of Protected and Conserved areas, and to help conserve nature and deliver benefits for people.
- BirdLife International's Important Bird and Biodiversity Area (IBA) programme aims to identify and effectively conserve a network of sites critical for the long-term viability of wild bird populations, across the range of those bird species for which a sites-based approach is appropriate. It is based on a local, site-level, participatory monitoring approach, and it follows a pressure, state, response framework that is simple, flexible and practical enough to be implemented effectively by many individuals (site caretakers, volunteers, managers etc.) across a large range of sites. The results can be easily compiled at a variety of levels, including site, national and regional.
- The Management Effectiveness Tracking Tool (METT)[9]: was developed to reflect the IUCN World Commission on Protected Areas (WCPA) framework for PA management effectiveness (Stolton *et al.* 2007).
- The Rapid Assessment and Prioritisation of Protected Area Management (RAPPAM)[10] methodology (Ervin 2003) was developed by WWF as a tool for policy makers to assess management effectiveness within PAs.

In conclusion, many site monitoring systems exist already in the Agreement Area. Consequently, the information required to monitor the AEWA Flyway Site Network is likely to be available. However, the different systems collect somewhat different details of information, use different terminology, classification system for threats and conservation measures and data fields. All of these differences represent an obstacle to the interoperability amongst the various schemes. Therefore, AEWA Parties shall agree to certain common standards which enable the AEWA Secretariat to produce the regular site reports required by the Agreement.

3. Proposal for a monitoring framework for the AEWA Site Network

3.1 Proposed approach and rationale

It is generally recommended that ecological monitoring schemes designed to support adaptive management are organised using the State-Pressure-Response framework (Levrel *et al.* 2009, Das *et al.* 2020) (Fig. 2). Also, Davidson *et al*. (1998) have organised the information needs of flyway scale conservation around this framework. Such a model sets out to measure the pressures that cause the changes to the system, the state reflects the outcome of the impacts of pressures and the responses that are measures taken to prevent, remove, minimize, or accommodate the pressures.

[8] https://www.iucn.org/theme/protected-areas/our-work/iucn-green-list-protected-and-conserved-areas
[9] https://www.protectedplanet.net/system/comfy/cms/files/files/000/000/057/original/METT.pdf
[10] https://www.protectedplanet.net/system/comfy/cms/files/files/000/000/056/original/RAPPAM.pdf

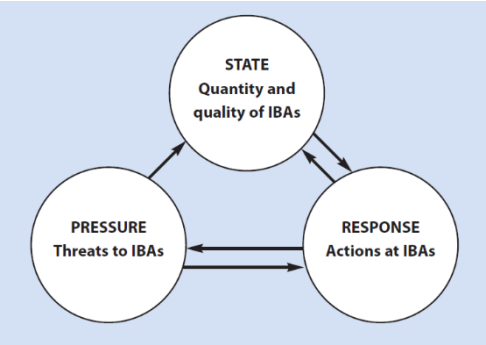

Figure 2. Relationship between the indicators of pressure, state and response that forms the basis of the proposal (from BirdLife International 2006).

The PSR model lends itself to support the adaptive management not only of individual sites but also the national or regional networks of sites or site networks for individual species or populations for example in the context of the implementation of species action plans.

We propose to organise the future monitoring of the AEWA Flyway Site Network according to the Pressure-State-Response (PSR) model.

Most of the monitoring frameworks profiled are based on self-assessment scorecards containing questions scored. They offer the potential for delivering state, pressure and response indicators. Following a detailed appraisal of these schemes, and their potential for delivering state, pressure and response indicators (Appendix 1), we identified the Natura 2000 (and Emerald Network) SDFs as representing the best opportunity of getting regular (periodic) updates to a relatively large sample of AEWA sites. As the Special Protection Area designation is the most frequent international designation (Nagy *et al.*, 2012) for which up-to-date information on the sites is required, it is proposed to align the reporting on the AEWA Flyway Site Network with this existing system. A selection of the relevant data fields that specifically inform state have been identified (further details in Section 3.2). It is anticipated that the datasets based on these relevant fields from the SDFs may be obtained and feed directly into the proposed AEWA monitoring protocol.

However, the SDF is currently under review, and some of the suggestions made here may need reconsideration when the review is complete, and when the revised form is available. Furthermore, it is acknowledged that this information may not be readily available and accessible for many other sites (e.g. elsewhere in the AEWA region, and for sites that are not internationally important in Europe). As such, where possible, we specify the data requirements that are broadly consistent and fit into the framework.

As with every site monitoring system, what we propose here will require intimate knowledge of the individual sites and systematic monitoring of key species, careful assessment of the current and future conditions for them and recording of conservation and their effectiveness. Therefore, it can be applied most effectively if the monitoring includes the inputs of local site managers and/ or community groups. The relatively simple scoring system and indicators centred around the key species at the sites enables its use in the context of managing networks of sites.

3.2 Appraisal of data availability and gaps

State

We propose a very simple system to describe the state of a site for key species in a given season, based on the list of species, and an estimate of their population sizes. This allows us to assess the comprehensiveness of the network, i.e. what proportion of a population is in the AEWA site network, and how does this coverage change over time.

Ideally, in time, it may be worthwhile trying to measure and report on the condition of sites, and on how many sites are in good condition across the AEWA network. This could be achieved where we can measure how the current, or most recent, population size compares with the conservation objectives of the site or other appropriate benchmarks set by the country.

For most waterbirds, the direct monitoring of population size through census or sampling is the most straightforward approach and the simplest to interpret. It is often simple to obtain these from existing monitoring schemes such as the International Waterbird Census and/or monitoring of breeding bird colonies or based on sampling for common dispersed species (see Box 2).

Only the following data fields from the SDF are required:

- Species scientific name
- (Seasonal) presence at the site: Permanent (resident), Reproducing (breeding), Concentration (moulting and passage), Wintering
- Population at the site (where an exact number is not known give a population interval if possible)
- Where quantitative data do not exist, indicate whether the species is common (C), rare (R), or very rare (V). In the absence of any population data indicate it as being present (P).

Box 2: Considerations for monitoring bird numbers at sites

Future improvements to state assessments could be made by making comparisons in waterbird numbers at site level. For site-based monitoring of bird numbers, the different methods and the timing and frequency of the surveys will depend on the seasonal patterns in site use by waterbirds, and the functions (breeding, stop-over, wintering) of the site (Hearn *et al.* 2018). For monitoring site importance, more frequent counts are usually required, since standard January IWC counts (e.g. for flyway population monitoring) alone will not be sufficient to monitor breeding or as migration stop-over sites.

Some issues to pay attention to when determining the timing of site counts for monitoring include:

- Monitoring birds on migration that have short stop-over periods is more difficult than monitoring those with a longer period of stay.
- Periods of peak numbers might vary between years (e.g. depending on weather conditions), meaning it might not be effective to carry out a count on a fixed date each year.

To be able to detect changes in numbers at sites, it is important that the same method is applied from year to year once an appropriate method is established. If methods need to be changed to take advantage of technical or methodological advances, it is important to calibrate the new method with the old one. Depending on the seasonal occurrence of the key species at the site, both breeding and non-breeding methods might be needed. In many African countries, for example, the presence of breeding and non-breeding migrant species may overlap.

The frequency of site monitoring counts is dictated, on the one hand, by the aims of these counts (site designation, management processes, the type of indicators the data is used for) and also by the ecology and phenology of the species present at the site. Ideally, prior to designation, key sites should be surveyed on multiple occasions over many years, timed to reflect the (potential) presence of the (likely) key species. Post-designation, monitoring cycles will be partly dictated by the species for which the site is identified or designated for, but key sites typically support important numbers of non-qualifying species and monitoring programmes also need to address data requirements for these species. Monthly counts should provide robust data on the seasonal use of key sites. If monthly monitoring is not possible, select one or two months during each season.

At stop-over sites, carry out counts during both the spring (usually April-May) and the autumn (usually August – November) when most key species are likely to reach their seasonal peak numbers besides the counts in January and a breeding bird survey. Although it is very useful to identify such months for optimum migration counts at a national scale, it is not necessary to coordinate these internationally.

Pressure

We propose to capture information on the pressures and threats taking that are affecting the species using the site. For the purposes of this framework, we define these terms in accordance with the definitions provided in Article 12 and Article 17 reporting guidelines:

- Pressures have acted within the current reporting period and they have an impact on the long-term viability of the species or its habitat(s);

- Threats are future/foreseeable impacts (within the next two reporting periods) that are likely to affect the long-term viability of the species and/or its habitat(s).

By capturing information on the pressures taking place at each site, this will help inform the necessary remedial or preventive conservation actions. Hence, it supports adaptive management both at site and at network level.

The Natura 2000 Standard Data Forms requires details on the most important pressures, and also takes into consideration those taking place in the surroundings of the site, using a hierarchal threat classification scheme developed specifically for Birds and Habitats Directives reports. The threats in this scheme are classified into 15 categories corresponding to the main sectoral driver, and the full list (including Levels 1 to 4 of the scheme used in 2013) is shown in Appendix 2. This threat classification scheme is currently under review and parts of it may be altered.

Box 3: Role of Remote Sensing data in supporting site monitoring assessments

In the past 20 years, there have been many significant technological developments, including access and availability of a range of remote sensing products. Specifically, there are increasing numbers of free, high resolution, regularly updated products based on RS that can inform site monitoring assessments.

Some of these datasets are hosted on dedicated platforms, that not only reduce or remove the need for downloads of very large datasets, but some also often enable analysis within the platforms using these datasets. Some go one step further to make the tools very user-friendly and so maximising the use of the tools by creating interactive dashboards, some of which are described below.

Some that may be used to help inform site condition, as well as some of the datasets that may be useful in supporting monitoring assessments of state, pressure and response at wetland sites by Contracting Parties and others include:

- JRC global surface water can inform the availability and extent of water at a site, and trends over time, potentially informing the suitability of a site for trigger species, especially sites for which flooding at the margins is important.
- Increased night lighting around urban/suburban wetlands in particular may adversely affect one or more of the trigger species. In this respect, and given this layer informs change over time, night lights it could be used to inform State.

Both of these layers could also be used to inform Pressure, as in many cases they relate to water management and urbanisation respectively. Other layers reflecting human activities, such as those presented in WWF Sight inform other activities taking place at or near sites and potentially affecting trigger species, such as mining, oil and gas exploration among others. A fuller list of relevant datasets is presented in Appendix 3.

It is proposed that the Natura 2000 threat classification scheme, when agreed and finalized, is considered as for data collation on pressures – assessors should be asked to list as many as possible the pressures (although the SDF currently limits this list to 20) that are affecting the key species occurring at the site and to indicate whether the impact high, medium or low.

The definitions of high and medium given for Article 12 currently are as follows:

- High importance/impact: Great direct or immediate influence and/or acting over large areas.
- Medium importance/impact: Medium direct or immediate influence, mainly indirect influence and/or acting over moderate part of the area/regionally only.

The availability of remote sensing datasets may be informative in enabling desktop assessments of habitat condition (possibly supporting site-level assessments of State into the future), and of human activities (Pressure) taking place at sites. However, caution is urged in the use and interpretation of habitat extent condition as a proxy for species given the broad range of factors affecting their occurrence and distribution, many of them totally unrelated to habitat extent and condition (e.g. hunting, or mammalian/ avian predation).

Response

The following details from the SDF should be used (and, as above, perhaps further considerations will be needed following alterations when the SDF review is complete):

1. Total percentage of the area covered by national or regional protected area designations
2. Does a Management Plan exist or is one planned, or not?
3. Are any conservation measures in place? Y/N/Unspecified[11]

There are few global remote sensing datasets (Box 3) available globally that specifically inform response indicators (management planning, conservation actions etc.). However, on a site by site basis, it may be possible to infer that some improvements have been made through conservation action and/ or as a result of decisions taken and implemented through planning and/ or regulations using some of these or other national or regional remote sensing datasets. Separately, the Protected Area layer (not remote sensing but is available online) can be used to measure protected area coverage at most sites.

3.3. Principal data gaps and opportunities

It is shown above that at least some data informing state, pressure and response could potentially be extracted through the Natura 2000 SDFs, and can potentially deliver the respective indicators at site level. However, there are some gaps:

1. Many countries are not providing regular updates. A comparison of the 2010 and 2019 SDF databases has shown that many countries did not update their forms in the past decade.
2. No mechanism yet exists for capturing these details from other Parties (and from European Parties for other nationally important sites) although corresponding fields exist also in other assessment schemes such as the one for Ramsar (RSIS) and various versions of the Bern Convention (PAMET).

Given the pace of change both in usage of sites and in the pressures facing them, it is important that European countries are encouraged to submit updates to these forms. A data portal will be needed to a) import relevant SDF results, and b) to support collection of data from other sites both within the EU and beyond.

With 17,000 protected area assessments completed as part of other monitoring frameworks (some identified above), there exists a considerable volume of information that could fill some gaps and/ or support monitoring assessments at AEWA sites. Where no monitoring data exist, AEWA Parties are encouraged to review opportunities for accessing data from other schemes. Integrating data from other schemes may require some detailed review, crosswalking the other framework with the AEWA monitoring protocol from the outset to identify comparable indicators, and how to harmonise the scoring if possible.

4. Establishing site monitoring across the AEWA Flyway Site Network

4.1 National level implementation

If countries agree to a AEWA site monitoring framework at MOP8 in order to report on the state, pressure and response by 2024 as foreseen in the AEWA Strategic Plan 2019-2027, a number of tasks should be taken at national level to implement the process. The necessary implementation steps are shown in Figure 4 and described in more details in the text.

[11] Information on conservation measures taken or necessary for the site may currently be provided in a free text field in the SDF. Information on conservation measures at a site is very valuable, and is recognised in Paragraph 7.4.(c) of Annex 3 of AEWA "the networks of sites used by each population, including reviews of the protection status of each site as well as of the management measures taken in each case".

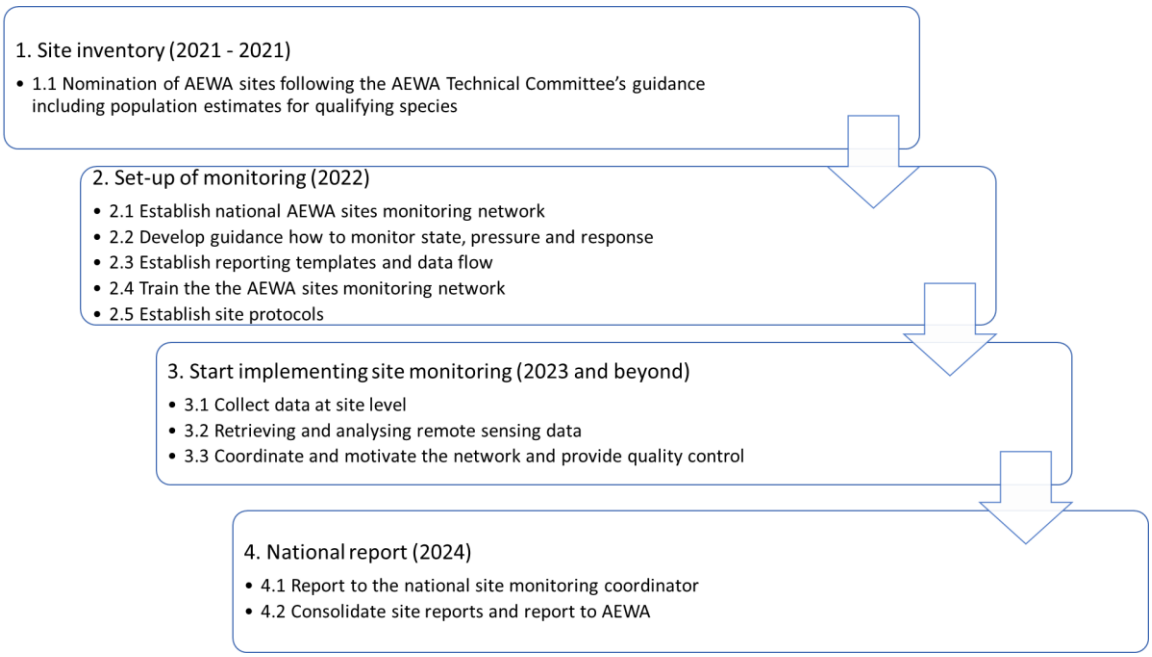

Figure 4. Overview of the National-level implementation steps needed for a flyway monitoring framework resulting in site- and national relevant data for conservation and management and data for the national report for AEWA as needed for the international assessment.

Nomination of AEWA sites

In August 2020 the parties of AEWA were asked to start a process to nominate their AEWA sites (letter from Dr. Jacques Trouvilliez, ref 20—43-sd, 11 August 2020). These are sites of national and international importance for migratory waterbirds listed by AEWA. Detailed guidelines for this nomination, including requirements relating to the estimates of the population sizes of the appropriate species and populations at these sites needed, were attached to that letter (Guidance notes, July 2020). It is envisaged that this process of nomination will be finalised by MOP8 in accordance with the AEWA SP.

Set-up of monitoring

After the parties agree on a monitoring framework for these sites at MOP8, a national monitoring system should be established and implemented after the MOP (in 2022). In short, this implementation entails everything that should be in place before the collection of data can really start. This involves nominating a national coordination unit, and organizing a network of organisations and persons who will be involved in the future collection of the monitoring data. It needs national-level decisions and guidance on the collection of data on:

- bird numbers, in which period of the year and which species (needed for State),
- human use and influence on birds (needed for Pressure) and
- conservation and management measures (needed for Response).

Part of these guidelines also include the establishment of site protocols, especially for large and complex sites. 'Hands on' training of field workers and site coordinators in the whole methodology, including organizing the templates and processes for the data flow, will be essential.

This monitoring framework should seek as much as possible to integrate synergies and monitoring routines that already exist at national level to minimise doubling up on the work, and to benefit from efforts already underway (especially Natura 2000 sites monitoring and to a lesser extent Ramsar sites monitoring). Guidelines, tools and training from AEWA will be provided in cooperation with other monitoring initiatives (see 4.2).

Implement monitoring

This entails the actual collection of the data and information for state, pressure and response. It is important to stress that these data are not needed every year. Nationally, decisions can be taken to distribute the task over several years within a cycle of 6 years (see Figure 5). Although AEWA Site Reports are foreseen to be produced only once in every 6 years and Parties will be asked to report only once in every 6 years. It might be beneficial to collect bird data

annually, or in every 2 or 3 years to collect generate to account for variability and trends as well as to fulfil national data needs. On the other hand, information on certain pressures or responses can be collected less frequently. For example, it might be sufficient to assess land use change through remote sensing only once in 6 years. It is also not critical that state (bird), pressures and response data are gathered in the same year within the cycle. Efforts and funding could be distributed over different years.

Figure 5. Overview example of a 6-year cycle to collect the national data, in each year a part of the national task can be done to have a complete overview by the end of the cycle.

National report

National reporting to AEWA will take place once in every 6 years. It will be necessary to collect and review the site reports and compile a national report (which would be nothing more than the submission of all approved site reports from the country, i.e. a similar process as the submission of the SDFs for a country). However, this also provides a good opportunity for national assessment of the performance of the site network and draw conclusions for improving policy and management. In the meantime, it will be also a good moment to review the site monitoring scheme and make necessary adjustments.

4.2 Agreement-level tasks

If countries agree to a site monitoring framework at MOP8 in order to report on the state, pressure and response at AEWA sites by 2024 as foreseen in the AEWA Strategic Plan 2019-2027, a number of tasks should be taken also at the Agreement-level to support the process. Steps recommended at the Agreement-level to deliver the AEWA site report by MOP 10 in 2027 are summarised in Figure 6 and described in more details below.

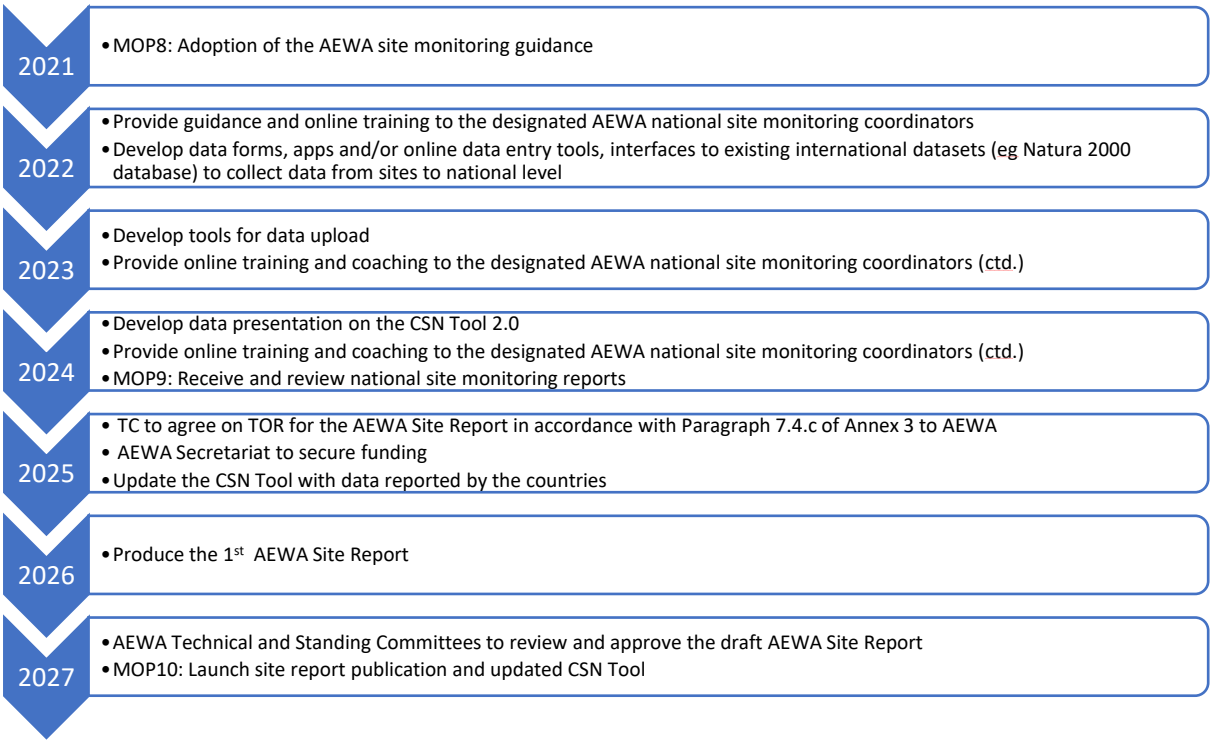

Figure 6. Overview of the Agreement-level tasks to facilitate the production of the AEWA Site Report in 2027.

Adoption of an AEWA site monitoring guidance

The precondition of producing the first AEWA Site Report is that Parties agree on a site monitoring framework because agreements should be reached concerning the specifics of the data to be collected and reported, just like with any other reporting in the framework of AEWA and other international conservation instruments and initiatives. Without such agreements the whole process cannot really start. Ideally, such an agreement should be reached by MOP8.

Set up data flow

Once an agreement is reached on the scope and the common standards of the AEWA Site Report, it is important that the Technical and the Standing Committees review and approve the reporting form developed by the Secretariat.

Considering that collecting data from the AEWA Sites is not possible without collecting data from a relatively large number of data providers at national level, it is also very important to support the national data collection processes with some IT tools such as multi-lingual online data entry portals that can reduce the burden of collecting and collating data at national level. This task should also include developing interfaces to the international datasets that might be used in the context of monitoring of the AEWA Flyway Site Network such as the EU Natura 2000 database, the EMERALD Network database and the Ramsar Site Information System. However, the system will be designed in a way that the use of such tools is optional because some countries might already have appropriate tools to manage the data flow and duplication of efforts should be avoided.

Provide guidance, training and coaching to AEWA technical National Focal Points (NFPs)

Once the content of the AEWA national site reporting module is agreed, it is important to communicate its content to the AEWA Technical National Focal Points in order to assist them with organising the national data collection (see Chapter 4.1). Experience with AEWA national reporting on population status shows that most countries would benefit from a detailed guidance document. The guidance document should contain detailed explanation of data fields to be reported and definition of terms and threat and conservation measure categories in a similar fashion as it is done in case of the Ramsar Information Sheet or the EU Natura 2000 Standard Data Form.

Once the guidance document is ready, it is recommended to organise (online) trainings for the AEWA Technical National Focal Points to prepare them for organising their national data collection (including explanation of the data form and the IT tools, their national adaptation) and to train their national site monitoring networks.

It is also important to establish some coaching capacity supporting the Parties throughout the entire first reporting cycle. Although some capacity already exists at the Secretariat, it is likely to be insufficient to support all Parties in need of advice. Therefore, it would be beneficial to establish a network of coaches with experience with site monitoring who could assist a smaller number of Parties throughout the process. Coaching could be provided by government agencies of other Parties, monitoring capacity building schemes, NGOs, or training and research institutions with more experience with site monitoring. It would be important to secure some funding for such coaching capacity.

Develop a data upload module

A data upload module should be developed in 2023 while countries are working on data collection. This module should be designed in a way that would allow importing data from the data collection tool or available national tools and to minimise the need of manual data entry.

Develop module to present the data on the Critical Site Network Tool

The Critical Site Network Tool has been developed first under the Wings Over Wetlands and then under the Climate Resilient Flyway projects to support AEWA and its Parties in getting overviews in the flyway context. It will be impractical to present site network information for each of the 255 species listed in Annex 2 of the Agreement in a report. However, such information can be easily presented on the Critical Site Network Tool online.

Develop TOR for the Site Report and secure funding

Following MOP9, the AEWA Technical Committee should develop a realistic TOR for the AEWA Site Report that takes into account the limitations of the agreed AEWA site monitoring framework and of the completeness of the national reporting (e.g. how to take into account Party and non-Party Range States that did not report).

Produce the AEWA Site Report

Once funding is secured, the AEWA Secretariat shall tender the production of the AEWA Site Report and guide the production of the report in consultation with the AEWA Technical Committee. The production of the AEWA Site Report should be timed so that it can be reviewed and approved by the Technical and Standing Committees before MOP10.

Revise the AEWA Site Monitoring Framework

It is recommended that once the first cycle of data collection and reporting for the AEWA Site Report is completed, the AEWA Site Monitoring Framework and the whole process is critically evaluated and the framework is revised as necessary.

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6. Appendices

Appendix 1. Assessment of how the monitoring frameworks profiled potentially deliver state, pressure and response indicators:

State

The Natura 2000 SDF gathers information specifically on the abundance of the key species, which could be compared over time, but in many cases, these have not been updated. The information required under 'Ecological information' includes:

1. Information relevant to Annex I and regularly occurring migratory species.
2. Additional information required but optional includes
    a. Information on Annex I habitats listed in the Habitats Directive and species of flora and fauna in Annex II
    b. Other relevant flora and fauna details

Member States are required to provide the following details relating to species:

3. Presence – options are Permanent, Reproducing, Concentration, Wintering
4. Abundance – options for minimum and maximum for each species, or if unknown the following terms are used: Common, Rare, Very rare, Present.
5. Unit – the unit of the population value
6. Data quality – as Good, Moderate (e.g. based on partial data with extrapolation), Poor (e.g. rough estimate), Data deficient (used where an estimate is not given)
7. Relative importance of the site for the species using the following parameters:
    a. Pop: Relative importance of the site in a national context (A – C = 15-100% – 0-2%). In this case a 'D' applies to species rarely observed at a site.
    b. Con: Degree of conservation of the features of the habitat which are of importance for the species and possibilities of restoration (A – C = conservation excellent – average or reduced conservation).
    c. Iso: Degree of isolation of the population present at the site relative to its natural range (A – C = Isolated – not isolated)
    d. Glo: Global assessment of the value of the site for the conservation of the species concerned (A – C = excellent – significant).

Abundance measures over time can be used to examine change at a site, and the other factors listed can be used to help with interpreting the quality and comparability of the counts over time.

The IBA Monitoring Protocol recommends a score is assigned that reflects the proportion of each of the trigger species populations remaining, and that ranges between 0 (very few) and 3 (most remaining). For many sites, insufficient data are available on the trigger species and habitat is used as a proxy. The weakest link approach is used to represent each site, where the worst-case scenario (lowest score) is applied.

The East Atlantic Flyway Monitoring project seeks information on the numbers of waterbirds of all species using the site and through its Environmental monitoring protocol collects data about wetland habitat available, ecological circumstances and on natural processes.

Other schemes: Some do not assign scores, and the assessment of state is largely narrative based (e.g. METT, R-METT), while some assign scores of State that are more generic, reflecting the state of biodiversity and habitats overall, not specifically focussed on the triggers (e.g. RAPPAM).

Pressure

Most of the methods reviewed compile information on threats, and use the IUCN/CMP Threat Classification Scheme[12] (some with tailored modifications, e.g. Ramsar), while some methods use alternative threat schemes. Specifically, European Member States tend to use a bespoke threat classification scheme developed for the European

[12] https://www.iucnredlist.org/resources/threat-classification-scheme

Directives, and used in all EU Natura 2000 reporting, including the EU Natura 2000 Standard Data Forms. This classification scheme cannot be readily translated to the IUCN classification scheme. The World Heritage Convention also uses another different bespoke hierarchal threat classification scheme.

The Natura 2000 SDF compiles the list of threats, and for each:

- an indication of whether the impacts are High, Medium or Low,
- whether taking place inside the site, outside the site or both,
- whether it is a positive and negative impacting threat.

The World Heritage Convention seeks the following details:

- Whether positive or negative impact
- Current or potential (Impact)
- Inside or outside the site (Origin)
- Whether increasing, stable or decreasing (Trend).

The IBA Monitoring Protocol compiles 0-3 scores for each of

- timing (happening now = highest score of 3 and worst-case scenario)
- scope – reflecting how much of the trigger species is affected (most or entire population affected = highest score of 3)
- severity – the impact of the threat on each trigger (highest rate of impact = highest score of 3)
- the scores for timing, scope and severity are summed and an overall impact score assigned. The weakest link approach is used where the score reflecting the worst-case scenario score is used

The East Atlantic Flyway Environmental Monitoring project adopts a similar approach to that if the IBA protocol, but asks also for details about all human activities taking place at sites and surrounding areas regardless of their impact, most of which is scored between 0 (absent) and 10 (happening everywhere). For those affecting the waterbird community present, the assessors are asked to assign timing, scope and severity scores (as described above).

Other schemes: METT (and R-METT) seeks information on the perceived level of impact (low, medium, high, N/A), while RAPPAM generates a score based on extent (within site), impact, permanence (relating to potential recovery); and the latter aspect is not assessed in the IBA protocol. They separate pressures (happening now) from threats (predicted into the future).

Response

Natura 2000 SDF requests further knowledge about how the site relates to other international, regional and national designations that it affords. The first part seeks information under the following three categories, and seeks the % cover of each of these other designation types:

- Designation types used with the intention to protect fauna, flora, habitats and landscapes;
- Statutes under sectorial, particularly forestry, legislative and administrative acts providing adequate protection relevant for fauna, flora and habitat conservation;
- Private statutes providing durable protection for fauna, flora or habitats.

The form seeks information on other international designations (along with % cover), including Ramsar, Biogenetic Reserve, Biosphere Reserve, World Heritage Site, Marine Protected Area, among others. Member States are asked whether or not a Management Plan exists or is in preparation, and to provide the names of the plans and links where available. They have the option of providing further details about conservation measures at the site through free text narrative.

The IBA monitoring protocol generates a single score per site based on the sum of three individual indicators based on

- Protected Area coverage (highest score of 3 = most/ all covered)
- Management Planning (highest score = comprehensive management plan being implemented)
- Conservation Action (highest score = comprehensive conservation measures in place)

The East Atlantic Flyway Environmental Monitoring Protocol scores for each of the response activities taking place at a site the extent to which measures are being taken (most between 0 (at very small area) and 3 (whole area), and some as yes/no), and the effectiveness of the actions: good (good), some effect (some) or no effect (none).

Other schemes: Questions around designation, other protected status, management planning and conservation action are generally very well covered by the PAME tools (METT, RAPPAM, R-METT), and are part of a much broader suite of scoring questions that relate to staffing, infrastructure, visitor facilities among others.

Appendix 2. Natura 2000 pressures and threats (from classification scheme used in 2013)

A. AGRICULTURE

A01. Agricultural cultivation

A02. Modification of cultivation practices

- A02.01. agricultural intensification
- A02.02. crop change
- A02.03. grassland removal for arable land

A03. Mowing or cutting grasslands

- A03.01. intensive mowing or intensification
- A03.02. non intensive mowing
- A03.03. abandonment / lack of mowing

A04. Grazing by livestock

- A04.01. intensive grazing
  - A04.01.01. intensive cattle grazing
  - A04.01.02. intensive sheep grazing
  - A04.01.03. intensive horse grazing
  - A04.01.04. intensive goat grazing
  - A04.01.05. intensive mixed animal grazing
- A04.02. non intensive grazing
  - A04.02.01. non intensive cattle grazing
  - A04.02.02. non intensive sheep grazing
  - A04.02.03. non intensive horse grazing
  - A04.02.04. non intensive goat grazing
  - A04.02.05. non intensive mixed animal grazing
- A04.03. abandonment of pastoral systems, lack of grazing

A05. Farming and breeding of livestock

- A05.01. Animal breeding,
- A05.02. stock feeding
- A05.03. Lack of animal breeding

A06. Crops of annuals & perennials (non-timber)

- A06.01. annual crops for food production
  - A06.01.01. intensive annual crops for food production/ intensification
  - A06.01.02. non- intensive annual crops for food production
- A06.02. perennial non-timber crops
  - A06.02.01. intensive perennial non-timber crops/intensification
  - A06.02.02. non-intensive perennial non-timber crops
- A06.03. biofuel-production
- A06.04. abandonment of crop production

A07. Use of 'pesticides' in agriculture

A08. Fertilisation in agriculture

A09. Irrigation in agriculture

A10. Restructuring agricultural parcels

- A10.01. removal of hedges and copses or scrub
- A10.02. removal of stone walls and embankments

A11. Other agriculture activities

B. SYLVICULTURE, FORESTRY

B01. Afforestation

- B01.01. forest planting on open ground (native trees)
- B01.02. artificial planting on open ground (non-native trees)

B02. Forest and plantation management & use

- B02.01. forest replanting
  - B02.01.01. forest replanting (native trees)

B02.01.02. forest replanting (non native trees)
B02.02. forestry clearance
B02.03. removal of forest undergrowth
B02.04. removal of dead and dying trees
B02.05. non- intensive timber production (leaving dead wood/ old trees untouched)
B02.06. thinning of tree layer
B03. Forest exploitation
B04. Use of 'pesticides' (forestry)
B05. Use of fertilizers (forestry)
B06. Grazing in forests & woodland
B07. Other forestry activities

C. MINING, EXTRACTION OF MATERIALS AND ENERGY PRODUCTION
C01. Mining and quarrying
C01.01. Sand and gravel extraction
C01.01.01. sand and gravel quarries
C01.01.02. removal of beach materials
C01.02. Loam and clay pits
C01.03. Peat extraction
C01.03.01. hand cutting of peat
C01.03.02. mechanical removal of peat
C01.04. Mines
C01.04.01. open cast mining
C01.04.02. underground mining
C01.05. Salt works
C01.05.01. abandonment of saltpans (salinas)
C01.05.02. conversion of saltpans
C01.06. Geotechnical survey
C01.07. Mining and extraction activities not referred to above
C02. Oil and gas exploitation
C02.01. exploration drilling
C02.02. production drilling
C02.03. jack-up drilling rig
C02.04. semi-submersible rig
C02.05. drill ship
C03. Production of renewable energy (abiotic)
C03.01. geothermal power production
C03.02. solar energy production
C03.03. wind energy production
C03.04. tidal energy production

D. TRANSPORTATION AND SERVICE CORRIDORS
D01. Roads, railroads and paths
D01.01. paths, tracks, cycling tracks
D01.02. roads, motorways
D01.03. car parcs and parking areas
D01.04. railway lines, TGV
D01.05. bridge, viaduct
D01.06. tunnel
D02. Utility and service lines/pipelines
D02.01. electricity and phone lines
D02.01.01. suspended electricity and phone lines
D02.01.02. underground/submerged electricity and phone lines
D02.02. pipe lines
D02.03. communication masts and antennas
D02.09. other forms of energy transport
D03. Shipping lanes and ports
D03.01. port areas
D03.01.01. slipways
D03.01.02. piers / tourist harbours or recreational piers
D03.01.03. fishing harbours
D03.01.04. industrial ports
D03.02. Shipping lanes

D03.02.01. cargo lanes
D03.02.02. passenger ferry lanes (high speed)
D03.03. marine constructions
D04. Airports and flightpaths
D04.01. airport
D04.02. aerodrome, heliport
D04.03. flight paths
D05. Improved access to site
D06. Other transportation & service infrastructure

E. URBANISATION, RESIDENTIAL AND COMMERCIAL DEVELOPMENT

E01. Urbanisation and human habitation
E01.01. continuous urbanisation
E01.02. discontinuous urbanisation
E01.03. dispersed habitation
E01.04. other patterns of habitation
E02. Industrial or commercial areas
E02.01. factory
E02.02. industrial stockage
E02.03. other industrial / commercial area
E03. Discharges (household/industrial)
E03.01. disposal of household / recreational facility waste
E03.02. disposal of industrial waste
E03.03. disposal of inert materials
E03.04. Other discharges
E03.04.01. costal sand suppletion/ beach nourishment
E04. Scattered structures and buildings
E04.01. Agricultural structures, buildings in the landscape
E04.02. Military constructions and buildings in the landscape
E05. Storage of materials
E06. Other urban/industrial developments
E06.01. demolishment of buildings & human structures
E06.02. reconstruction, renovation of buildings

F. BIOLOGICAL RESOURCE USE OTHER THAN AGRICULTURE & FORESTRY

F01. Marine and freshwater aquaculture
F01.01. intensive fish farming, intensification
F01.02. suspension culture
F01.03. bottom culture
F02. Fishing and harvesting aquatic resources
F02.01. Professional passive fishing
F02.01.01. potting
F02.01.02. netting
F02.01.03. demersal longlining
F02.01.04. pelagic longlining
F02.02. Professional active fishing
F02.02.01. benthic or demersal trawling
F02.02.02. pelagic trawling
F02.02.03. demersal seining
F02.02.04. purse seining
F02.02.05. benthic dredging
F02.03. Leisure fishing
F02.03.01. bait digging / collection
F02.03.02. pole fishing
F02.03.03. spear-fishing
F03. Hunting and collection of terrestrial wild animals
F03.01. Hunting
F03.01.01. damage caused by game (excess population density)
F03.02. Taking and removal of animals (terrestrial)
F03.02.01. collection of animals (insects, reptiles, amphibians.....)
F03.02.02. taking from nest (e.g. falcons)

F03.02.03. trapping, poisoning, poaching
F03.02.04. predator control
F03.02.05. accidential capture
F03.02.09. other forms of taking animals

F04. Taking and collection of terrestrial plants

F04.01. pillaging of floristic stations
F04.02. collection (fungi, lichen, berries etc.)
F04.02.01. hand raking
F04.02.02. hand collection

F05. Illegal taking of marine fauna

F05.01. dynamite
F05.02. date mussel-fishing
F05.03. poisons
F05.04. poaching
F05.05. shooting
F05.06. removal for collection purposes
F05.07. other (i.e. drift nets)

F06. Other hunting, fishing and collection activities

F06.01. game/ bird breeding station

G. HUMAN INTRUSIONS AND DISTURBANCES

G01. Outdoor sports, leisure and recreational activities

G01.01. nautical sports
G01.01.01. motorized nautical sports
G01.01.02. non-motorized nautical sports
G01.02. walking, horseriding and non-motorised vehicles
G01.03. motorised vehicles
G01.03.01. regular motorized driving
G01.03.02. off-road motorized driving
G01.04. mountaineering, rock climbing, speleology
G01.04.01. mountaineering & rock climbing
G01.04.02. speleology
G01.04.03. recreational cave visits
G01.05. gliding, delta plane, paragliding, ballooning
G01.06. skiing, off-piste
G01.07. scubadiving, snorkelling
G01.08. other outdoor sports and leisure activities

G02. Sport and leisure infrastructures

G02.01. golf course
G02.02. skiing complex
G02.03. stadium
G02.04. circuit, track
G02.05. hippodrome
G02.06. attraction park
G02.07. sports pitch
G02.08. camping and caravans
G02.09. wildlife watching
G02.10. other sport / leisure complexes

G03. Interpretative centres

G04. Military use and civil unrest

G04.01. Military manouvres
G04.02. abandonment of military use

G05. Other human intrusions and disturbances

G05.01. Trampling, overuse
G05.02. shallow surface abrasion/ mechanical damage to seabed surface
G05.03. penetration/ disturbance below surface of the seabed
G05.04. Vandalism

- G05.05. intensive maintenance of public parcs /cleaning of beaches
- G05.06. tree surgery, felling for public safety, removal of roadside trees
- G05.07. missing or wrongly directed conservation measures
- G05.08. closures of caves or galleries
- G05.09. fences, fencing
- G05.10. overflying with aircrafts (agricultural)
- G05.11. death or injury by collision

H. POLLUTION

H01. Pollution to surface waters

- H01.01. pollution to surface waters by industrial plants
- H01.02. pollution to surface waters by storm overflows
- H01.03. other point source pollution to surface water
- H01.04. diffuse pollution to surface waters via strom overlows or urban run-off
- H01.05. diffuse pollution to surface waters due to agricultural and forestry activities
- H01.06. diffuse pollution to surface waters due to transport and infrastructure without connection to canalization/sweepers
- H01.07. diffuse pollution to surface waters due to abandoned industrial sites
- H01.08. diffuse pollution to surface waters due to household sewage and waste waters
- H01.09. diffuse pollution to surface waters due to other sources not listed

H02. Pollution to groundwater

- H02.01. groundwater pollution by leakages from contaminated sites
- H02.02. groundwater pollution by leakages from waste disposal sites
- H02.03. groundwater pollution associated with oil industry infrastructure
- H02.04. groundwater pollution by mine water discharges
- H02.05. groundwater pollution by discharge to ground such as disposal of contaminated water to soakaways
- H02.06. diffuse groundwater pollution due to agricultural and forestry activities
- H02.07. diffuse groundwater pollution due to non-sewered population
- H02.08. diffuse groundwater pollution due to urban land use

H03. Pollution to marine waters

- H03.01. oil spills in the sea
- H03.02. toxic chemical discharge from material dumped at sea
  - H03.02.01. non-synthetic compound contamination
  - H03.02.02. synthetic compound contamination
  - H03.02.03. radionucleide contamination
  - H03.02.04. introduction of other substances (e.g. liquid, gas)
- H03.03. marine macro-pollution (i.e. plastic bags, styrofoam)

H04. Air pollution, air-borne pollutants

- H04.01. Acid rain
- H04.02. Nitrogen-input
- H04.03. other air pollution

H05. Soil pollution and solid waste (excl. discharges)

- H05.01. garbage and solid waste

H06. Excess energy (noise, light, heating, electromagnetic)

- H06.01. Noise nuisance, noise pollution
  - H06.01.01. point source or irregular noise pollution
  - H06.01.02. diffuse or permanent noise pollution
- H06.02. Light pollution
- H06.03. Thermal heating of water bodies
- H06.04. Electromagnetic changes
- H06.05. Seismic exploration, explosions

H07. Other forms of pollution

I. INVASIVE, OTHER PROBLEMATIC SPECIES AND GENES

I01. Invasive alien species

I02. Problematic native species

I03. Introduced species/genes

- I03.01. genetic pollution (animals)
- I03.02. genetic pollution (plants)

J. NATURAL SYSTEM MODIFICATIONS

J01. Fire and fire suppression

- J01.01. burning down
- J01.02. supression of natural fires
- J01.03. lack of fires

J02. Changes in water bodies conditions

- J02.01. Landfill, land reclamation and drying out, general
  - J02.01.01. polderisation
  - J02.01.02. reclamation of land from sea, estuary or marsh
  - J02.01.03. infilling of ditches, dykes, ponds, pools, marshes or pits
  - J02.01.04. recultivation of mining areas
- J02.02. Removal of sediments (mud...)
  - J02.02.01. dredging/ removal of limnic sediments
  - J02.02.02. estuarine and coastal dredging
- J02.03. Canalisation & water deviation
  - J02.03.01. large scale water deviation
  - J02.03.02. canalisation
- J02.04. Flooding modifications
  - J02.04.01. flooding
  - J02.04.02. lack of flooding
- J02.05. Modification of hydrographic functioning, general
  - J02.05.01. modification of water flow (tidal & marine currents)
  - J02.05.02. modifying structures of inland water courses
  - J02.05.03. mofification of standing water bodies
  - J02.05.04. reservoirs
  - J02.05.05. small hydropower projects, weirs
  - J02.05.06. wave exposure changes
- J02.06. Water abstractions from surface waters
  - J02.06.01. surface water abstractions for agriculture
  - J02.06.02. surface water abstractions for public water supply

		J02.06.03. surface water abstractions by manufacturing industry J02.06.04. surface water abstractions for the production of electricity (cooling) J02.06.05. surface water abstractions by fish farms J02.06.06. surface water abstractions by hydro-energy J02.06.07. surface water abstractions by quarries/ open cast (coal) sites J02.06.08. surface water abstractions for navigation J02.06.09. surface water abstractions for water transfer J02.06.10. other major surface water abstractions
	J02.07. Water abstractions from groundwater	
		J02.07.01. groundwater abstractions for agriculture J02.07.02. groundwater abstractions for public water supply J02.07.03. groundwater abstractions by industry J02.07.04. groundwater abstractions by quarries/open cast (coal)sites J02.07.05. other major groundwater abstractions from groundwater for agriculture
	J02.08. Raising the groundwater table /artificial recharge of goundwater	
		J02.08.01. discharges to groundwater for artificial recharge purposes J02.08.02. returns of groundwater to GWB from which it was abstracted J02.08.03. mine water rebound J02.08.04. other major groundwater recharge
	J02.09.. Saltwater intrusion of groundwater	
		J02.09.01. saltwater intrusion J02.09.02. other intrusion
	J02.10. management of aquatic and bank vegetation for drainage purposes	
	J02.11. Siltation rate changes, dumping, depositing of dredged deposits	
		J02.11.01. Dumping, depositing of dredged deposits J02.11.02. Other siltation rate changes
	J02.12. Dykes, embankments, artificial beaches, general	
		J02.12.01. sea defense or coast protection works, tidal barrages J02.12.02. dykes and flooding defense in inland water systems
	J02.13. Abandonment of management of water bodies	
	J02.14. Altered water quality due anthropogenic changes in salinity	
	J02.15. Other human induced changes in hydraulic conditions	
J03. Other changes to ecosystems		
	J03.01. reduction or loss of specific habitat features	
		J03.01.01. reduction of prey availability (inluding carcasses)
	J03.02. anthropogenic reduction of habitat connectivity	

J03.02.01. reduction in migration/ migration barriers
J03.02.02. reduction in dispersal
J03.02.03. reduction in genetic exchange

J03.03. reduction, lack or prevention of erosion
J03.04. applied (industrial) destructive research

K. NATURAL BIOTIC AND ABIOTIC PROCESSES (WITHOUT CATASTROPHES)

K01. Abiotic natural processes
K01.01. Erosion
K01.02. Silting up
K01.03. Drying out
K01.04. Submersion
K01.05. Soil salinization

K02. Vegetation succession/Biocenotic evolution
K02.01. species composition change (succession)
K02.02. accumulation of organic material
K02.03. eutrophication (natural)
K02.04. acidification (natural)

K03. Interspecific faunal relations
K03.01. competition (fauna)
K03.02. parasitism (fauna)
K03.03. introduction of disease (microbial pathogens)
K03.04. predation
K03.05. antagonism arising from introduction of species
K03.06. antagonism with domestic animals
K03.07. other forms of interspecific faunal competition

K04. Interspecific floral relations
K04.01. competition (flora)
K04.02. parasitism (flora)
K04.03. introduction of disease (microbial pathogens)
K04.04. lack of pollinating agents
K04.05. damage by herbivores (including game species)

K05. Reduced fecundity/Genetic depression
K05.01. reduced fecundity/ genetic depression in animals (inbreeding)
K05.02. reduced fecundity/ genetic depression in plants (incl. endogamy)

K06. Other interspecific floral competition

L. GEOLOGICAL EVENTS, NATURAL CATASTROPHES

L01. Volcanic activity
L02. Tidal waves, tsunamis
L03. Earthquake
L04. Avalanche
L05. Collapse of terrain, landslide
L06. Underground collapses
L07. Storm, cyclone
L08. Flooding (natural processes)
L09. Fire (natural)
L10. Other natural catastrophes

M. CLIMATE CHANGE

M01. Abiotic changes (climate change)
M01.01. temperature changes (e.g. rise of temperature & extremes)
M01.02. droughts and less precipitations
M01.03. flooding and rising precipitations
M01.04. pH-changes
M01.05. water flow changes (limnic, tidal and oceanic)

M01.06. wave exposure changes M01.07. sea-level changes ***M02. Biotic changes (climate change)*** M02.01. habitat shifting and alteration M02.02. desynchronisation of processes M02.03. decline or extinction of species M02.04. migration of species (natural newcomers)
U. UNKNOWN THREAT OR PRESSURE
X. NO THREATS OR PRESSURES ***XE. Threats and pressures from outside the EU territory*** ***XO. Threats and pressures from outside the Member State***

Appendix 3. Remote sensing tools and datasets that may be relevant to AEWA site monitoring

GlobWetland

The GlobWetland Project, funded through the European Space Agency (ESA) in collaboration with the Ramsar Secretariat launched the GlobWetland I in 2003 aimed to demonstrate the current capabilities of Earth Observation (EO) applications to support inventories, monitoring, assessment of wetlands eco-systems. In doing so this enabled improvement in the ability of wetland managers to better monitor and assess the condition of wetlands within their respective countries.

In 2010, GlobWetland II was launched with the overarching objective of contributing to the setup of a Global Wetlands Observing System (G-WOS) (Strauch *et al.* 2016). The GEO-Wetlands Initiative is the global framework for cooperation and development of the GWOS and aims to provide Ramsar Contracting Parties with the necessary Earth Observation methods and tools to better fulfil their commitments and obligations towards the Ramsar Convention. It contributes directly to the development and implementation of best monitoring practices for the UN Sustainable Development Goals (SDGs).

As part of this initiative, a dedicated portal has been developed that hosts many relevant wetland layers, including (among others):

- JRC/Google Global Surface Water layers, including:
    - JRC Global Surface Water: maps of the location and temporal distribution of surface water from 1984 to 2019 and provides statistics on the extent and change of those water surfaces
    - JRC Monthly Water History: history of water detection on a month-by-month basis.
    - JRC Monthly Water History, v1.1
- Ramsar Sites Information Service (boundaries of sites and points)
- World Database of Protected Areas (WDPA)

Global Earth Engine (GEE)

A range of RS datasets are available through Google Earth Engine (GEE), including several mentioned above and included in the GEO-Wetlands platform. GEE is a cloud computing platform that enables users to run large scale, complex geospatial analysis on Google's servers (therefore not restricted to any individual computers processing ability) and grants access to a large range of geospatial datasets.

GEE is available for non-commercial use by scientists, researchers, and developers to detect changes, map trends, and quantify differences globally. Users also benefit from automated updates when they become available, some being very regular, varying from daily and monthly measures to seasonal and annual averages. Examples of other relevant layers available through GEE that would inform either the state of habitats, and/ or some of the pressures include:

- Night lights: VIIRS Stray Light Corrected Nighttime Day/Night Band Composites Version 1 illustrating monthly average radiance composite images.
- Murray Global Intertidal Change Classification: global maps of tidal flat ecosystems.
- Global Project Population Data: Estimated Residential Population per 100x100m Grid Square (and others related to Global Human Settlement
- Precipitation: international satellite mission to provide next-generation observations of rain and snow worldwide every three hours.

WWF Sight

WWF Sight is another a global intelligence platform which aims to provide an up-to-date high-level understanding of what is happening on the ground. It brings together diverse spatial datasets and combine them with satellite imagery to provide a near real-time high-level understanding on the current status of conservation assets around the globe. The tool is not yet publicly available, but some of the datasets are available elsewhere and can be sourced directly (e.g. Global Fishing Watch).

Provision and presentation of remote sensing datasets

If RS datasets are to be made available to support monitoring assessments, then care is needed to ensure that such a facility is presented in a clear and coherent format given the size and complexity of the underlying datasets. This could be achieved:

- tailoring datasets to sites – e.g. freshwater versus saltwater, inland versus coast
- performing some overlap assessments and provision of summary metrics – e.g. total area of site under water per month.