

An aerial photograph of a winding asphalt road cutting through a dense, lush green forest. Several cars are visible on the road, including a red one, a white one, and a blue one. The road curves in an S-shape, and the surrounding trees are vibrant green.

Use of technologies for better protection and management of nature and biodiversity

A Policy Brief from the Policy Learning Platform on Environment and resource efficiency

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Introduction

Reaching from publicly accessible environmental data and online monitoring tools to satellite imagery, numerous technological solutions carry the potential to boost environmental protection efforts in European regions. Technologies can help develop a quantitative understanding of the status and changes in ecosystems. In addition, they provide information on the links between ecosystems and the socio-economic systems, hence contribute to the improvement of policies in the field of nature protection and biodiversity. Technologies can also help improve the evidence base necessary for the development of environmental economic accounts, useful at local, regional and national level.

The policy brief explores the link between technology use and protection of natural heritage. It gives an overview of UN and EU strategic framework documents emphasising the benefits of technologies and stimulating their uptake. In addition, the document demonstrates several major challenges of using technology for nature protection and presents good practices from Interreg Europe projects, with the aim to inspire regions to take up existing successful practices.

Policy context

New technologies offer significant potential for better protection of environment. The UN and EU frameworks are consistently pointing to this potential. For instance, the [Convention on Biological Diversity \(CBD\)](#) signed in 1992 at the Rio Earth Summit, calls upon its contracting Parties to promote scientific and technological cooperation in the field of conservation and sustainable use of biodiversity. Both access to and transfers of technologies among Contracting Parties are important for the achievement of the objectives of this Convention.

According to the EU [Action Plan for nature, people and the economy](#) adopted in April 2017 there is a need to address the identified implementation gaps in the [Birds](#) and [Habitats](#) Directives and boost the potential of these Directives to delivering concrete results. One of the envisaged actions in the Plan is focused on improving knowledge necessary for the implementation of the Directives, including through enhanced and more efficient monitoring and public online access to data. (e.g. satellite imagery from the [Copernicus programme](#)).

In fact, EU countries produce and use valuable geospatial data, for example, on ground water, transport networks and population. Public authorities need to be able to easily access and compare these geospatial data across borders. The implementation of the [INSPIRE Directive](#), which is focused on the establishment of Infrastructure for Spatial Information in the European Community (Inspire), can facilitate the dissemination of relevant data, for instance by supporting dedicated smartphone applications which allow citizens, policymakers and scientists to get access to geo-coded biodiversity information. The Directive is a significant step towards overcoming the challenges regarding the availability, accessibility and sharing of spatial information across various governance levels in Europe. It defines common standards for 34 spatial data themes including Natura 2000.

In line with the strategic and legislative framework outlined above, the EU continuously supports actions focused on promoting the increase, use, sharing and distribution of data related to European natural heritage and landscapes. Examples of relevant information platforms and tools is presented below:

- [Biodiversity Information System for Europe \(BISE\)](#) is a single-entry point for data and information on biodiversity supporting the implementation of the EU strategy and the Aichi targets¹ in Europe.
- [The Biodiversity data centre](#) (BDC) provides access to data and information on species, habitat types and sites of interest in Europe and to related products for biodiversity indicators and assessments.

¹ <https://www.cbd.int/sp/targets/>

- [INSPIRE Geoportal](#) is a one-stop shop for public authorities, business and citizens to discover, access and use data sets related to the environmental issues in Europe.
- [ESP Visualization tool \(ESP-VT\)](#) is an interactive knowledge platform that allows users to share information on ecosystem services such as maps, data and mapping methods.
- [European Alien Species Information Network \(EASIN\)](#) is the official information system helping the European Commission and the EU Member States to implement the [EU Regulation on Invasive Alien Species](#). The network aims to complement existing information on the distribution of those species across Europe.
- [Natura 2000 Public Viewer](#) is an online interactive GIS tool to explore the Natura 2000 network.

Application for tracking invasive alien species in the EU

Invasive Alien Species (IAS) can have harmful effects on biodiversity and ecosystems, as well as on human health. Dealing with invasive alien species demands international collaboration, harmonisation and sharing of data. The Joint Research Centre has developed a smartphone app that aims to help citizens to capture and share information about 37 [invasive alien species](#) of concern for the EU. The '[Invasive Alien Species Europe](#)' app, which contains detailed information and photos of those plants and animals, gives citizens the possibility to use their phones' GPS system and camera to capture images of them. Users of the App can send the exact location of a sighted invasive alien species with a photo via the app. The data collected by the users will enrich the maps included in the application. Once checked for accuracy, the information is also included in the [European Alien Species Information Network](#) (EASIN) to complement existing information. The information generated through the app could also feed into the respective surveillance systems in the Member States.

Challenges and experiences at regional level

Local and regional governments play a key role in meeting the objectives of EU nature and biodiversity policy. Regional policy can support the development and implementation of a wide range of instruments aimed at the Natura 2000 network such as preparation of management plans for Natura 2000 areas; ecosystem restoration projects; development of infrastructure for public access; improving the knowledge base and public awareness about nature, etc. Technological solutions can contribute significantly to the achievement of regional policy objectives concerning nature protection and specifically to the improvement of monitoring. However, harnessing these technologies at regional level is often challenging. Specific challenges faced by regions include:

Access to and use of data

Protection of biodiversity and natural heritage assets requires reliable, structured and robust data, necessary for establishing the conservation status of species and habitats, as well as monitoring and assessing human impacts. Inadequate knowledge and poor access to data were identified in the comprehensive evaluation ([Fitness check](#)) of the Birds and Habitats Directives as obstacles to their implementation. The fitness check revealed that information on the Natura 2000 sites is often inadequate or unavailable from the competent authorities.

While analysing regional biodiversity data processes, the partners of the Interreg Europe project [BID-REX](#) highlighted the importance of biodiversity information infrastructures to respond to the information needs of decision makers and the effective use of that information in decision-making concerning conservation policies. Partners also emphasised the role of biodiversity information infrastructures as tools especially developed for the purpose of standardising, sharing, storing, and analysing heterogeneous data; and providing a trustworthy and relevant resource for decision makers and other

end users. In this context, tools and technical aspects are major factors that can influence the use of data infrastructures.²

At the same time, policymakers need to find solutions for the challenge of handling large amounts of data generated by several departments in public administrations and how to use this data effectively for regional development purposes. SITXell project described below is a positive example in this regard.

In addition, the challenge of building trust and maintaining dialogue between data providers and data needs to be addressed. For example, as highlighted by BID-REX project Elia, Belgium's electricity transmission system operator (data user), and Natagora, an environmental non-governmental organisation (data provider), collaborated to minimize the environmental impact of high voltage overhead lines in Belgium. After a wide dialogue, Natagora provided maps of bird's collision risk to Elia. Thanks to these maps, Elia added devices to enhance the visibility of the overhead lines in priority areas to reduce bird's collision risk.³

Digitisation

Regarding the omnipresent trend of digitisation, the challenges range from the fragmentation of national databases to a lack of digitisation standards as well as different standards for metadata, collection management principles and database structures. In addition, funding for large scale digitisation works is often insufficient to meet the demands, as highlighted by [CD-ETA](#) project partners.

Digitisation of natural heritage is important for educational purposes and some countries and regions are already taking steps in this direction by developing platforms of citizen science. For example, as identified by CD-ETA project, a Nature Information System was established in Estonia as the primary database for the National Nature Conservation Registry. In addition, a [mobile app](#) for Citizen Science (nature observations-photos) was created and a pilot Citizen Science project for public schools, Estonia 100 herbarium, was launched in 2017.⁴

The role of geographic information systems (GIS)

Spatial visualization tools such as Geographic information systems (GIS) play a key role in ensuring efficient management of protected areas as they provide reliable information for decision-making processes. By accommodating spatial and non-spatial data GIS is an important tool for monitoring biodiversity as per the requirements of INSPIRE Directive. Besides, GIS-based systems improve transparency by providing public access to the information for the spatial scale, location and functional status of protected areas. A key challenge in this regard is the accuracy and completeness of the data included in the system as well as lack of common standards for information from different data sources.

Some of the regions are already benefiting from GIS tools. For example, the CD-ETA project partners discussed the Atlas of Landscape Risks developed in Italy with the aim to visualise and analyse land-use changes and a Wetlands Atlas of Tuscany. The methodology of the latter is based on the integration and comparative analysis of archaeological, historical and geographical data coming from different sources in a GIS environment.⁵

Solutions and good examples from European regions

The current Interreg Europe programme provides support to partners which intend to work together on challenges related to the uptake and wider use of ICT for better protection and management of natural heritage. Moreover, several ongoing Interreg Europe projects already identified good examples and offer

² https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1520004857.pdf

³ https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1517483859.pdf

⁴ https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/Digitization%20in%20Estonia.pdf

⁵ https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/Digitization%20in%20Italy.pdf

insights and inspiration in this regard. Three examples stemming from ongoing Interreg Europe projects are presented below:

Use of Biodiversity data in decision making: the SITxell Project, [BID-REX](#)

The [SITxell project](#) is a successful example of using GIS schemes based on scientific information about the ecological and socio-economic values of natural areas. On a technical level it is a cartographic database, which helps with analysis and planning of open areas. An important advantage of the SITxell tool is its applicability in land planning processes, on both local and regional level. Specifically, the aim of the initiative is to foster a new territorial analysis and organisational strategy based on a multidisciplinary view of the territory and develop a cascade planning model (territorial organisation plans, master plans, town plans and management plans) following a new concept and basic common information.

The SITxell project promotes the use of information related to territorial analysis (geology, hydrology, botany, zoology, ecology, socio-economics, agronomy, town planning) both from independent groups of experts and from public administration. At the core of the project is the transformation of expert information into knowledge that can easily be applied to territorial analysis, planning and management, to be used by all public bodies. The information needed to run and update SITxell GIS layers is obtained through collaboration with experts from different fields. New information can be added in different ways depending on the specific discipline and the involved stakeholders. For instance, the Regional Government of Catalonia is in charge of updating land cover or habitat maps. When new maps are produced, the basic information in the GIS is updated and new assessment maps are prepared to be used in territorial analysis and planning. In some cases, the Provincial Government of Barcelona can use its own resources to update some specific and minor changes. For some layers that depends on NGOs and/or citizen science, data can be updated more often.

Around 2 MEUR was invested in 2003-2010 to acquire information through agreements with research centres. In addition, the amount of 50.000 EUR per year is needed to update the information. There are two experts on land analysis and GIS who are responsible for updating the information and producing new elaborated layers. They work together with other public administrations, research centres, universities, NGOs, consultants, farmers' unions, etc. The tool has been used in the land planning in more than 100 municipalities. One example has been a new natural protected area declared by the municipality of Viladecavalls after developing the local analysis through the SITxell project. The tool has also been used in spatial plans for protected areas and for strategic plans (hydrology, agriculture). In regional planning SITxell analysis provided a basis for the definition of areas of special protection.

An important factor for the success of the project was the combination of scientific information and strong political support. SITxell tool can be easily transferred to other regions due to its flexibility and adaptability. SITxell project has gained international recognition.

Carles Castell Puig from the Provincial Council of Barcelona: "The important thing to have in mind is the concept of SITxell and to start using the available territorial information in land-decision processes even if just a few layers of information is available. It is better to have a lot of multidisciplinary information that gives a more complex and real vision, but if you just have some basic and specific information, use what you have, but use it! Our advice is not to see SITxell project as a package of hundreds very expensive layers of information. We are here after 15 years, but the project already had sense, impact and benefits from the very beginning, with only a few layers of information. Because what is important is the concept, the willingness to collaborate and the involvement of the different stakeholders".

<https://www.interregeurope.eu/policylearning/good-practices/item/679/use-of-biodiversity-data-in-decision-making-the-sitxell-project/>

Using digital tools for spatial planning in the Seascape Character assessment, HERICOAST

The preparation of a Strategic Environmental Assessment required by EU SEA Directive for the County Development Plan (CDP) 2012-2018 identified a gap and set an objective to provide a Seascape Character Assessment (SCA) within a Landscape Character Assessment for Donegal, Ireland. To carry out the SCA, digital tools for spatial planning were used to collate data and inform analysis of the marine and coastal environment. In addition, extensive consultation, desk research and field work were carried out, and workshops were organised as part of the process. The digital data was used to inform the Seascape Character Assessment, facilitate consultation and as part of the interactive finished SCA product.

The pros of the digital applied tools were extensive; it allowed a quantifiable evidence base via a GIS format that was developed in a user friendly manner meaning that at any point on the interactive GIS mapping, the layers of digital data and background information are available. A digital public consultation process was developed and this process was also point specific so that the comments were automatically mapped and the associated text and comments captured in a spatial manner. The adopted SCA is also an interactive tool that can be used by members of the public and to inform land use plans and funding applications within the county as all of the information and pertinent data is contained at one location. The nature of the GIS system developed also facilitates updates to the spatial data fields. SCA is considered a good practice because of its applicability in different domains. The practice is an ongoing work in progress raising awareness of the value of the coastal resources and the importance of appropriate management. The main stakeholders are all citizens but in particular those in coastal communities.

To carry out the project, it is necessary to have a GIS expert (team) involved from the very inception. In addition, the success of the project could be dependent on the extent to which existing spatial data exists for the area/region.

The vastness of the heritage assets in each of the Seascape Units challenged the inclusion process. It did however create a window to explore the possibilities for future management of heritage in the context of conservation. The methodology employed in SCA can be adapted and further developed to inform future projects and plans. The integrated approach to spatial planning allows for the allocation of space in a more efficient manner, avoiding decision making on a single sector base. In addition, it provides policy makers with a forum of knowledge exchange from which to inform future intervention and assess opportunities. The practice can provide helpful insight and inspiration to other coastal regions motivated to preserve and manage their heritage through an informed and objective approach.

<https://www.interregeurope.eu/policylearning/good-practices/item/821/seascape-character-assessment/>

Nature Information System of the Basque Country, [BID-REX](#)

In Basque Country a bottom-up approach was used to enhance collaboration and networking, as well as knowledge and biodiversity data flow between different systems, data providers and users. These data flows were integrated in a public, open data infrastructure: the [Nature Information System of the Basque Country](#). It is a tool for the integration of available scientific and technical knowledge necessary for the proper development of public competences in the planning, management, monitoring and evaluation processes. The system was also linked to other public repositories of data like [GBIF](#) and to platforms of citizen science like [ornitho.eus](#).

The essential feature of the system is the organisation of the information into interconnected elements (species, habitats, sites, references, occurrences, institutions, etc.). Open access, making data sharing the norm and ensuring that the data can be understood and used across systems and disciplines are also important aspects of the system.

The Nature Information System collaborates with the Society of Sciences Aranzadi, the University of the Basque Country, and AMBAR, the Society for the study and conservation of marine fauna. In addition, quality criteria and standard formats were incorporated for the delivery of information in monitoring programs for common birds, butterflies, etc.

A network of knowledge feeds this common technological infrastructure, which interacts with other open data information systems and publish the data needed for decision-making, reporting, education, and dissemination and communication. There were more than 50.000 visits to the website of the system in 2018 and there are 3.600 references, 8.000 multimedia, 1000 collaborators recorded.

The data model that is used to integrate information from multiple sources can be transferred to other regions, since the system is based on international data and metadata standards.

<https://www.interregeurope.eu/policylearning/good-practices/item/1887/nature-information-system-of-the-basque-country/>

What can regions do next?

In the period 2014-2020, Interreg Europe Programme continues to support projects that aim to improve regional policies focusing on nature and biodiversity. In fact, interregional cooperation offers the possibility to share policies and lessons that encourage the uptake of technological solutions for better protection of nature and biodiversity.

- On one hand, regions should improve the processes of collecting and accessing robust biodiversity data as a basis for various applications. Subsequently, the collected data should be used systematically for policy making and decision-making purposes on regional and local levels. Specifically, data managers should provide relevant, useful, and timely data for the needs of decision-makers. This can be achieved in several ways and some of these have been, emphasised by the BID-REX partners: use of participatory approaches and coordinate contact with the end users; involve input and feedback from end users into the data collection approaches and methodology; integrate upstream of the parameters identified by the end users, etc. BID-REX project partners are also preparing a **Guide for public authorities and local stakeholders** which among other themes will focus on improving the skills related to the production, management and use of biodiversity information by all relevant stakeholders.
- There is a need to improve the level of trust between the various data providers. Nature and biodiversity-related data is increasingly available online and for download and use by anyone, as “open data”. Adopting an open data policy is a way to improve transparency and ensure more robust analyses. The **Nature Information System** developed in the Basque Country (Spain) can provide helpful insight to other regions in this regard.
- The use of GIS technologies and the development of GIS databases, which allow for the visualisation and analysis of spatial data on natural assets, can facilitate the planning process on a territory with due consideration given to the protection of environment and mitigation of negative impacts on Natura 2000 sites. The experience with **SITxtell project** can be inspirational and replicated at local and regional levels elsewhere.
- There is a need to strengthen the knowledge base and speed up the application of technology for the improvement of spatial planning and protection of the natural environment, etc. The **Seascape Character Assessment (SCA)** that was carried out through a participatory approach in Donegal county (Ireland) illustrates the usefulness of digital solutions for adopting better informed and objective approach towards spatial planning and managing of coastal heritage assets. Public authorities could also benefit from existing information platforms and tools such as the [Biodiversity data centre](#) (BDC) which provides access to data on species, habitat types and sites of interest in Europe, [ESP Visualization tool \(ESP-VT\)](#) which is an interactive knowledge platform that allows users to share information on ecosystem services, etc.
- Public authorities could use innovative ways of disseminating data, i.e. by providing broader access or more customer-oriented portals, building flexibility into tools, etc. Besides, the use of technologies should be encouraged in facilitating public consultation processes through web-based information platforms and discussion fora.

Sources of further information

- UN, [Convention on Biological Diversity \(CBD\)](#), 1993
- EC, EU [Action Plan for nature, people and the economy](#), 2017
- EC, Directive 2007/2/EC establishing an Infrastructure for Spatial Information in the European Community ([INSPIRE Directive](#)), 2007
- Interreg Europe Database of good practices

#natural heritage
#technologies
#cooperation



Interreg Europe Policy Learning Platform on
Environment and resource efficiency

Thematic experts:

Venelina Varbova

& Ruslan Zhechkov

v.varbova@policylearning.eu

r.zhechkov@policylearning.eu

www.interregeurope.eu

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