European Commission

Species protection rules under the Birds and Habitats Directives: how effectively are they integrated into sectoral policies?

Task 1
Availability and awareness of data occurrences of Annex IV species and of wild bird species

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ABBREVIATIONS

EU	European Union
GBIF	Global Biodiversity Information Facility
IUCN	International Union for Conservation of Nature
NDFF	Nationale Databank Flora en Fauna (Netherlands)
NGO	Non-governmental organisation

REPORT ON TASK 1 – AVAILABILITY AND AWARENESS OF DATA OCCURRENCES OF ANNEX IV SPECIES AND OF WILD BIRDS SPECIES

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EXECUTIVE SUMMARY

The work of Task 1 included a thorough analysis of data availability and awareness of occurrence data for Annex IV species and wild birds in all 27 EU Member States. Based on an extensive survey, additional desk research and a dedicated assessment, the results of this task entail 27 national country fiches and an aggregated datasheet (provided as separate documents) as well as an overarching analysis presented in the following section. The report captures the results on occurrence data for 1) data availability and 2) data awareness and uptake. Additionally, best practice examples are presented.

The in-depth analysis on data availabilities in the context of the Nature Directives and beyond revealed a highly heterogeneous picture across the 27 EU Member States. Key findings are presented below.

- **Reporting under the Nature Directives**: occurrence data in the form of distribution maps 10x10 km (as required under Article 17 Habitats Directive) is close to complete for Annex IV species, from over 3 350 potential maps that could have been provided by the Member States, 3 231 were submitted. Most gaps were identified for arthropods. The submission of occurrence data under the Birds Directive in the form of distribution maps 10x10 km (as required under Article 12 Birds Directive) was lower compared to the Annex IV species with gaps for 20 % of the wild birds. Data was most complete for breeding birds with most gaps relating to *Passeriformes* (151) and for *Charadriiformes* (48).
- More precise occurrence data, likely to be needed in the context of the application of the species protection provisions, often appear to be missing in a systematic way, with exceptions linked to some high resolution data based in single countries, atlases for various species groups in diverse resolutions as well as to local initiatives and citizen science portals.
- **Main obstacles related to the availability of data on species occurrence refer to:**
  - **lack of funding;**
  - **lack of capacities and specialists;**
  - **the lack of strategy** for a national data collection and monitoring system which often has led to different standards, methodologies and priorities;
  - **the distribution of responsibilities:** especially in federal Member States, responsibilities are highly dispersed among different government bodies;
  - **the lack of successful collaboration with neighbouring countries,** which is crucial for the management of protected species populations;
  - **the lack of a common repository** of data, which impedes systematical spatial data availability in many Member States.
- General data availability and quality tends to be improved through new technologies and efforts by the Member States. **Citizen science** often plays a key role in data collection, the importance and potential of which is increasing with the developments of new digital applications and artificial intelligence.

The synthesis of survey results on data awareness and uptake identified the following key findings:

- Survey responses of national experts from Member State authorities and other relevant institutions assessed **data awareness on occurrences of Annex IV species and wild birds in general as well as for the agricultural and forestry sector** for practitioners and land users as **marginal to rather low**. Projects and initiatives, however, often can make a considerable difference – especially on local level.
- Generally, **a lack of awareness concerning species and their distribution is often found in the sectors having a significant impact on nature** (e.g. energy, transport infrastructure, construction, tourism, agriculture, forestry and water management). According to the survey, stakeholders in these sectors tend to have insufficient knowledge and understanding of the subject. Nevertheless, awareness is assessed as higher in "bigger" companies due to higher responsibilities and impact.
- Regarding the **data awareness for different species groups:** in particular mammals, in most cases birds, fish and to some extent amphibians and reptiles have in most countries higher awareness in general, but also specifically in the agricultural and forestry sector.
- The majority of Member States found that there is a **higher level of awareness inside the Natura 2000 network for all sectors,** e.g. through mapping activities for management planning, while there are fewer information campaigns outside Natura 2000 sites due to a lack of resources and information.
- The **awareness of practitioners, land users, stakeholders or a general public is highly dependent on whether a species (among other aspects) is …**
    - included in a management plan or a national actions plan,
    - priority for local communities,
    - being perceived "prominent", "attractive", "charismatic or "conspicuous",
    - targeted by conservation projects, or
    - subject of conflicts between the interests of nature protection and human activities.
- The **degree of uptake and practical application[1] of species occurrence data** was generally considered marginal or rather low in the majority of the Member States in general, and in the field of agriculture and forestry in particular. Specifically for mammals, the degree of practical application of occurrence data was estimated to be higher than for other species groups.
- Typical **formats used to communicate and create awareness** on species occurrence data and protection rules include websites and online-data tools, hand-outs, brochures, pamphlets, leaflets, manuals, posters and booklets, guidance documents, events, round tables and institutional publications, PR campaigns and personal contact between land users and site managers (mail-outs, letters and phone calls). New forms of awareness communication are emerging, such as the use of digital solutions (e.g. free download apps that allow their users to upload bird occurrence), but primarily for the general public.

This synthesis report provides at the end dedicated conclusions regarding the availability and awareness of Annex IV species and wild birds occurrences and includes some important recommendations targeting key stakeholders at national and EU level.

[1] Uptake and practical application means the use of occurrence data, a) as authorities to raise awareness of biodiversity conservation in the context of these sectoral activities, potentially influencing the identification and design of appropriate management practices in forestry and agriculture, b) for farmers/foresters to apply in conjunction with appropriate practices on the ground or to refrain from violating the rules based on known species occurrence.

1. INTRODUCTION

This section of the interim report is dedicated to the results of Task 1. The task comprises a comprehensive research effort focusing on occurrence data for Annex IV species and wild birds in all 27 Member States of the EU. It includes an assessment of spatial data availabilities based on the Nature Directives reporting 2013-2018 and beyond, as well as a collection of information on their public awareness and uptake in general and within the agricultural and forestry sectors in particular.

While the 27 country fiches are provided in a separate document due to their length, the following sections identify and illustrate the aggregated key findings on

- data availabilities
- data awareness and uptake and
- best practices

Following a brief overview on the respective methodological approach, this report presents the results for these three topics in separate sections, completed by key conclusions.

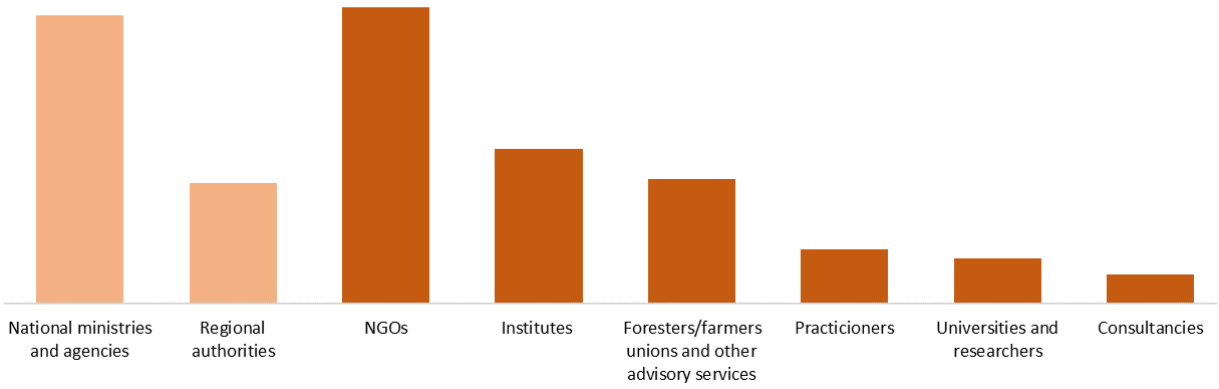
2. METHODOLOGICAL APPROACH

The main part of the national research was executed by dedicated experts for each EU Member State. Information on data availabilities as well as their awareness and uptake was gathered via a) an extensive survey, b) desk research and c) follow-up interviews if useful (see Task 1 Annex III). While the assessment of data availability included data gathered for the national nature reporting as well as additional available datasets, the assessment on awareness targeted the factual knowledge of local stakeholders on the level of implementation and existing information on species distributions. As another focus, the study went beyond the awareness and intended to gather further information on the actual and practical uptake and usage of the species distribution data. Based on the gathered insights, a comprehensive country fiche was elaborated for each Member State. In addition to these activities covering mostly qualitative aspects of the assessment, a dedicated quantitative data assessment on the availability of species occurrence data reported within the Nature Directives' reporting 2013-2018 was conducted by the task lead, Ecologic Institute.

The work of the national experts was coordinated by Ecologic Institute. To ensure a consistent understanding of the task, a training of the experts was given in December 2020 by Ecologic via a webinar. Additionally, a guidance document was distributed among the experts. A central Teams workspace was created to share instructions and provide survey results on a regular basis. For the results, a template for the country fiche as well as a data sheet with Annex IV species and wild birds available in the respective country was provided to the national experts.

As the primary way to secure the most reliable and realistic information, a semi-structured survey was prepared by the task lead to be then distributed by the national experts within each country. Based on a thorough research on key contact persons, the national experts forwarded the survey to federal and state nature conservation authorities, NGOs that contribute to the data collection or dissemination (e.g. BirdLife), farmers and hunting associations, and other relevant actors in this field. In federal countries, the rule was made to focus on 1-2 exemplary states to limit the scope. In total, over 330 national experts where contacted in over 270 different institutions (see Figure 1 below). As a mean, around 13 entities were contacted per country. The survey was executed between December 2020 and March 2021. An additional effort to gain further feedback was conducted by the European Commission services until end of July.

Figure 1: Type of institutions contacted to participate in the survey



This methodological approach allowed a thorough investigation into the topic and gathered valuable insights that are often not openly accessible, in particular regarding the perspectives on data awareness and uptake on local level. While the survey was executed and documented in a coordinated manner via LimeSurvey, additional desk research and ad-hoc interviews were undertaken by the national experts according to their individual needs. The survey was anonymous, the participants were asked to indicate their work place. A total of 134 participants – at least partly – took the survey, but with a highly diverse degree of detail. According to the responses, at least 33 % of these respondents were governmental officials, 36 % indicated themselves as either a member of a NGO, researcher or independent advisor, another 10 % as practitioners and another 19 % did not specify there occupation.

Ad-hoc interviews addressed survey participants to give some additional detail on single survey questions, these interviews were mostly not separately documented by the national experts.

For interpreting the results, however, some limitations arise. While the participation was high for some countries, we received fewer or less detailed feedback from other countries. The lack of feedback for parts of the survey was compensated by the national experts' own desk research or additional interviews. The majority of the country fiche was populated with the responses of the consulted experts, combined with findings from the relevant literature. Another limitation arises from the qualitative nature of most of the survey questions. Perspectives from the participants reflect their professional positions, personal opinions, impressions and knowledge, which could not be fully validated. The careful selection of participants intended to address that risk and to ensure high quality responses. Even though considerable efforts were undertaken to gather as much information as possible, the country fiches potentially do not capture the entirety of information related to species occurrences and their awareness in each country.

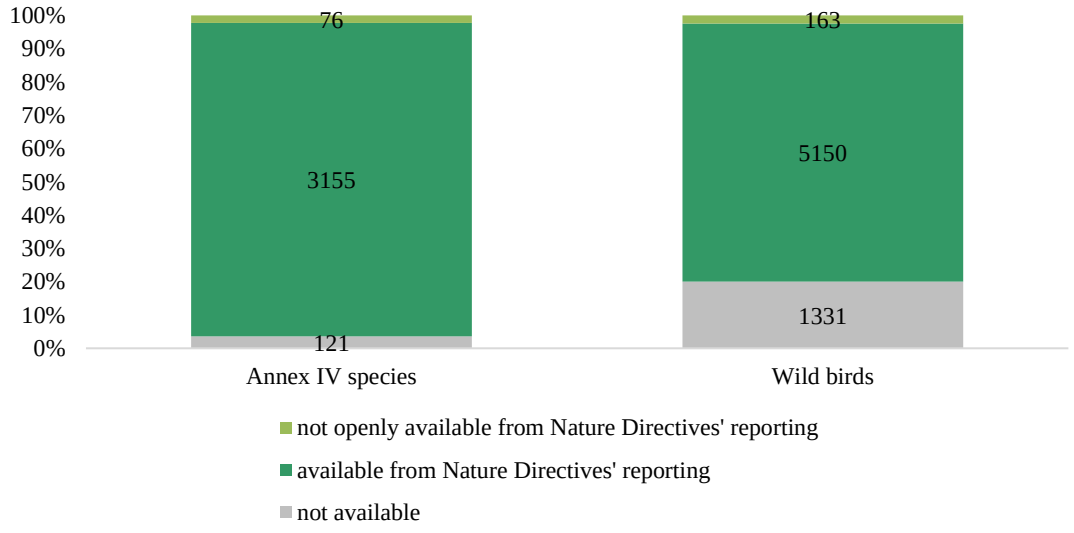
3. DATA AVAILABILITY ON SPECIES OCCURRENCES IN THE EU

3.1. Key general findings

Comparing the results across the 27 EU Member States draws a highly heterogeneous picture on the availabilities of occurrence data and the underlying processes and responsibilities. Member States perform extensive **species monitoring under the Nature Directives** and report the results every six years under Article 17 Habitats Directive and Article 12 Birds Directive. These results also include mandatory spatial occurrence data provided as 10x10 km ETRS89 grid resolution that represent the national distribution of each species across the biogeographical regions of the country. Bird occurrence data provided within the Article 12 reporting of the Birds Directive are mandatory for breeding birds[2]. Malta is the only country known to provide a higher 1x1 km grid resolution in the course to the Nature Directives' reporting.

In total, the Article 17 reporting includes 1 389 species of European interest under the Annexes II, IV and V of the EU Habitats Directive. Of these, around 1 030 species are identified as species targeted with strict protection regimes and are therefore listed either exclusively or additionally within the Annex IV of the directive. The analysis of the spatial occurrence data provided for Annex IV species showed that distribution maps are available for over 95% of the species, with some of them only confidentially available (see following Figure 2). From over 3 350 maps that could have been provided by the Member States, 3 231 were submitted. Many of the Annex IV species occur in more than one country, so that several occurrence maps would be submitted for an individual species. For some countries, complete spatial datasets are available, whereas for other countries larger gaps could be identified. Some countries, such as Greece, provided a large share of data as confidential maps due to the classification of sensitive species. The results are further detailed per species group in the following section 3.2.

Figure 2: Availability of Annex VI species and wild birds distribution maps submitted within the Nature Directives' reporting 2013-2018



Note: The numbers reflect the total number of maps provided for Annex IV species and wild birds from all Member States
Source: National reporting 2013-2018 to the Nature Directives

For **birds**, over 6 644 records of bird species could have been expected from the EU Member States as many species occur in more than one country. The overall data availability is lower than for non-bird species: for 20 % of the wild birds occurring in the EU, no map has been submitted. The majority of missing spatial data relates to wintering and passage birds, as spatial data provision is not mandatory for

[2] This is further detailed in section 4 of the Explanatory Notes and Guidelines for the Article 12 reporting period 2013-2018.

them (for reference, see Footnote 2). Some 160 map records were provided as confidential maps from species classified as sensitive.

Survey and research results concluded that missing spatial data under the Nature Directives reporting most frequently relates to:

- the rarity of a species (or extinction) in a respective country and thus the lack of sightings
- the lack of systemic monitoring or field studies
- unequal distributed data collection across regions and remote locations
- the lack of financial support and human capacities (e.g. leading to insufficient data collection and validation).

According to the survey results, general **data quality** is perceived as rather poor for some countries. However, general data availability and quality tends to be improving through new technologies and efforts by the Member States, especially in newer EU Member States where suitable monitoring systems to effectively accommodate the requirements under the Nature Directives are often still under development and not yet fully established. Due to the complexity of this process, e.g. to build the required monitoring network and to set up a technical data infrastructure, the establishment takes several years to implement.

Beyond the scope of the occurrence data provided within the reporting of the Nature Directives, additional data is available in most of the countries – though nationally available data is often related to and used for the reporting under the directives. The availability of data in the different EU Member State is highly heterogeneous. While in some countries a considerable wealth of openly accessible data on different species groups was identified, no relevant data sources were found in other countries.

These discrepancies can be explained through **different distributions of national responsibilities regarding biodiversity data collection, assessment, reporting and dissemination**. In many countries, a strategic national concept for data collection and aggregation is not existent. Responsibilities are often unclear and are distributed among a variety of different government and non-governmental entities – especially in federal countries such as Austria or Spain. Furthermore, survey results indicate that federal structures lead to heterogeneous approaches and monitoring ambition. Systematic approaches are necessary to overcome such structural hindrances, as done so, for instance, in Germany. Here, a comprehensive and nationally uniform monitoring system has been developed for the previous reporting period (2007-2012) in a Research & Development project. In March 2008, the sixteen German Länder agreed on a common understanding regarding field methods, survey intervals, scope, etc.

Birds are mostly treated separately with dedicated organisations responsible for data collection and dissemination, most importantly national BirdLife subsidiaries (in Malta, Slovakia, Slovenia and Spain) or partner organisations such as

- the *Ligue pour la Protection des Oiseaux* (France),
- the Hellenic, Latvian, Lithuanian, Norwegian, Romanian and Swedish *Ornithological Societies*
- the *Nature and Biodiversity Conservation Union* (NABU, Germany),
- the *Magyar madártani és Természetvédelmi Egyesület* (Hungary),
- BirdWatch Ireland,
- the *Lega Italiana Protezione Uccelli* (Italy),
- the *Society for the Protection of Birds* (the Netherlands),
- the *Polish Society for the Protection of Birds and*
- the *Portuguese Society for the Study of Birds.*

Potentially due to the long standing reporting under the Birds Directive, processes relating to birds monitoring and respective reporting interacts more smoothly, so that data availability and quality is often perceived as higher for birds. So it appears that more data is available for birds than is reported under Article 12, most probably due to the voluntary option to submit spatial data for wintering and passage

birds.

The most common data formats are distribution maps. Such maps are often based on point observations from in situ monitoring or presumed population presences that are either represented as dots on the maps or aggregated to grid distributions in vector format (same visualisation e.g. for modeling results). Grids are mostly rather coarse, often in as the Nature Directives' requirements in a 10x10 km map resolution. Underlying or additional datasets in tabular format are sometimes also accessible. For the dissemination of data, many countries use so-called "atlases" for distribution data. Though some of them are also available in digital formats, most of them are still only available as hard copies with rather coarse grid resolution, mostly shown for the national scale (often as medium to higher priced books). Most known and widespread atlases are available for breeding birds, which often represent the basis for the European Breeding Bird Atlas (the second edition of this atlas was published December 2020 with a spatial resolution of 10x10 km). National breeding bird atlases are, inter alia, available in Austria, Cyprus, Denmark, Germany, Hungary, Lithuania, the Netherlands and Slovenia. Atlas formats are also available for various species groups (e.g. the NDFF Distribution Atlas for flora and fauna in the Netherlands) as well as for other specific species groups, such as for amphibians (in France, online, and Germany), butterflies (in Germany and Luxembourg), insects in general (in Sweden), fish (in Finland), mammals (in France and Germany), or plants (in France, online, and Germany).

While for many countries, the lack of **common data repositories** limits the access and usability to the data, some countries have dedicated central platforms with map viewers to openly illustrate national occurrence data for diverse species groups, some examples are:

- The Nature Conservation Database in Czechia
- The uniform Nature Conservation Information System in Hungary, building an independent part of the National Environment Protection Information System
- The Swedish Species Observation System (Artportalen) jointly used by individuals and NGOs (95% of data), by public authorities or agencies, and by corporate enterprises.
- The centralised National Database managed by the museum of natural history in Luxembourg
- The Nationale Databank Flora en Fauna (NDFF) in the Netherlands (however some data is user-restricted) and the Ecological Monitoring Network NEM)

The national assessments and survey results have shown that countries take highly distinct approaches in **making data available to the public but also to relevant entities**. In some countries, as shown above, species occurrence data is made openly available. However, such open-access data is scarce in other countries. In some cases, organisations involved in species data collection (such as hunting association, nature conservation organisations, but also public entities) do not disclose their data via open-access (e.g. Malta currently provides species distribution data in an internal-use version of its Environmental Platform, MEPS). In some federal countries, such as Germany, data repositories are rather provided on state level.

A central role in data collection can be attributed to **citizen science initiatives**. In some countries, it even takes an important role in species monitoring – traditionally or as a new emerging trend. While citizen science is still rather unknown in some countries (e.g. Lithuania), it is popular in others (e.g. Austria, France, Germany, the Netherlands or Slovenia). New technologies allow citizens to actively participate in species monitoring, especially regarding the possibilities of mobile devices for photos and applications. Natural history museums (like the one in Austria, Bulgaria, Denmark, Finland, France, Sweden), universities, other species conservation organisations provide the technical infrastructure, and, in most cases, assure the validation of the data. One successful example is Naturbasen in Denmark that cooperates with the National History Museum and encourages interested citizens to actively participate in the national monitoring initiative. According to survey participants, the database includes more information on certain rare species (e.g. on dung beetles and butterflies) than any other national database. The Ecological Monitoring Network (NEM) is a citizen science initiative in the Netherlands that was

already set up in 1999 as a joint initiative by government organisations. It meets the needs of government and monitors trends in nearly all species groups relevant to nature policy. In Slovenia, the national Bioportal hold with close to 2 million data entries a considerable wealth of species information. In the same way, international apps like iNaturalist[3] are already popular in several EU Member States (e.g. Austria, Croatia, Luxembourg and Finland). The bird specific Ornitho Platform cooperation with national bird conservation associations and can rely on a highly active community, particularly in Luxembourg, Austria and Germany.

Member States also mention **cross-country cooperation as an important factor for successful species monitoring**. Especially for the mobile species, trans-national cooperation is also needed for setting up collective monitoring schemes, improving the collaboration among data holders and implementing international data standards (e.g. from the Global Biodiversity Information Facility – GBIF).

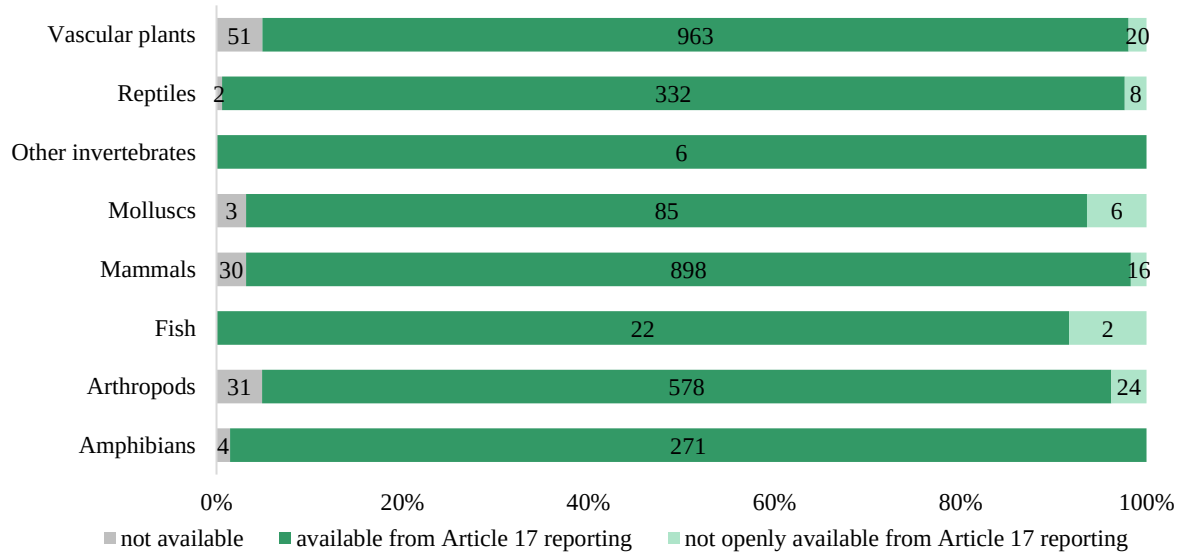
In general, survey results indicate that data for species occurring within the Natura 2000 sites is more systematically gathered because it is needed for the preparation of the management plans for these sites.

Overall, it is unclear whether the available data as presented above are sufficient to effectively implement and enforce the species protection requirements under the Birds and Habitats Directive.

3.2. Results for the different species groups

For Annex IV species, the total numbers of species is not equally distributed among the different groups. For instance, while only 11 different fish species are listed under Annex IV, vascular plants account for over 600 different species in Annex IV. Additionally, some species are especially wide spread and are reported from a great number of EU Member States, such as many bat species like the Natterer's bat (*Myotis nattereri* – occurs in 26 of the 27 Member States), the Eurasian otter (*Lutra lutra* – occurs in 22 of the 27 Member States), or the Smooth snake (*Coronella austriaca*– occurs in 22 of the 27 Member States). Expected map availabilities from the national reporting under the Habitats Directive 2013-2018 therefore differ considerably across the different species groups, as shown in Figure 3 below.

Figure 3: Availability of Annex VI species distribution maps submitted within the Habitats Directive reporting 2013-2018, per species group



Note: The numbers reflect the total number of maps provided per species from all Member States
Source: National reporting 2013-2018 to the Nature Directives

[3] iNaturalist is a joint initiative of the California Academy of Sciences and the National Geographic Society launched in 2008

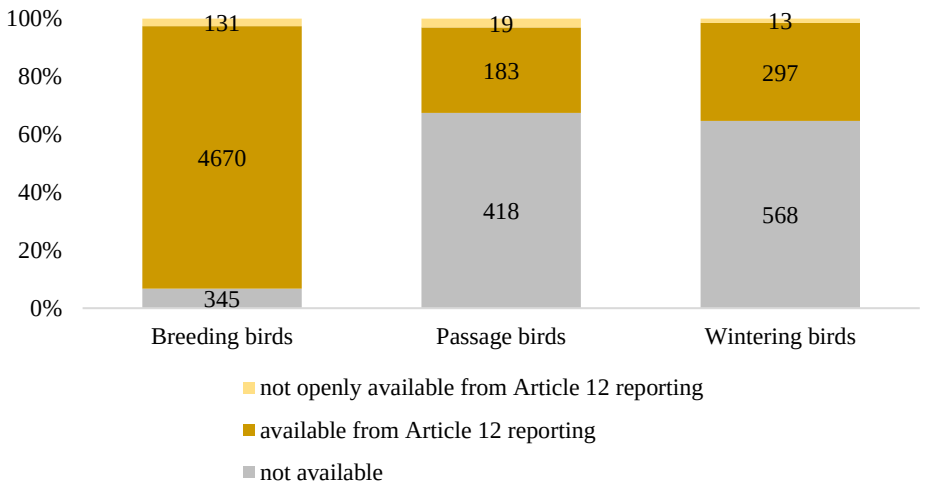
In total, **distribution maps are missing for 110 Annex IV species**, at least for one country respectively. In relation to the total numbers of species, most data is missing for arthropods. For instance, map data for the Danube clouded yellow (*Colias myrmidone*) is missing in three countries (out of seven countries with listed occurrences). While data availability for widely distributed species is mostly high, some rare species lack data. Also marine species tend to have less data available, as it is the case for the Mediterranean monk seal (*Monachus monachus*).

No detailed conclusions on distribution across biogeographical region can be drawn.

For birds, data is provided for 93 % of the breeding birds naturally occurring in EU territory. **Maps are missing for 243 breeding bird species** (at least in one country). The Little tern (*Sternula albifrons*) and the Rock dove (*Columba livia*) are the two breeding bird species with most missing spatial data. For both bird species, the EU population status is assessed as 'secure' based on the latest reporting under the Birds Directive (EEA, 2020).

The majority of missing spatial data relates to wintering and passage birds, as indicated in Figure 4 below. This mostly relates to the fact that the provision of distribution maps is not mandatory for them (for reference, see Footnote 2).

Figure 4: Availability of wild bird distribution maps submitted within the Birds Directive reporting 2013-2018, per season



Looking at the availability for different taxonomic groups, most breeding bird maps are missing for *Passeriformes* (151) and for *Charadriiformes* (48) in absolute numbers. However, in relation to the number of maps provided, data is most scarce for *Galliformes* (8 %). Regarding the other seasons, most data is missing for wintering *Anseriformes* (34%) and passing *Charadriiformes* (44 %).

For more details on country-specific information and status on data availability, please see the separate comprehensive Country Datasheet.

4. AWARENESS OF OCCURRENCE DATA

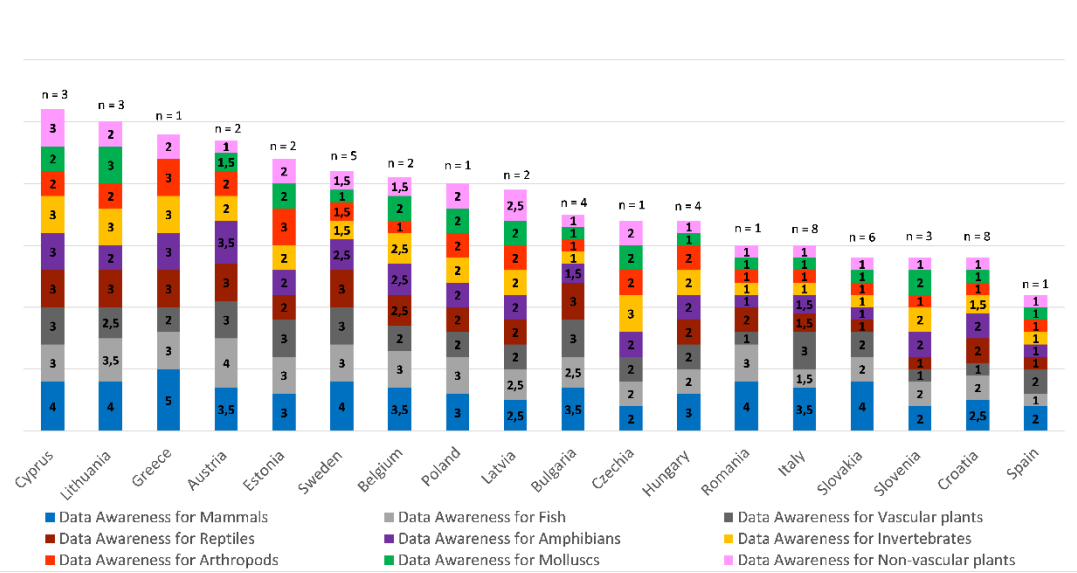
4.1. Awareness of species occurrence data in general

In the majority of Member States **the general level of data awareness on occurrences of Annex IV species and wild birds** for practitioners and land users not involved in forestry or agriculture was assessed as **marginal to rather low** (AT, BE, BG, CZ, CY, GR, HR, HU, IT, LT, LV, PL, RO, SK), while this was not specified concerning the remaining 13 Member States.

In addition, the level of data awareness depends upon the species group. Figure 5 below presents the general level of data awareness for species groups in 18 Member States (no data on this issue is available for the remaining 9 Member States).

- A higher level of awareness (moderate to significant) on **mammals** is assessed in the majority of Member States (AT, BE, BG, DE, GR, HU, IT, LT, PL, RO, SI), followed by **fish** (AT, BE, GR, HU, LT, RO, SI), **birds** (AT, DE, LT, PL, SE) and **reptiles** (AT, BE, GR, LT, HU).
- Awareness on **amphibians** is assessed as moderate (BE, GR, HU) and low (CY, LT, PO, RO). Awareness on **invertebrate** species is low in some Member States (BE, CY, HU, PL), notwithstanding the negative opinion that invertebrates are considered "pests" despite their argued usefulness (HU). Awareness for **invertebrate** species was assessed as higher only in LT and GR.
- Awareness on **molluscs** and **arthropods** is assessed as low (accordingly AT, BE, BG, HU, LT, PL, RO), while for arthropods in Greece as higher.
- For **vascular** and **non-vascular plants** there is also low awareness in particular beyond the agriculture and forestry sector (AT, BE, BG, GR, HU, LT, RO) with an exception in Italy.

Figure 5: Perceived data awareness (median values) in general for different species groups (with 1=marginal awareness to 5=significant awareness; n=no of surveys)



Note: Based on data from 18 different countries. No respective data was provided for countries not appearing in the figure.

Although no **difference in level of awareness between inside and outside the Natura 2000** network was observed in a number of Member States (BG, CY, HU, LU, RO), in the majority of Member States a higher awareness level (CZ, DE, EE, HR, LT, LV, PL) is observed in Natura 2000, as in these areas, numerous surveys were carried out in order to establish management plans. Survey respondents from Cyprus reported a generally low awareness on species occurrence and prohibitions, regardless the protection status, with the exception of wetland birds for which awareness is good both inside and outside Natura 2000 sites.

Most Member States indicated that the level of **awareness varies among different sectors and individual stakeholders**.[4] While for Austria and Denmark, it was stated in general terms, other Member States identified specific sectors and stakeholders that stand out with an especially high or especially low level of awareness for certain species. Generally (but with some exceptions), a lack of awareness concerning species and their distribution is often found in the sectors having a significant impact on nature (e.g. energy, transport infrastructure, construction, and tourism, agriculture, forestry and water management). Stakeholders have insufficient knowledge and understanding of the subject. Nevertheless, awareness is assessed as higher in "bigger" companies due to higher responsibilities and impact. Results for other sectors reveal that:

- In the development phase of **constructions and large infrastructure projects**, developers, landowners and the public/NGO's direct their focus towards data availability, including data on species and birds occurrences in specific geographical areas. The mandatory documents that must be taken into account in spatial planning is the consideration of "localities of specially protected species of plants and animals of national importance". However, a frequent lack of awareness was stated in the industrial and commercial sectors during construction activities.
- The level of stakeholders' awareness in the **tourism sector** was considered as low.
- Despite the generally observed lack of awareness, some actors in these sectors make efforts to improve the situation. For example, the **windfarm industry** has raised awareness for bats and birds; the **energy** sector in general for birds and fish; the **transport** sector for large carnivores and the beaver; and the **water management** sector for birds, the beaver, and aquatic wildlife in general.

The level of **awareness of public institutions,** in the fields that deal with protected species, such as forestry and agriculture, nature conservation, ornithology, is generally considered as **high.** However, the following aspects were considered as barriers to awareness: a low geographical precision of some data, lack of comprehensive data platforms, low ecological knowledge of some species groups among non-experts, the secrecy on observation data for some species; and a general lack of available capacities. On a wider scale, planning authorities often exhibit low awareness on protected areas and the need for their protection and thus strategic planning.

A number of Member States indicated **a high level of awareness among professionals** working in the fields that deal with protected species, such as forestry, nature conservation, ornithology either for government institutions, environmental NGOs, scientists, as well as volunteers / citizen scientists (BG, CZ, EE, PL, SI). Similarly as stated above, Member States (IT, SI, SK) evaluated the stakeholders that have direct connection to Natura 2000 areas (e.g. landowners in a protected area) as being **generally more aware** and better informed about the presence of protected species, especially those for which the site was designated for. In some cases, a proactive management body carrying out e.g. educational activities was indicated as a prerequisite for achieving a good level of awareness (Italy).

Some stakeholders, like **hunters**, have been differently presented in the Member States. While it is stated that hunters tend to have low awareness about and sensitivity to species which can be hunted (FR, CY, with exception for mammals and birds in Hungary), other stated that hunters and anglers have a higher awareness than the average society, as they must pass exams concerning protected species before they get their licenses (Poland). Furthermore, in some Member States, the hunting sector has raised awareness on specific species, as for example for large carnivores, and bird species (Croatia).

The **awareness of practitioners, land users and stakeholders regarding occurrence of specific Annex IV species and wild birds depends on different aspects that affect the way of information distribution**. These aspects include:

- In many countries, awareness on occurrences of birds and mammals is higher than for other species protected under Annex IV of the Habitats Directive (AT, DE, FR, HU, LT, NL, SE, SK).

[4] Luxemburg did not provide information.

- A status of conservation of species and the level of its investigation, e.g. rare or endangered species (AT, EE, HR, LT, LU).
- A priority for local communities both for ecological reasons and regional tourist marketing (Italy), or historic reasons, for example, the Saimaa ringed seal (*Pusa hispida saimensis*) and the Siberian flying squirrel (*Pteromys Volans*) in Finland.
- Whether a species is included in a management plan or a national actions plan exist for it (FR, LU).
- Any of the species protected under the Annexes of the Nature Directives may receive attention in specific environmental impact assessments related to various actions or developments projects. For instance, amphibians such as the Great crested newt (*Triturus cristatus*) that could be disturbed through extraction of raw material and other activities that involve water holes (Denmark).
- Projects' financing with communication and awareness raising activities, e.g. LIFE programme, the EU projects (CY, IT, HU, HR, LT, SI). Examples include:
    - Lithuania: bird species receive higher awareness because of additional financial support by different international projects.
    - Croatia: higher awareness was reported for Balkan terrapin (in Natura 2000 areas) as continuity in educational activities and engagement in different projects for conservation of Balkan terrapin is present.
    - Large carnivores in Cyprus and some other species (like *Crex crex*) in Slovenia. *Lepidoptera* and amphibians in Italy. The Griffon vulture (*Gyps fulvus*) has received public recognition in recent years due to its depleted population and efforts made through projects to bolster it in Cyprus. For birds in Cyprus, a high awareness on birds is gained through hunting - a very popular activity in the country, as well as due to specific projects carried out under the Life programme.
    - Romania: WWF Romania lobbying for awareness raising of the remaining sturgeon populations.
- Species being "prominent", "attractive", "charismatic or "conspicuous" (AT, BE, CY, CZ, DE, HR, HU, IT, PL, SE). For example, "acoustically attractive" songbirds in Germany, "prominent" species, such as the Eurasian otter (*Lutra lutra*), in Austria; "flagship" species, such as the Cyprus mouflon (*Ovis orientalis ophion),* the Mediterranean Monk seal (*Monachus monachus*), the Loggerhead turtle (*Caretta caretta*) and the Green turtle (*Chelonia mydas*), as well as the Greater flamingo (*Phoenicopterus roseus*) receive in general greater recognition in terms of awareness of their occurrence by stakeholders beyond the agriculture and forestry sector.
- Species that enter into conflicts between the interests of nature protection and human activities, such as farming, fishing, wind energy production, tourism (CY, DE, IT, PL, RO, SK). For example, the Wolf (*Canis lupus*) and the Brown bear (*Ursus arctos*) receive a higher level of attention especially from cattle breeders in Italy; awareness of the existence of sea turtles was raised by conflicts over the use of turtle nesting beaches for tourism in Cyprus; species of the Cormorant family (*Phalacrocoracidae*) are often perceived as a problematic from fishermen, especially concerning fishponds, in Italy and Germany; fishes are given more attention due to their commercial value in Romania.
- Analyses from the citizen reporting portals in Germany indicate that especially common species hardly be confused, or conspicuous species in the vicinity of human structures are reported most often. Besides birds (here especially garden birds or conspicuous birds of prey), the species groups of seed plants and dragonflies as well as day/night butterflies and moths are also reported more frequently.

In general, it is assumed that the public and the tourism sector is becoming more aware, especially of iconic species as the result of the work of environmental associations.

The **institutions and organisations involved in awareness raising on species occurrence data** include mainly the national and regional public bodies mandated for (marine) environmental protection and nature conservation, scientific institutes and environmental NGOs. Often national public bodies mandated for agriculture, centers, forestry or fisheries contribute to these activities (CY, CZ, HR, LT, MT, PL, RO, SK). There is, however, often a lack of capacities/personnel in these organisations, resulting in insufficient communication/cooperation and knowledge transfer to relevant stakeholders. On the local level, communities and biological stations carry out more targeted and specific awareness raising on protected species occurrence, as for instance in Luxemburg. Some biological stations also provide personal advice to interested citizens who want to know more on protected species in their land with a special focus on birds and bats. Interesting examples can be found, for instance, in the Danish, German, Hungarian, Irish, Lithuanian, and Slovakian country fiches.

In the Member States, various **communication channels are used to distribute information on species protected under Annex IV and wild birds**. The majority of communication channels however target the general public and only few are offered to farmers and foresters for awareness raising or educational purposes, see Table 1 below.

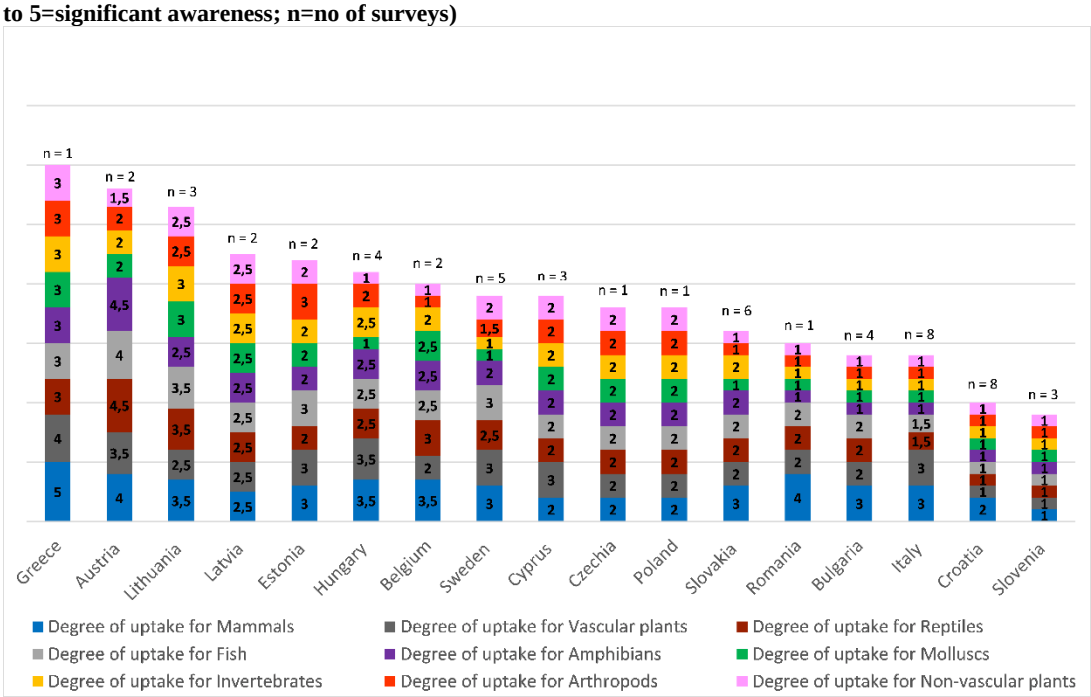
Table 1: Communication channels to distribute information on species distributions

Communication channel and the target group	Examples
Traditional "written-text" communication channels - mostly dedicated to the general public	Brochures, leaflets, guides, education material that include some occurrence data and references to further information sources.
	Books that take a stock of species and habitats of community interest.
	Posters with data concerning occurrence of species and wild birds in urban parks, open land hiking tracks, forests, national parks and Natura 2000 sites.
	Websites and databases, conduct PR campaigns.
Additional ways to obtain the information for land users	Dissemination activities in projects related to nature conservation or sustainable tourism development.
	Management plans available on the websites of the environmental protected areas.
	Interactive forms such as trainings and workshops, examples of good practices and field visits.
	A separate written notification for landowners on the highest priority species observed on their land.
Communication channels to the general public	Educational activities such as popular walks (e.g. the "night of the bats") (LU)
	A popular and awarded TV programs with nature conservation professionals that increases awareness on various species and donates the price to conservation projects (DK)
Citizen science and other initiatives using digitalisation solutions – mostly dedicated to the general public	A citizen science initiative providing a free download App for children covering almost hundred species (DK)
	A bird-identification application App for smart phones that enables its users to upload occurrence data of birds into the Bird Atlas (HU)

Note: A more detailed description of examples can be found in the respective Country Fishes.

The **degree of uptake and practical application of species occurrence data** was generally considered as marginal or rather low by the majority of the Member States. In the case of mammals specifically, the degree of practical application of occurrence data was estimated higher than for other species groups. The degree of the practical uptake and application of species occurrence data by stakeholders varies depending on the sector. While environmental NGOs, scientists and spatial planning experts generally show a rather high uptake of data, the general public or the end-users can rarely make use of this species information. Differently to this situation, in the Netherlands, a wide range of actors was indicated that use the centralised, high-quality occurrence data on fauna and flora provided by the Dutch National Database Flora and Fauna (NDFF)[5]. A difference in uptake between inside and outside the Natura 2000 network has not been directly indicated, but landowners in protected areas are more aware of the data and use it more actively. A low degree of uptake was also reported for hunters in few Member States, though the situation is different for fishermen that are very sensitive to marine habitats and species.

Figure 6: Perceived data uptake (median values) in general for different species groups (with 1=marginal awareness to 5=significant awareness; n=no of surveys)



Note: Based on data from 17 different countries. No respective data was provided for countries not appearing in the figure.

[5] For more information see: https://www.ndff.nl/english/

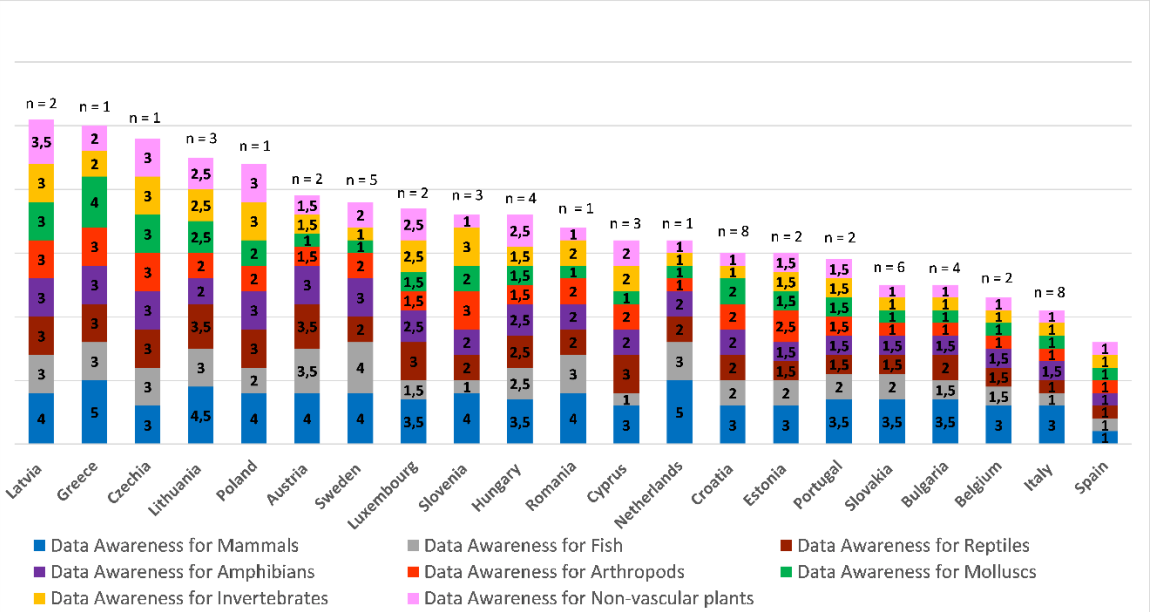
4.2. Awareness of species occurrence data in the agriculture and forestry sector

The **level of data awareness** on occurrences of Annex IV species and wild birds for farmers and foresters was assessed as **marginal** to **rather low** in the majority of Member States (AT, BE, BG, CY, CZ, EE, HR, HU, IT, PL, PT, RO, SK), as medium in few Member States (LT, LV, PL), and "sufficient" in Finland. Some countries indicated that awareness was higher for one sector, but there is no universal indication towards one side apart from the fact that both have higher awareness compared to society at large. The lowest awareness scores were repeatedly attributed to private forest owners, which often solely rely on advice from district foresters for habitat and species protection measures. **Information is not always easily accessible and often lacking guidance**, which results that in many cases farmers/foresters are not well informed about species occurrence data. In addition, the lack of information also includes measures for conservation options to safeguard protected species based on awareness of occurrence. Czechia, for instance, reported that foresters, fishermen, and farmers with animal production appear to be standing out as having a somewhat higher level of awareness, compared to other stakeholders within these sectors.

The majority of Member States did observe a distinguishable difference in the **level of awareness between individual species and species groups relevant to agriculture and forestry (see Figure 7 below)**.

- Frequency of occurrence and size of the species were found to be the biggest factors influencing the level of awareness among farmers and foresters, with larger and more prominent but also easily observable and recognisable species exhibiting higher levels of awareness.
- Same as in the general analysis, level of awareness of mammals and birds is considered as high. In most cases, fish and to some extent amphibians, molluscs and reptiles are generally better known by farmers and foresters of all Member States, as compared to other species groups. The level of awareness on wild bird species was assessed as moderate to high in few Member States (CY, GR, LT).
- A low level of awareness is observed for invertebrates (except for some pollinators), vascular and non-vascular plants by farmers/foresters, despite their dependence from these species groups.
- Certain emblematic species such as large carnivores including the Eurasian wolf (*Canis lupus lupus*), the Iberian lynx (*Lynx pardinus*; in Portugal and Spain), different bat species in Germany, birds of prey such as the Spanish imperial eagle (*Aquila adalberti*) or charismatic birds (e.g. Black stork (*Ciconia nigra*) in Spain and Czechia, common and often encountered species (e.g., the Siberian flying squirrel (*Pteromys volans*) in Finland) or 'flagship' species, e.g. the Great bustard (*Otis tarda*) in Hungary, were assessed as receiving especially high levels of awareness by stakeholders in forestry and agriculture, often having specific regional databases available.
- For agriculture, species with a potential for impacts on livestock (birds of prey, wolves, etc.) and, for forestry, species considered of positive/negative economic importance (e.g. insects which can damage trees) and species which are being hunted (hunters share monitoring data with regional authorities) were indicated as having higher awareness.
- Denmark is the only Member State for which an amphibian has been mentioned, the Great creasted newt (*Triturus cristatus*) and a reptile, the Sand lizard (*Lacerta agilis*), to be well known and have attention throughout farmer communities.

Figure 7: Perceived data awareness (median values) in the agricultural and forestry sector for different species groups (with 1=marginal awareness to 5=significant awareness; n=no of surveys)



Note: Based on data from 21 different countries. No respective data was provided for countries not appearing in the figure

Frequently cited **barriers/reasons for non-provision of data and/or low levels of awareness** included the lack of central/governmental information provision/dissemination initiatives (potentially lack of political will) which are often carried out only by NGOs; a general **lack of funding and resources** such as understaffed farming advisory bodies or control bodies which should ensure the distribution of info material on protected species to the landowners; and the practitioners' lack of interest (due also to the difficulty in obtaining data).

There appears to be a **difference in terms of awareness inside and outside Natura 2000 sites in the agricultural and forestry sector** in the majority of Member States, while only in few (BG, CY, FI, PL, SE) this is not the case. The reasons given for this were the following: contact with conservationists, fewer information campaigns outside Natura 2000 sites due to a lack of resources, information about the species in Natura 2000 areas available on the web, data for non-emblematic species and lesser known species not made available systematically outside of Natura 2000 sites, monitoring obligations and conservation activities required by the Habitats Directive and/or under the site‘s management plans which make it more likely that farmers or foresters are aware of the species and their conservation status as well the content of the Natura 2000 management plans. At least in some countries, farmers and other land owners are directly involved in the development of management plans.

Concerning awareness in Natura 2000, information was evaluated as often being spread across multiple sites without well-established communication channels for sharing information and data between Natura 2000 site management authorities and farmers and foresters. Hence, **management authorities often may not know which farms and forests are exactly located in the Natura 2000 sites they manage, or even farmers and foresters do not know that they are located in a protected area** (Servadei *et al.*, 2018).

Further, **channels of information** used by regional authorities risk remaining ineffective without a prior direct contact with the rural stakeholders: for example in Italy, 20% of the agricultural entrepreneurs interviewed declare that they have never been informed or involved. Additionally, it was reported that trainings for forest/agriculture practitioners often lacked mandatory modules on conservation aspects which may also include species protection rules; that cartographic tools available to stakeholder do not encompass species and habitat maps especially outside of Natura 2000; that occurrence data are often not available at plot level regardless of inside or outside Natura 2000; and that data sharing is insufficient between all involved parties.

In some Member States, however, information linked to a specific conservation measure implemented through agri-environmental payments and the National Action Plans resulted in increased awareness on species particularly dependent on agriculture management practices (FR, HR, IT, LT, LU). The farm advisory system, being the main instrument under the Common Agricultural Policy and the Rural Development Programme, and its services are also mentioned as key for providing farmers with information on cross-compliance for EU subsidies. This is discussed again later in the context of granting permits.

See following examples from Luxembourg and France.

Example 1: Awareness raising in Luxembourg

In Luxemburg, the awareness on the Northern lapwing (*Vanellus vanellus)* increased due to the Lapwing Action Plan (2015) that set several specific actions concerning agriculture. The plan encourages annual controls of known areas of the species occurrence, monitoring and nest **protection in consultation and collaboration with farmers**. In addition, the plan supported the creation of the Northern lapwing **working group that includes agricultural stakeholders**. Other reason for species to gain a special attention by farmers is their conflicts with agricultural management, such as the Eurasian beaver (*Castor fiber*). The Beaver Species Action Plan (2018) includes actions to raise awareness and prevent or minimise conflicts, for example farmers with beavers occurring on their land receive payments for establishing and maintaining 5 m wide buffer strips along water courses, and can continue to receiving the CAP direct payments for land that must be less intensively managed or left fallow because of flooding caused by beaver activity.

Example 2: Agri-environmental climate measures in France

In France, awareness regarding specific species can be **linked to the implementation of agri-environmental and climatic measures** (AECM[6]), as some AECM are directly related to changes in agriculture practices benefiting protected species on a regional basis. For example, in the south west of France, farmers can benefit from AECM if they set up meadows in cultivated plains or maintain meadows in favour of the Little Bustard (*Tetrax tetrax)*. Farmers can also benefit from AECM for agriculture measures in favour of the European hamster (*Cricetus cricetus*). Moreover, the presence of birds in a site may be very variable from year to year. Even if information on the likely occurrence of a species is available and disseminated, farmers need to fit their measures taking into account the field and information about the real status of the species. On the other side, some species of small birds like *Passeriformes* might face low awareness, maybe because of different perceptions on these species.

Concerning **preventive measures** in place to enable effective compliance of farmers/foresters with the prohibitions set in Article 12 and 13 of the Habitats Directive and Article 5 of the Birds Directive, survey responses from the majority of Member States indicated that **hardly any specific information is made available by the authorities**. Furthermore, there was consensus among the responses in that authorities usually only react and do not act by informing farmers/forest managers in a preventive and proactive way about the available data on species occurrence as well as the rules and prohibitions. This limits the uptake and practical application of available occurrence data. It also makes it difficult for stakeholders to actually comply with the bans. However, **forest management plans** play a key role in the implementation of species protection measures of forest-type habitats, outside of Natura 2000 sites. **Natura 2000 management plans** fulfil the same role within this network of protected areas, but do not exist for all sites. Additionally, survey responses indicated the existing ones as not always being of high quality, e.g. because of insufficient funding for contractors to carry out studies for supporting their development (e.g. Poland). Nature conservation authorities are involved in the assessment of such forest management plans, while the aim is to regulate forest management so that it does not have significant impacts on nature and species on the sites. Both forest and Natura 2000 management plans include activities that are required by law to achieve conservation objectives for target species and habitats.

[6] AECM are based on a contract between farmers and the responsible public body, financed through the European Agricultural Fund for Rural Development (EAFRD), also abbreviated as FEADER, for 5 years.

Further, non-compliant activities are defined within them, accompanied by penalties for violations. However, the extent to which such plans are effective depends largely on the existence of robust species occurrence data available and its availability to stakeholders. Furthermore, it also depends on whether a rigorous monitoring programme with inspections is in place. Both of these prerequisites seem to show areas for improvement in many of the Member States, according to the survey results.

Moreover, the extent to which these plans undergo **appropriate assessment procedures** (also in areas outside of Natura 2000) was not clear for all respondents and quoted as non-existent or with too low frequency (e.g. every 15 years) by several countries, so that they might miss the newest information available on species and their protection rules.

Some country examples are presented below:

- In Bulgaria, preventive measures have been included in some of the national laws (e.g. the ban on logging around biotope trees) and information materials on this are available (books, etc.), but are considered insufficient and not systematic enough by the local experts.
- In Romania, forest management plans are in many cases (still) not made entirely publicly available and requests from NGOs for the information to be submitted are being rejected.
- An example from Hungary indicated that if a nest of a protected bird (e.g. Great bustard) is discovered, the competent National Park Directorate informs the nature protection authority which orders the farmer/forester to leave a certain radius of non-activity around the nest. For Hungary, it is unclear what the protection mechanism is if the nest is found outside of national parks. However, in Lithuania, forest clearing is prohibited within a certain radius around the nests of large forest birds (e.g. Black Stork), regardless of whether they are located in a Natura 2000 site, in another protected or non-protected area.
- In Slovakia, preventive measures often do not work or are neglected because farmers/forest managers were assessed as lacking guidance and incentives to comply or because they are afraid of the burden of further new restrictions and bans.
- In Czechia, however, in contrast to other survey results, direct communication with farmers and foresters takes place in case when protective/preventive measures (e.g. protection of nesting individuals) are necessary. The protection of individual species in Czechia is typically addressed according to the specific situation in the area (e.g., without exception it is not possible to carry out disturbing activities (such as mining) around the occupied nests of sensitive bird species (e.g., birds of prey, black stork (*Ciconia nigra*)). Data on the occurrence of protected species in Czechia are enhanced with various sources of social science, including surveys and evaluations with farmers/foresters, and then used to protect these species via species protection strategies.

In many Member States, the consideration of occurrence of species plays an important role in the context of **permits for agricultural and forestry projects** by local authorities (e.g. in the context of relevant consultations, when granting exemptions from species protection requirements such as authorising the use of biocides) as well as in the context of environmental impact assessments. Occurrence data and species protection rules of the Nature Directives are typically taken into account by authorities when issuing the permits. This is particularly the case within Natura 2000 sites where risks to habitats and species require more stringent assessments. For example, if a logging activity is in conflict with the protection needs of protected species, the permit will not be issued, or binding conditions set to the activities (e.g., the logging permitted only outside the nesting period of the species). In less serious cases, non-binding management recommendations are issued. Some more specific country examples are presented below:

- In Spain, authorities granting permits to farmers and foresters outside Natura 2000 were considered unlikely to be aware of the presence of species and therefore unable to pass on this information to stakeholders. Furthermore for Spain, authorities granting permits for exploiting

water resources or water extraction in the water basin, are in some cases completely disconnected to the impacts these permits can have on local flora and fauna.

- In Denmark, a specialised support facility allows farmers and private forestry owners to apply for grants on planting of various vegetation suitable for improvement of habitats for Annex IV species living in agricultural areas close to forest environments. The facility is giving applicants access to GIS data in order to identify their property and its location in context of occurrence data for these species. Species for which analytical data are available for spatial planning, as well as protected species, generally receive higher levels of awareness by stakeholders due to the permit process or occurrence of prohibitions.
- According to a report (Arnkil *et al*. 2020) prepared under the Lajiturva project in Finland, forestry actors mostly encounter endangered species and species occurrence data only when planning forest management actions (e.g. loggings/felling tickets) which was echoed by several responses from other countries.
- In Cyprus, it was reported that species occurrence data is made available to authorities granting permits for farming-related projects, especially through the Environmental Impact Assessment (EIA) legislation. Species protection rules under the Habitats and Birds Directives are taken into account by the authorities when granting permits for farming-related project activities or plans inside or outside Natura 2000 sites.

The **formats** being used to communicate and create awareness include a wide range websites and online-data tools, hand-outs, brochures, pamphlets, leaflets, manuals, posters and booklets, guidance documents, events and institutional publications, PR campaigns (television, social media, etc.) and personal contact between land users and site managers (mail-outs, letters and phone calls), which are presented in more detail below (or see also Table 1 in section 4.1):

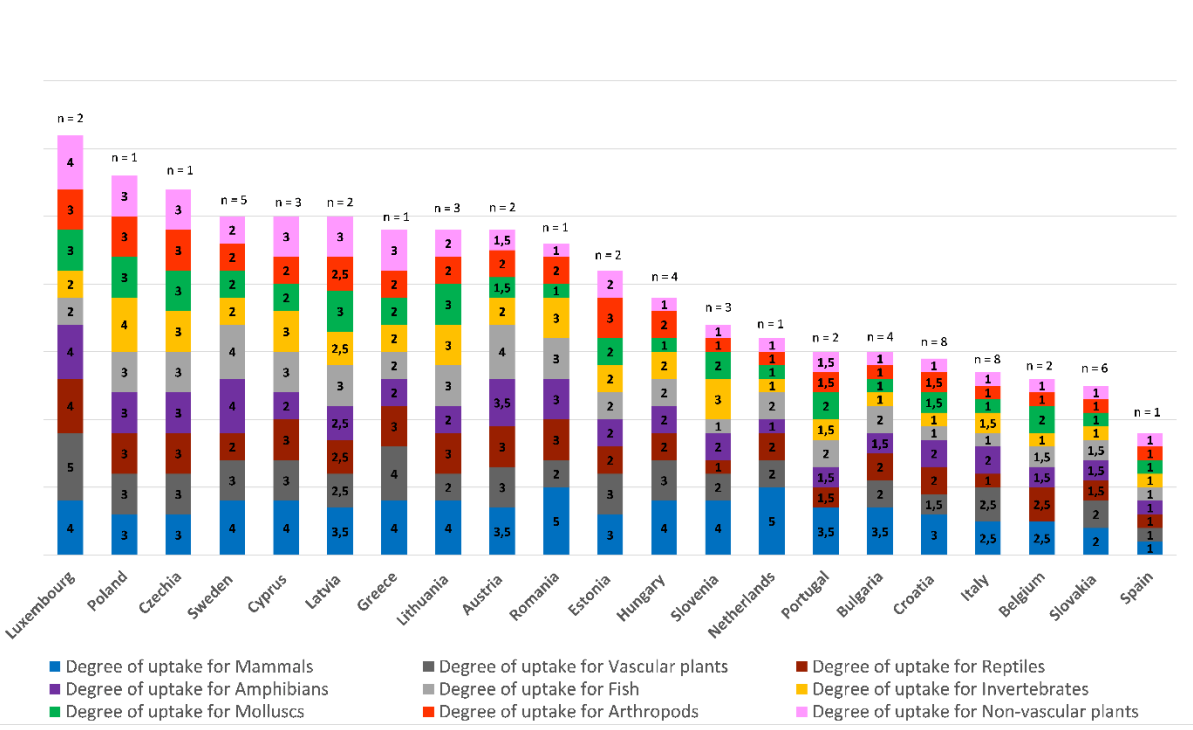
- **Events and meetings, trainings, workshops, seminars and excursions**: These formats are often provided especially/exclusively within Natura 2000 sites for farmers/foresters and are occasionally or regularly organised (e.g., within the processes for designation as protected site, within a framework of various projects) by the relevant agricultural, forestry and environmental authorities, nature conservation NGOs or scientific institutes. However, they are also reported for areas outside of the Natura 2000 network, providing targeted nature protection courses for interested farmers or, in the case of Germany for instance, round tables for different species groups (e.g. meadow nesting birds), joining farmers with conservation associations, the agricultural administration and the nature conservation administration. **Training** is also provided within the framework of LIFE projects mainly on issues such as how to prevent poisoning, illegal trade, capture and marking techniques, etc. The Ministry of Ecological Transition in Spain has published guidance on measures for agricultural practices and the interactions with certain key wildlife species: the so called Catalogue of measures for the protection of agriculture and livestock: Interactions with wildlife. Also, Guidelines for the monitoring and evaluation of the conservation status of threatened and protected species.
- **Guidance documents**: In Denmark, a new and user-friendly guidance for farmers has been published in January 2021, focusing on nature and biodiversity and how farmers can protect and promote biodiversity on their farm. In the example of Spain, guidance documents are developed on specific topics, e.g. habitat management, monitoring techniques, etc. For example, habitat management guidelines have been published for Iberian lynx and Capercaillie, which are relevant to foresters and private forest owners.
- **Social media** was also mentioned as useful channels for communication (e.g. from Italy, ERSAF YouTube channel).
- **Campaigns** are carried out regularly, e.g. to prevent destruction of nests of ground breeding birds, (harriers, bustards). These and similar campaigns are run by **NGOs** in multiple Member

States, e.g., WWF Spain communication and technical training campaign on "useful fauna for farming". Other campaigns address specific mortality factors like the illegal use of laces to trap wild boar, which has an indirect impact on the Brown bear (*Ursus arctus*) mortality in the Cantabrian Mountains. In Romania, the Agent Green Association, a very active NGO in the forestry sector, has recommended good forest management practice inside Natura 2000 protected areas to ensure better protection of species and habitats. In Germany, a successful project called "Feldhamsterland" is the largest project in Germany to save the field hamster (*Cricetus cricetus*) with valid recording and intensive stakeholder engagement.

- In Sweden, the Swedish Forestry agency provides information through a **dedicated magazine** called 'Skogs Eko'. It is distributed to e.g. forest owners and officials in forestry and contains information regarding Annex IV species and wild birds that are protected under the Nature Directives.

Also projects receiving funding from the government or other entities have been found to be of particular value to increase the awareness among farmers and foresters, which can be mainly attribute to **LIFE projects** (such as LIFE GESTIRE 2020 in Lombardy Region of Italy). For certain Member States, information on species contained in the projects is not commonly conveyed to foresters/farmers directly but requires them to proactively search online for the respective information (e.g. management programmes for protected areas) and often even cross-reference this information with forestry maps. Another successful tool for improving awareness and also uptake is the concept of contractual nature conservation (AT, DE), as a means of voluntary contractual cooperation with land owners over a certain period of time.

Figure 8: Perceived data uptake (median values) of farmers/foresters for different species groups (with 1=marginal awareness to 5=significant awareness; n=no of surveys)



Note: Based on data from 21 different countries. No respective data was provided for countries not appearing in the figure

In the majority of Member States, **uptake and practical application of occurrence data and information in agriculture and forestry** is considered low to moderate and was perceived as the result of a lack of awareness raising activities and/or inadequate supervision. Furthermore, the survey results show that the level of uptake is species-dependent (see Figure 8 above) with roughly the same trend

mentioned above for awareness, especially concerning large carnivores, species targeted by dedicated protection programmes, etc. From several responses it emerged that the level of uptake is **greater within Natura 2000 networks**, because the site manager's efforts in using the available data are greater. The level of respect of the species protection rules is intricately linked to the level of awareness and greatly depends on the implementation of dedicated information campaigns and conservation projects.

5. BEST PRACTICE EXAMPLES

There are notable efforts and ambitious projects that have emerged from national or EU level funding programmes, often implemented through the **association of several actors** (authorities, NGOs, private entities, academia, etc.). These efforts have led to significant results in terms of raising awareness among actors from agriculture or forestry on the availability of data on species occurrence and have contributed to remarkable conservation outcomes for target species or associated species and habitats. There is a **wide variety of approaches**, and, while some projects focus specifically on one or more particularly threatened or endangered species (e.g. under the Nature Directives, the IUCN Red List of Threatened Species), or those with an umbrella character or high potential for conflict with certain stakeholders, others focus on entire taxa, habitat types or all Annex IV species. Methods include data bases on species occurrence data, guidances in many different forms that benefit species protection and promoting of good practices as well as practical measure applications to implement species protection.

Particularly successful examples of good practice in raising awareness of protected species and their occurrences among stakeholders in the agriculture or forestry sectors of the European Union are **LIFE projects**, as they are typically large and well-funded, focusing stakeholders' attention on specific species, habitats, and broader biodiversity issues. The **LIFE programme** is the only dedicated financial tool for implementing the EU's Biodiversity Strategy and the Birds and Habitats Directives.

In many cases, LIFE projects **work directly with some of the key agencies and channels that collect and disseminate data** in a coordinated manner within each Member State. LIFE funds under the sub-programme Nature and biodiversity are dedicated exclusively to conservation purposes. Moreover, awareness-raising work is a part of all LIFE projects, whereby they effectively draw the attention of foresters and farmers (and practitioners from other sectors and the general public) to the distribution and conservation needs of specific species or habitats within their periphery. This includes species and habitats listed in the Annexes of the Nature Directives, as well as those listed as threatened in the European Red Lists[7], as these have been included in the scope of the latest LIFE programme (2014-2020). In some instances, these projects have raised the profile of many species, even to iconic status, such as the Spanish imperial eagle (*Aquila adalberti*).

Since the LIFE programme is known on being particularly effective in **developing guidelines, raising awareness, and creating tools** to help stakeholders reduce pressure on native species and natural habitats, its impact in creating greater recognition and uptake of species protection rules under the Nature Directives across the European Union cannot be overstated.

7 The Red Lists identify extinction risk, main threats and concrete conservation measures and, among others, raise awareness of the role of species in European ecosystems.

5.1. Agricultural sector

Agricultural land plays an important role in land use patterns across the EU. Grassland and cropland together make up 39 % of Europe's terrestrial area, while around half of Europe's land has changed its land cover at least once since 1900 (EEA, 2017).

The following cases illustrate some particularly **remarkable best-practice examples** concerning **agricultural habitats and species** from the conducted surveys:

Conserving the imperial eagle (*Aquila heliaca*) through compensations to farmers

Imperial eagle (*Aquila heliaca*) © Bernd Thaller, Wiki Commons

A good example of useful tools to reduce pressure on a native species dependent on agricultural areas is a LIFE project in **Bulgaria**, with the short title "**Land for Life**". It aims to restore and sustainably manage the habitats of the imperial eagle (*Aquila heliaca*) in Natura 2000 sites. It is a continuation of an earlier project, which has resulted in a 25 % increase of the local population of the bird. As part of these efforts, Birdlife Bulgaria managed to introduce, in cooperation with the Ministry of Agriculture, Food and Forests, a new agro-ecology measure in the Rural Development Programme. Thanks to this measure, **payments are provided as compensation to farmers**, in whose lands endangered species (e.g. Imperial eagle, Egyptian vulture or Red-breasted goose) are located and who make a commitment to preserve the habitats of these species. By using occurrence data to locate the species, this project gives farmers incentives to account for the species protection rules. As part of these measures, farmers are also encouraged to convert arable lands to pastures in the vicinity of Imperial eagle and Egyptian vulture nests to preserve their foraging habitats, but also to support animal husbandry practices. **Awareness raising and dissemination of data about the occurrence** of the Eagles and the existence of suitable habitat was essential for this project to succeed.

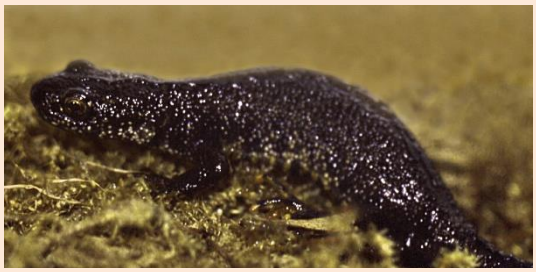
The preservation of the European Hamster (*Cricetus cricetus*) through integrated and concerted actions

European Hamster (*Cricetus cricetus)*, @ SgH Vienna Wiki Commons

A further best practice example marks the **Life ALISTER project** (2013-2019) which advanced the preservation of the European Hamster (*Cricetus cricetus*) in **France** through integrated and concerted actions. Classified as an endangered species in the IUCN Red list in France, the European hamster is found in France only in the eastern part, the Alsace. This species suffers from agriculture practices, habitat fragmentation and negative perception by stakeholders. The project was set up to find new innovative solutions for integrating hamster conservation measures into local socio-economic activities, especially agriculture, land-planning and transport. Based on **partnership with different stakeholders**, the project managed to develop new agriculture measures to support the conservation of the hamster and **raise public awareness on this umbrella species**. By identifying local populations and disseminating targeted measures to protect them, this project gives farmers hands-on tools to account for the species protection rules. However, the hamster population has not increased in the previous reporting period of the Habitats Directive reported by France and maize monoculture, which is a particular threat to this species[8], continues despite the increased awareness.

[8] https://royalsocietypublishing.org/doi/10.1098/rspb.2016.2168

LIFE grasslands: protecting species in agricultural landscapes



Great crested newt (*Triturus cristatus*) @ Christian Fischer / Wiki Commons

The LIFE funded project 'Conservation and management of species-rich grasslands by local authorities' in **Luxembourg** covers 15 Natura 2000 sites within 15 communes of the SICONA communal syndicate. In addition to **protecting threatened grasslands habitats through conservation and restoration**, the project **directly aims to improve the conservation of six protected species.** Three of these are species under annex IV of the Habitats Directive: the Yellow bellied toad (*Bombina variegata*), Great crested newt (*Triturus cristatus*) and Geoffroy's bat (*Myotis emarginatus*). The other three are wild birds under the Birds Directive: Tree pipit (*Anthus trivialis*), Common redstart (*Phoenicurus phoenicurus*) and Woodlark (*Lullula arborea*).

Sites selected and purchased for protection and restoration are mostly managed by local farmers using extensive biodiversity friendly practices. Farmers sign agro-environmental contracts ensuring they carry out these activities and are compensated for any potential losses of productivity stemming from them. For the Great crested newt, new ponds have been dug to create areas for reproduction and areas around them managed using extensive grazing and mowing practices to avoid disturbances. For the bat, new hunting grounds have been created, and existing ones preserved by conserving and enhancing linear landscape structures. For bird species, extensive agricultural use and removal of shrubs has been conducted. In total, 5 ha have been purchased for the Yellow-bellied toad and Crested newt, 2 ha for Geoffroy's bat and 3 ha for the Tree pipit, Woodlark and Common redstart. In addition, the project aims to **raise awareness and improve monitoring efforts** for these species. To inform farmers from the outset, the project and information (incl. data) on the habitats and species has been **introduced in a series of conferences** which have been organised by a consulting group. The socioeconomic impacts of the project are also carefully monitored using farmer consultation. By identifying concrete sites of importance, this project requires farmers and other land owners to respect the species protection rules with a concrete management measures and compensation mechanisms.

Nature-friendly agriculture and guidelines for farming among carnivores

The Eurasian wolf (*Canis lupus lupus*) © Marek Chomko

Several non-governmental organisations in **Poland** agreed that a strong, common voice on sustainable agriculture is needed - this is how the idea for the **"Agriculture for Nature" Coalition** was born. The coalition, which was established in January 2020, is made up of NGOs with extensive experience in implementing and promoting nature-friendly agriculture - both on a practical and a formal basis. The key task of the Coalition is to develop and present to the Ministry of Agriculture and Rural Development its own proposals of solutions supporting nature-friendly agriculture. The Agricultural Advisory Center in Brwinów, Poznań Branch, regularly organises training and workshops for agricultural advisors. An annual training course was organised on 15 March 2021 on changes in the agri-environment-climate measures and on ecological farming that will apply in 2021. The training provided information on key changes for the coming years, the effects of non-compliance with the conditions and requirements of these activities and changes in the application for the preparation of an agri-environmental activity plan.

The Regional Directorate for Environmental Protection in Białystok publishes on its website extensive guidelines on the protection of wolves and on the measures that can be taken to prevent damages caused by wolves to farm animals. The publications explain that wolves are strictly protected and that it is forbidden to kill them, catch them or damage the places where they live and breed. It is also explained that in case of incurring damages to farm animals caused by wolves, farmers can obtain compensation – the materials published explain the procedures and practical steps that must be taken in such cases. By actively engaging advisory bodies and disseminating targeted information materials, this project supports farmers to respect the species protection rules.

Pilot measure to protect butterflies


Alcon blue *(Phengaris alcon*) © Svdmolen, WIKI

Four species of endangered and strictly protected diurnal butterflies live in only a few smaller areas in **Croatia**: *Phengaris teleius, Phengaris nausithous, Phengaris alcon alcon* and *Coenonympha oedippus.* In order to protect these four species of butterflies, it is necessary to ensure their unhindered development and to preserve their habitats in their original form through an adapted mowing method. The operation is carried out in habitats inhabited by endangered butterflies, and are located in the ecological network Natura 2000. As with other grasslands inhabited by endangered species, the use of mineral fertilizers, manure and plant protection products is prohibited. Mowing is only permitted by hand or shear mowers. The term and method of mowing is determined for each butterfly separately. Since the use of herbicides is prohibited, illicit plants should be removed manually. Hydromelioration interventions (drainage or irrigation) are not allowed. Farmers receive financial grants if they implement the abovementioned species conservation measures.

Pilot measure: https://ruralnirazvoj.hr/files/documents/MPS-Brosura-200x275-Kako-ostvariti-potporu-za-mjeru-10.pdf

Guide on measures for agricultural practices: interactions with wildlife species

The Ministry of ecological transition in **Spain** has published **guidance** on measures for agriculture practices and the interactions with certain key species. The information contained therein is presented in the form of fiches by species of wild fauna. It provides a description of the species, **where they occur**, **threats and damages they face** and a subsequent detailed technical description of the proposed preventive measures.

The information contained in the fiches comes from the review and evaluation of technical or scientific publications on good practices or better prevention techniques, as well as from specific experiences developed in the Spanish context itself. In general, the aim has been to give an innovative approach, taking advantage of the potential that new technologies and recent scientific knowledge can bring to the more traditional approaches of dealing with the interactions of wildlife with agriculture and livestock.

At the moment guidance exists for five species: Abejaruco/ European bee-eater (*Merops apiaster*), Calamón común/ western swamphen (*Porphyrio porphyrio*), Lobo ibérico /Iberian wolf (*Canis lupus*), Oso pardo/Brown bear (*Ursus arctos*) and Aguila real/Imperial eagle (*Aquila chrysaetos*). Due to their nature as a proposal for the best available techniques, the fiches will be progressively updated as new scientific or technical information appears.

The guide *Catalogue of measures for the protection of agriculture and livestock: Interactions with wildlife* can be found here.

Nature conservation measures as part of CAP implementation

According to the legal framework in **Estonia**, the Environmental Protection Agency, which oversees nature conservation, is involved in the implementation of the Common Agricultural Policy. Among other things, they are involved in granting subsidies to farmers. Within this framework, all applications for subsidies (also for area-based subsidies) are subject to a (mostly automated) review by the Environmental Board. If the occurrence of nationally protected species (including Annex IV species and many wild birds) on the agricultural land is registered in the environmental cadaster, binding conditions for funding are imposed by the Environmental Board. A common example is the restriction of coring grass on natural grassland to protect ground-nesting birds.

Although concerns have been raised by farmers as to whether all these conditions are justified, this system at least ensures that if the presence of a species is detected, validated and registered in the central nature conservation database, this habitat receives some protection from unlimited agricultural activities.

5.2. Forestry sector

Forest tree cover makes up 157.6 million ha in the EU which is about 39 % of the total land area, making it one of the most forest-rich regions in the world; although forest coverage varies considerably from one Member State to another. While Finland (79.4 % of total land area) and Sweden (71.5 %) are the most heavily forested Member States accounting for nearly one-third of the EU's total forested land area, Ireland (10.5 %) and the Netherlands (8.8 %) are the least forested countries (Forest Information System for Europe, 2018). Only 0.7 % of Europe's forest area are considered primary forests (of a high naturalness) with most of them (89 %) inside protected areas, but only 46 % strictly protected (Sabatini et al. 2018).

The following cases illustrate some particularly **noteworthy best-practice examples** concerning **forestry habitats and associated species** mentioned in the conducted surveys.

Protecting the European beaver (*Castor fiber*)

The European beaver (*Castor fiber*)
© Harald Olsen, WIKI

One particularly good example which concerns the agricultural sector but also the forestry sector, is a project protecting the European beaver (*Castor fiber*). Here, **Croatian and Slovenian** partners are implementing the EU LIFE project „LIFE BEAVER - LIFE with the beaver, wetlands and climate change". The European beaver is listed in the Annexes II and IV of the Habitats Directive. The European beaver was completely extinct in Slovenia and Croatia. However, as a result of conservation programmes, the species is recovering across its entire range in Europe. Thus, the beaver is also re-colonising its historical habitats in both project countries. But its long absence means the beaver has **disappeared from the public's perception**, losing not only its natural but also its social habitat. Beavers returning are now considered as a new species, and even as a pest, by local inhabitants and various. Conflicts arise as the beaver population increases. The project will **raise awareness about beavers in general, stressing their important role in freshwater ecosystems**, and to prepare guidelines on water management strategies and agricultural policy for living with beavers. Insights about the natural impacts the beaver causes with its key engineering behaviour in aquatic ecosystems, will be shared amongst the widest of audience. Particularly, the project will direct it towards various target groups, which have most contact with the beaver: **farmers, foresters**, **land owners, water managers, fishermen and hunters**. It will try to have an **influence on agriculture, water management and environmental politics**. In this light, it will also test how the system for "damage" evaluation of wild animal activities and compensation scheme assessment works.

Protecting endangered species in forests and forestry

Epipogium aphyllum suffers from loggings and drainings causing habitats to dry out.
© Terhi Ryttäri

Another good example is a project from **Finland** aiming at safeguarding biodiversity in Finnish forests, covering all Annex IV species, that are present in Finland, presenting a cooperation project between state-owned Forestry consultancy Tapio, Finnish Environment Institute SYKE and Finnish Forestry Centre Suomen Metsäkeskus. Funded by the Ministry of Agriculture and Forestry under the broader METSO-programme the main activities of the project include:

- Focusing and promoting sustainable forestry management practices in sites with known local populations.
- Increasing forestry management measures that promote and safeguard the habitats and breeding sites of endangered species by **using and sharing species occurrence data especially with forestry actors**.
- The overall aim is to ensure coexistence of forest management and conservation efforts.
- The project's recent result have been published in a report

Great spotted woodpecker (Dendrocopos major) © Andreas Eichler

Protecting forest birds

A cooperation between the Austrian Federal Forestry Company (ÖBf) and BirdLife **Austria** aims to identify fundamental conservation measures for forest bird species and implement them within the area of the ÖBf. The main activities of the project include:

- to identify and establish biodiversity island in the forests, with an age of over 120 years
- increase the amount and volume of dead wood
- conservation and designation of biotope trees

Such conservation measures provide co-benefits also for other species, ranging from lichens to mammals and support the respect of the species protection rules

Project: https://www.bundesforste.at/die-bundesforste/naturschutz/projekte-kooperationen/kooperationen/birdlife.html

A forest nature protection information system

In **Germany**, the state forestry research institute (Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg) provides the openly accessible forest nature protection information system for the state of Baden-Wuerttemberg ("Waldnaturschutz Informationssystem"). On this platform, forest species are presented with individual factsheets and distribution maps, among other information.

The system provides interfaces for forest managers of all forest ownership types and other target groups to make this information easily accessible and individually retrievable. It can be used to compile individual and practical information tailored to the respective forest area, which can be disseminated via different information channels. In addition to forest managers, the tool is also available to other target groups from politics and society and thus contributes to raising awareness and sensitisation for biodiversity management in the forest. For this purpose, the data and information are prepared and presented in a comprehensible, appealing and contemporary form. The system is also available as App.

Conserving the lesser spotted eagle (*Clanga pomarina*) in forests

'The lands and forests of the eagle' is a LIFE-financed project which aims to conserve the populations and habitats of the lesser spotted eagle in Bulgaria. It is implemented in 20 special protected areas in the Natura 2000 network in Eastern Bulgaria and continues an earlier LIFE project for the conservation of the same species. Thanks to the earlier project, the national forest legislation was amended to integrate biodiversity needs in the planning and implementation of forest management activities. A methodology was adopted for measuring the quantity and characteristics of dead trees and biotope trees in the forest ecosystems, on which the survival of more than one third of the species

Lesser spotted eagle (Clanga pomarina) © Ron Knight, Wiki Commons

in the European forests depends. Thanks to pilot testing and a model for forest inventory and planning in four state forest companies, sustainable management of over 120 000 ha of habitats was ensured. In addition, forest-ecology services were created in 16 regional forest directorates. They can provide forest owners with free-of-charge information and consultations concerning forest-ecology measures and their implementation, advice on conservation and management of forests, use of non-wood forest products etc. Through specific capacity building events the knowledge of other institutions involved in forest management was also development.

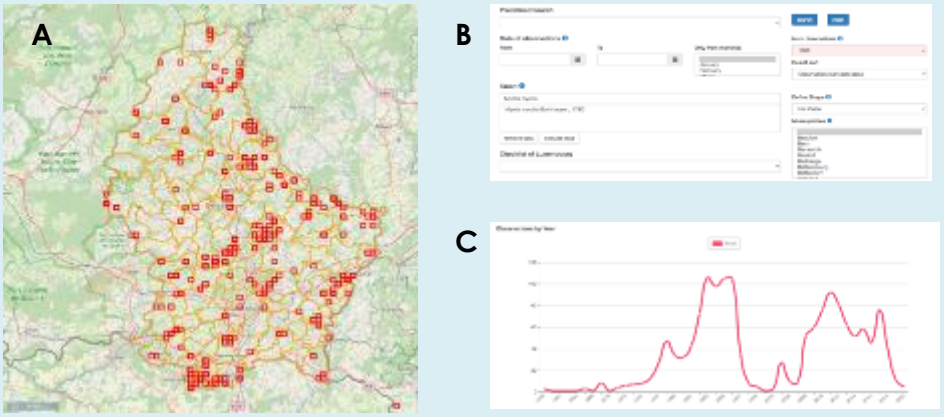
Project: https://eagleforests.org/

5.3 General examples on data availability

MNHN dataportal: accessible data on species occurrence

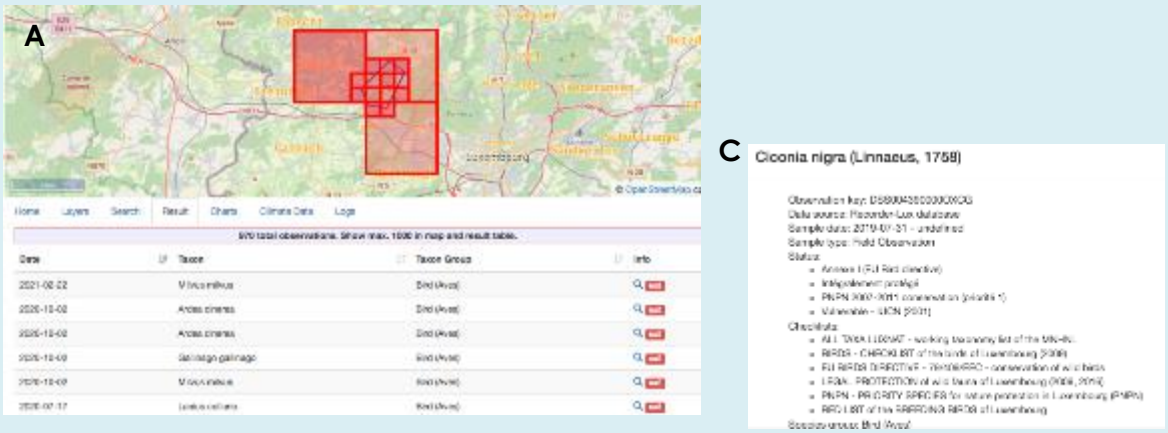
The online MNHN data portal of Luxembourg gives free, open access to protected species occurrence data in Luxembourg. Users can define their searches using a number of parameters such as: species name, taxonomic group, predefined species lists (e.g. those reported under the habitats directives or in Red Lists), dates of observation, specific locations, threat categories and institutions collecting the data. Searches yield a list of species observations which are automatically mapped at a 1 km^2 grid scale over a detailed map of Luxembourg. Map layers can be added over these maps including aerial imaging, topography, administrative borders and protected areas. In addition, charts showing observations over time, taxonomy composition, taxon status and climate data are provided. Figure 5 below shows an example of a map produced using the database to illustrate this.

Map of Luxembourg with overlaid communes showing all *Myotis myotis* observations. B. Search parameters for map in A. C. Graph showing *Myotis Myotis* observations by year from 1899.



For farmers and foresters, this information can be used to determine occurrence of protected species within their land and data availability for their observations. The website has a function allowing users to draw out geographical areas of interest allowing land owners to delineate their land. Within this shape, searches for specific species or groups (e.g. EU Habitats Directive species) can be searched for. The example in Figure 6 below shows a search for a hypothetical landowner wishing to determine what Red Listed breeding birds occur within their area (within the blue polygon).

Results for a specific location search using the Polygon drawn in B for Red List Breeding Birds. C. Shows the information available for each of the 970 total observations that match the search.



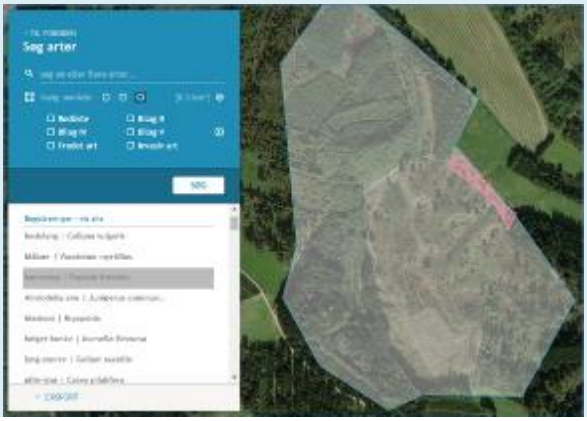
Registered users can search and download full metadata and precise locations for species observations.

Database available at: https://mdata.mnhn.lu/

Nature Database in Denmark

This database form the Danish Ministry of Environment offers spatial explicit data on nature, including occurrence data on Annex IV species. How to search for such species in a specific geographical area in Denmark (e.g. on cultivated field areas or forestry areas) is described on https://danmarksmiljoeportal.zendesk.com/ (Danish environmental portal administrated by Ministry of Environment) as well as on a dedicated demonstration video on youtube.
https://www.youtube.com/watch?v=G_WDuOHfd7k&feature=youtu.be

A map opens and you can mark a geographical area, and further increase spots in order to search for occurrence data for specific categories as Annex IV and red list species or all species. A step by step guide can be found here.



6. CONCLUSIONS

6.1. Key conclusions on level of data availability of species occurrences

The conducted assessment on occurrence data for Annex IV species and wild birds in the EU provided an extensive overview of the existing data availabilities and shortcomings as well as detailed information on country-specific efforts and trends.

Results showed that map data required under the Nature Directives reporting is provided for most of the species and breeding birds. Gaps in data availabilities often relate to particularly rare or small species (such as arthropods, amphibians or molluscs), but in the case of birds, they also affect some species with particularly wide distribution (as in the case of the Rock dove). Apart from the general availability, the results also raise the question of the quality of the provided data, which, in some cases is considered to be rather low. The most common resolution of occurrence data is on a 10x10km grid (as required under the Nature Directives' reporting) or as point observations in map format – either available digitally or as purchasable books. Open data availability is highly country and species dependent – with some countries already providing comprehensive and high resolution species distribution data on interactive platforms. However, depending on the use of the data, the current resolution tends to be too low to be useful for the implementation of the species protection rules. Overall, feedback to the survey and interviews revealed that data collection, assessment and distribution varies widely among the countries.

The main obstacles to comprehensive and high quality national species monitoring are reported as:

- the **lack of common data repositories and the distribution of responsibilities**, especially in the case of federal structures that hinder centralised data collection and assessment;
- the **lack of strategy** for a national data collection and monitoring system, which has led to different standards, methodologies and priorities as well as an overall shortage of funding for some areas or species;
- the **lack of funding capacities as well as knowledge and resource capacities of involved specialists;**
- the **large number and size of areas** that need to be monitored (especially in the more sparsely populated and remote areas);
- the **lack of successful collaboration with neighbouring countries**, e.g. on jointly monitoring of migratory species
- the **limited data availability from agricultural areas** due to the limited accessibility (private land) and few citizen visits (and thus sightings) as well as the lack of interest from many farmers to invest in surveys or monitoring of biodiversity.

The survey results further indicated that, in practice, **systematic species monitoring in a resolution apt to practically implement the species protection rules is in many ways a considerable challenge and is eventually deemed as unrealistic** to be achieved by the authorities alone. The necessary effort to conduct reliable and continuous monitoring on local or farm level as well as across the territory of the Member States is mostly not manageable with the available staff, time capacities and financing resources.

The country assessments **offer interesting insights into possible solutions in how to overcome some of these obstacles**. Aside from the urgent need for further prioritising species monitoring, particularly in terms of general needs such as financial resources, staff capacities and clear responsibilities, several additional factors that support data availability have been identified. One of the most promising opportunities lies in **new technical developments**, not only for back-end technical infrastructures for data flows and analytics, but also for collection, visualisation, dissemination and communication. In this context, **citizen science could potentially play a major role**, as readiness is high in many countries. Apart from national initiatives, successful initiatives and projects based on citizen science are

undertaken on the European level. One interesting example is the Able project, which collects standardised data on butterflies and distribute it via a central database (the European Butterfly Monitoring Scheme – eBMS). Convenient applications are not only user-friendly, but can also still ensure a high level of quality control (if they are part of the set-up). While experts are still validating the data, artificial intelligence is already able to help identifying flora and fauna – and is getting better the more input the algorithms receive.

There are also examples for **successful cross-country collaborations**, where countries collectively gather and share data. One example is the Great Region (including Luxembourg, France, Germany and Belgium), for which data is shared in a common data portal called **BIO**diversity in the **Gr**eat Region - BioGr.

Despite all negative implications of Covid-19, this period has increased citizens' attention and use of urban parks, forests, open land hiking tracks and the value of national parks/Natura 2000 sites and their flora and fauna. Moreover, the time of the pandemic has led to improvements of digital technologies and infrastructure, especially in the fields of remote communication and networking, which provides new opportunities for exchange and knowledge-sharing.

6.2. Key conclusions on awareness of species occurrence data

The responses to the survey reveal the **need to increase awareness and uptake on species occurrences**, as awareness is regarded as rather low across different sectors and species groups (with some species groups and selected species gaining higher awareness than others).

Results show that the awareness of many professionals working on protected species (either for government institutions, environmental NGOs or scientists) is generally considered high, but that many implementing entities and data end-users, such as farmers and foresters (in particular, private forest owners) or other land users lack specific knowledge. Also in other economic sectors that have a significant impact on nature (e.g. energy, transport infrastructure, construction, and tourism and water management), there is a lack of awareness, insufficient knowledge and understanding of the issue of species and their distribution. These shortcomings can be mainly attributed to:

- **Missing information or data access restrictions**, lacking guidance;
- Available with a **spatial resolution too coarse** for many applications in smaller areas;
- **Insufficient capacity building and education** from public authorities, farmers unions, advisory services and district foresters.

There was a consensus among the respondents to the survey/interviews across the Member States, that in order to increase awareness and uptake of practical application of species occurrence and species protection rules, **access to occurrence data for farmers/forest managers should further be improved** (made user-friendly and interactive) and more targeted information and education campaigns should be conducted to show where to find the data and how to use it. Personal and targeted advice/training to farmers and foresters was seen as an important requirement to change the status quo. In addition, the use of digital communication options could be boosted. While more guidance documents and other forms of (innovative) communication materials are essential and need to reflect the most current information and best practice, their effectiveness is greatly diminished if these stakeholders are not more actively engaged. Intelligent and timely awareness-raising measures can generate motivation to comply with prohibitions and, in addition, to participate with own initiative and seek new ways to protect species and habitats. Furthermore, there is a need to engage farmers and foresters as active and responsible stewards of species and habitats.

The importance of data sharing was mentioned in many responses, meaning that **making all existing species and wild birds' occurrences data available to all involved stakeholders is seen as an**

essential step to improve implementation on the ground. Moreover, survey results reflect the need for authorities granting permits for agricultural and forestry project activities or plans to use comprehensive and dedicated databases by improving the cooperation in data collection and processing. More research, frequent and rigorous monitoring as well as new, innovative and engaging tools incorporating the latest information on species in an appealing manner, are crucial to guide this process and ensure acceptance and adoption.

Survey results also indicated that the mere **awareness on available occurrence data on species does not necessarily lead to subsequent uptake** by the landowner, mostly due to lack of staff, time and financial resources. While ambitions do certainly vary among countries, states and local authorities, the country assessments offer many interesting insights into possible solutions in how to overcome such obstacles. Feedback from respondents of several Member States shows that **awareness raising initiatives, projects and programmes for specific species and species groups** can lead to very successful outcomes – also in the context of broader species conservation campaigns not directly targeting the species protection rules themselves. These campaigns and coordinated activities with different actor groups (especially when also involving farmers and forestry lobbies) can increase the knowledge significantly and are seen as an effective means in achieving species awareness. The subsequent uptake by farmers and forest managers, however, often still needs to be actively ensured. As farmers, for instance, do primarily need to secure productivity to survive financially, species protection is a perceived "add-on" they cannot always address. Though many of them, also according to conducted surveys, are principally interested in protecting species, current production frameworks make it difficult to spend time and resources on this topic. Instead of prohibitions and sanctions, **additional financial compensations would certainly increase acceptance and implementation**, potentially either with CAP incentives, contractual nature protection schemes or other funding options.

6.3. Recommendations for improving data availability and awareness

Results of the analysis on data availabilities draw the attention to existing shortcomings regarding technical infrastructures, data collection and quality and cooperation, among other issues. Key recommendations to improve data availabilities include:

- Allocate **sufficient financial resources** to monitoring of the species across the territory of the Member States
- Aim for **higher resolution of species occurrence data** in the future as point observations offer the opportunity for finer grid resolutions to make the data more useful for the implementation of the species protection rules
- Make use of the improved digital communication options and **foster national and trans-national knowledge transfer and best practice exchange** on the level of national, regional and local authorities and other entities involved in data collection and dissemination (e.g. via webinars on dedicated subjects such as cross-border coordination)
- Take up the **potential of citizen science and decentralised data collection** to address existing gaps, which can be realised with standardised App collection and validation to feed into official data channels
- Support **targeted capacity building to improve data collection, assessment and dissemination as well as its quality**, for instance considering digital and other technical state-of-the art technologies, e.g. to support the establishment of functional and appealing **central data repositories.**

Results of the survey consistently show the need to increase **awareness raising** and the practical uptake of species occurrence data across all land-intensive economic sectors. In doing so, land users, such as farmers and foresters, should be directly targeted to improve access to occurrence data by showing where

the data can be found and how it can be used it, and by making it "user-friendly" and interactive. Recommendations for the improvement of data awareness include:

- Organise **education campaigns and targeted capacity building** for farmers, foresters and other land users, local communities, and local and regional authorities to achieve higher awareness about species occurrence and the specific rules in place, e.g. via trainings, direct/personal advice, guidelines and other new information formats
- Increase the **role and capacity of farmers and foresters unions and farm/forestry advisory services**, which are a key stakeholders to disseminate information and promote relevant measures
- Foster **opportunities for financial incentives or compensation** to make species protection more attractive and realisable for farmers and other land owners, e.g. by specifying the CAP payment mechanisms
- Improve **data sharing** (e.g. through a legal mandate for data sharing to convince departments to publish data).

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