



DiSSCo

Harnessing the power of Natural
Science Collections

DiSSCo

Distributed System of Scientific Collections

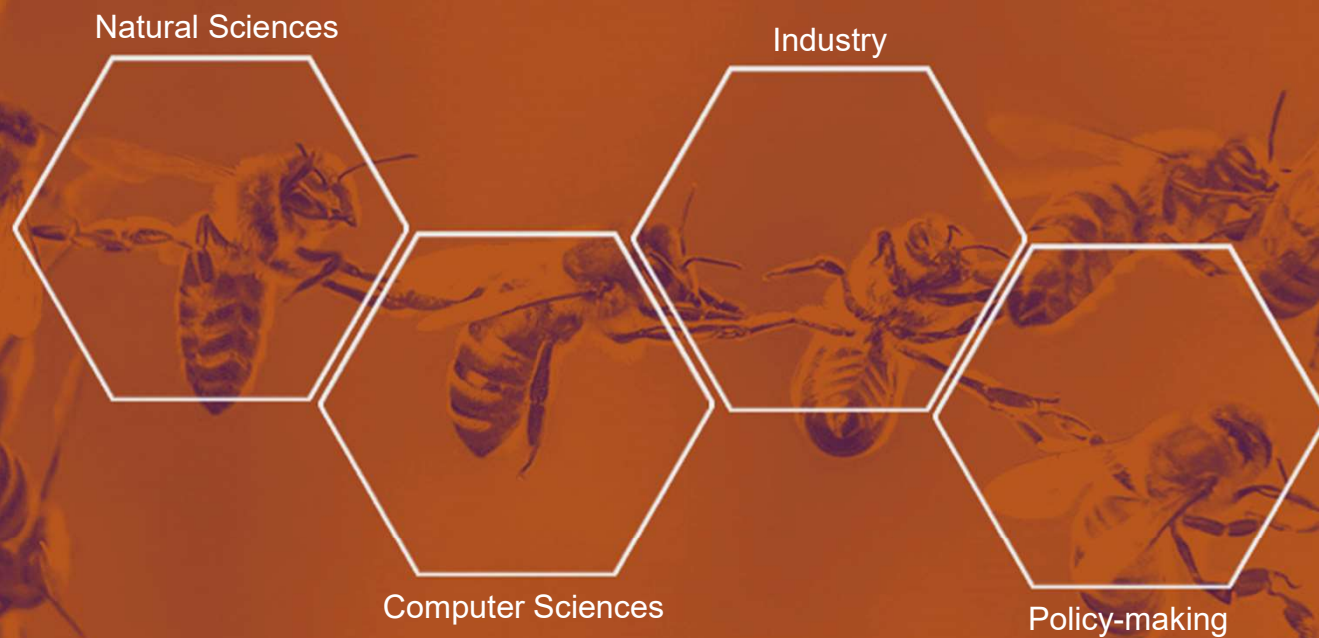
DiSSCo Coordination and Support Office

An aerial photograph of a city skyline, likely New York City, taken from a high vantage point. The image shows a dense urban landscape with numerous high-rise buildings and residential structures. In the background, a body of water (likely the Hudson River) is visible, with a bridge spanning across it. The sky is filled with dramatic, dark clouds, and a bright light source (the sun) is breaking through the clouds, creating a strong backlighting effect and illuminating the city below. The overall mood is somber and dramatic, reflecting the theme of the presentation.

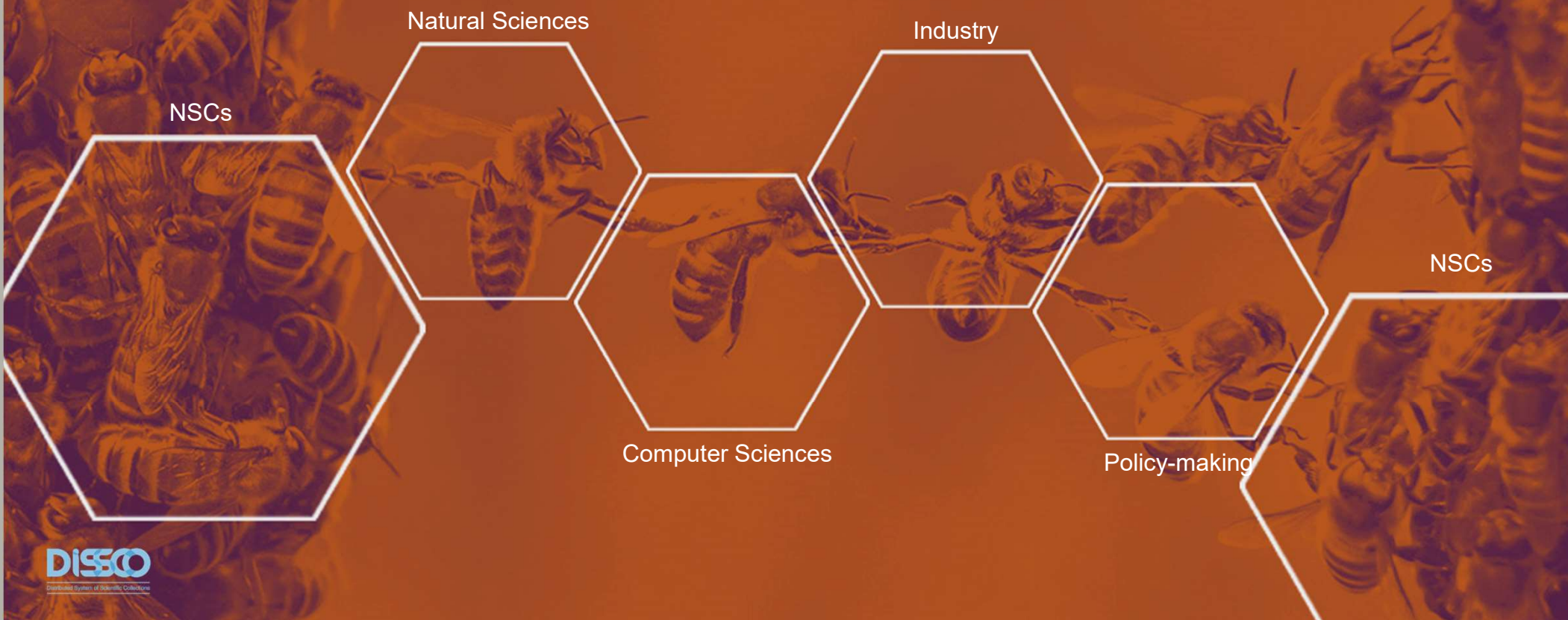
The battle of our times

- Loss of biodiversity
- Threats to our own living conditions

- Multifaceted global challenges call for multidisciplinary solutions ...
- ... and those require access to interconnected information and tools.



- Natural Science Collections (NSCs) have a vital role to play in this fight ...
- ... but some improvement is necessary



We need to embrace the future faster...

- Embrace the new developments: massive digitisation (<10% of 1.5 billion specimens is digitised, even less is published), new forms of data...
- Embrace better integration and interoperability (common policies, technical approaches and standards)

... because we have to give answers

January 14th 2021

The Washington Post Tags: Covid-19, Science

How natural history museums should play a bigger role in finding the sources of wildlife pathogens



A close-up photograph of many bees on a honeycomb, with a teal overlay and the text 'DiSSCo' in the center.

DiSSCo



Distributed System of Scientific Collections

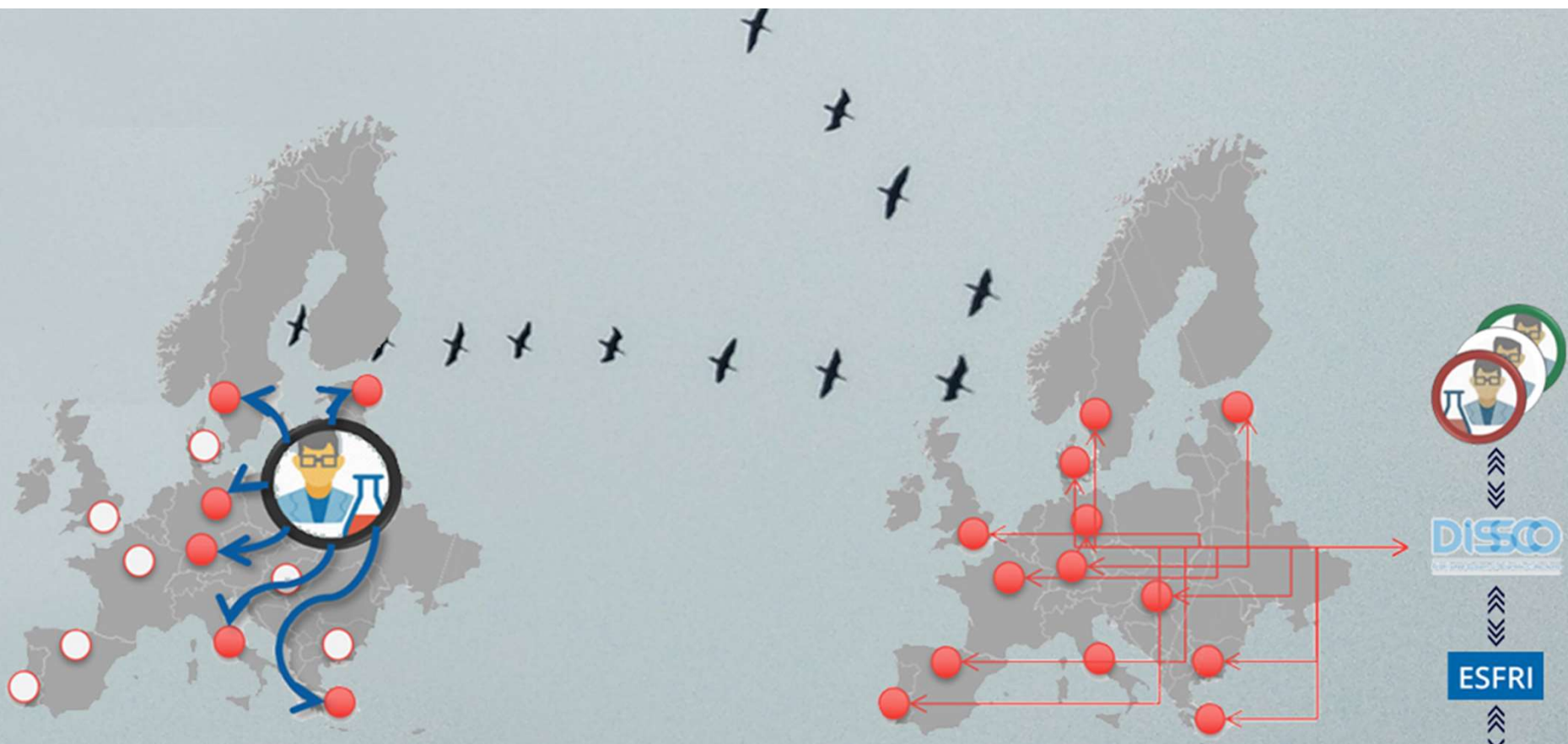
The goal: to digitally unify
today's fragmented landscape
of European NSCs into a single
knowledge base under
common curation, access
policies and practices.

120+ National Facilities,
21 Countries
1 European Collection

DiSSCO members

Austria - Naturhistorisches Museum Wien Belgium - Agentschap Plantentuin Meise - Royal Belgian Institute of Natural Sciences - Instituut voor Natuur-en Bosonderzoek (INBO) - Royal Museum for Central Africa, Tervuren - Flemish Research Institute for Nature and Forest - Royal Zoological Society of Antwerp - Université Libre de Bruxelles, Herbarium - University of Namur - Flanders Marine Institute Bulgaria - Institute of Biodiversity and Ecosystem Research - Bulgarian Academy of Sciences (IBER-BAS) - National Museum of Natural History, Sofia - Bulgarian Academy of Sciences (NMNHS-BAS) Czech Republic - Charles University, Faculty of Science - Institute of Botany, The Czech Academy of Sciences - Institute of Vertebrate Biology, The Czech Academy of Sciences - National Museum, Prague - Nature Conservation Agency of the Czech Republic - Masaryk University Denmark - Natural History Museum of Denmark, University of Copenhagen - Naturhistorisk Museum Aarhus - The Science Museums, Aarhus University Estonia - Estonian Museum of Natural History - Estonian University of Life Sciences - Tallinn University of Technology - University of Tartu Finland - Finnish Museum of Natural History - LUOMUS, University of Helsinki - Biodiversity Unit, University of Oulu - Biodiversity Unit, University of Turku - Digitalium, University of Eastern Finland - Kuopio Natural History Museum - Open Science Centre / Museum, University of Jyväskylä France - Muséum national d'histoire naturelle - Muséum d'histoire naturelle Philadelphie-Thomas de Gaillac - Centre de coopération internationale en recherche agronomique pour le développement - Centre Informatique National de l'Enseignement Supérieur - Nancy Museum-Aquarium - Conservatoire botanique national Alpin - Institut Recherche et Développement - Sorbonne University - La Société Nationale des Sciences Naturelles et Mathématiques de Cherbourg - Le Jardin Botanique de la Ville de Lyon - Muséum d'histoire naturelle de La Rochelle - Université de Toulouse III-Paul Sabatier - Université Lille 1 - Sciences et technologies - Université Claude-Bernard Lyon - Université Clermont Auvergne - Université de Bourgogne - Université de Montpellier - Université de Rennes - Université de Strasbourg - Université Pierre et Marie Curie - Tela Botanica Germany - Bavarian Natural History Collections - SNSB - Berlin Natural History Museum - Botanischer Garten und Botanisches Museum Berlin - Freie Universität Berlin - Centrum für Naturkunde, Universität Hamburg - Senckenberg Gesellschaft für Naturforschung - Zoological Research Museum Alexander Koenig - Museum für Naturkunde - Leibniz Institute for Evolution and Biodiversity Science Berlin - Naturkundemuseum Stuttgart Greece - Natural History Museum of Crete, University of Crete - Mineralogy and Petrology Museum, National and Kapodistrian University of Athens - Museum of Geology and Palaeontology, National and Kapodistrian University of Athens - Museum of Zoology, National and Kapodistrian University of Athens - Botanical Museum, National and Kapodistrian University of Athens - Zoological Museum of the University of Patras - Department of Geology, University of Patras - Botanical Museum of the University of Patras - Museum of Zoology of the Aristotle University of Thessaloniki - Goulandris Natural History Museum - Benaki Phytopathological Institute - Botanical Garden "Ioulia & Alexandros N. Diomidis" - Cephalonia Botanica - Focas-Cosmetatos Foundation - Collection of Micro-organisms, Agricultural University of Athens - Hellenic Collection for Pathogenic Fungi - Herbarium, Agricultural University of Athens - Hippocrates Botanical Garden of Kos - Hippocrates Botanical Garden of Markopoulo - Mycetothea, National and Kapodistrian University of Athens - Natural History Museum of the Municipality of Amaroussion - Phytothea, National and Kapodistrian University of Athens - Sedbank, National and Kapodistrian University of Athens - The Apollon-Delphi Botanic Garden - Hippocrates Botanical Garden of Limnos, University of the Aegean Hungary - Hungarian Natural History Museum Italy - Natural History Museum, University of Florence - National Academy of Sciences Italian National Academy of Entomology - Italian Botanical Society - Italian Geological Society - Italian Palaeontological Society - Italian Society of Biogeography - National Association of Science Museums - National Research Council (DSSTTA) Luxembourg - Musée national d'histoire naturelle (MnhnL) Netherlands - Naturalis Biodiversity Center - Natural History Museum Rotterdam - Natuurmuseum Maastricht - NIOZ Royal Netherlands Institute for Sea Research - Stichting De Bastei (Natuurmuseum Nijmegen) - Stichting Museum - Stichting TwentseWelle - Teylers Museum, Haarlem - NLBIF - University of Amsterdam - Utrecht University Museum - Westerdijk Fungal Biodiversity Institute - Natuurmuseum Brabant - Natuurmuseum Fryslân Norway - Natural History Museum, University of Oslo - Tromsø University Museum - NTNU University Museum - University Museum of Bergen Poland - Museum and Institute of Zoology, Polish Academy of Sciences - The University of Warsaw Portugal - National Museum of Natural History and Science, University of Lisbon (MUHNAC - Ulisboa) - Science Museum of the University of Coimbra (MUC - UC) - Natural History and Science Museum, University of Porto (MHNC - UP) - Botanical Garden of the University of Coimbra (JBUC) Slovakia - Plant Science and Biodiversity Centre, Slovak Academy of Sciences, Institute of Botany - Pavol Jozef Šafárik University in Košice - Comenius University Spain - National Museum of Natural Sciences (CSIC-MNCN) - Royal Botanic Garden of Madrid (CSIC-RJB) - Universidad de Navarra (UNAV) - Instituto Geológico y Minero de España (IGME) Sweden - Swedish Museum of Natural History - Bergius Foundation - Department of Biology, Lund University - Gothenburg Botanical Garden - Department of Biological and Environmental Sciences, University of Gothenburg - Department of Ecology and Environmental Science, Umeå University - Uppsala University, Museum of Evolution - Västärvet, The Gothenburg Museum of Natural History United Kingdom - Natural History Museum London - Royal Botanic Garden Edinburgh - Royal Botanic Gardens, Kew.





Current model

Slow
Fragmented
Expensive
Inefficient
Limited to physical access



Integrated RI model

Global access
Lower costs
Faster
New insights
Optimised
FAIR data



A background image featuring a large number of bees, likely honeybees, clustered together. The image is overlaid with a semi-transparent teal color. The bees are shown in various orientations, some facing forward and others in profile. The overall composition suggests a theme of collective effort or a network.

DiSSCo: more than *just* digitising data

- DiSSCo supports mass digitisation and curation
- DiSSCo links data: DIGITAL OBJECT architecture
- Not just any kind of data: actionable, FAIR data

PHYSICAL SPECIMEN



»»»
Digitisation
Analysis
Computation



DIGITAL SPECIMEN Actionable Knowledge Unit



FAIRdata

Findable
Accessible
Interoperable
Reusable

-

-



DISCO
Distributed System of Scientific Collections

The background of the slide is a teal-colored overlay on a photograph of many bees. The bees are clustered on the left and right sides, with a few in the center. The text 'DiSSCo e-Services' is centered in white.

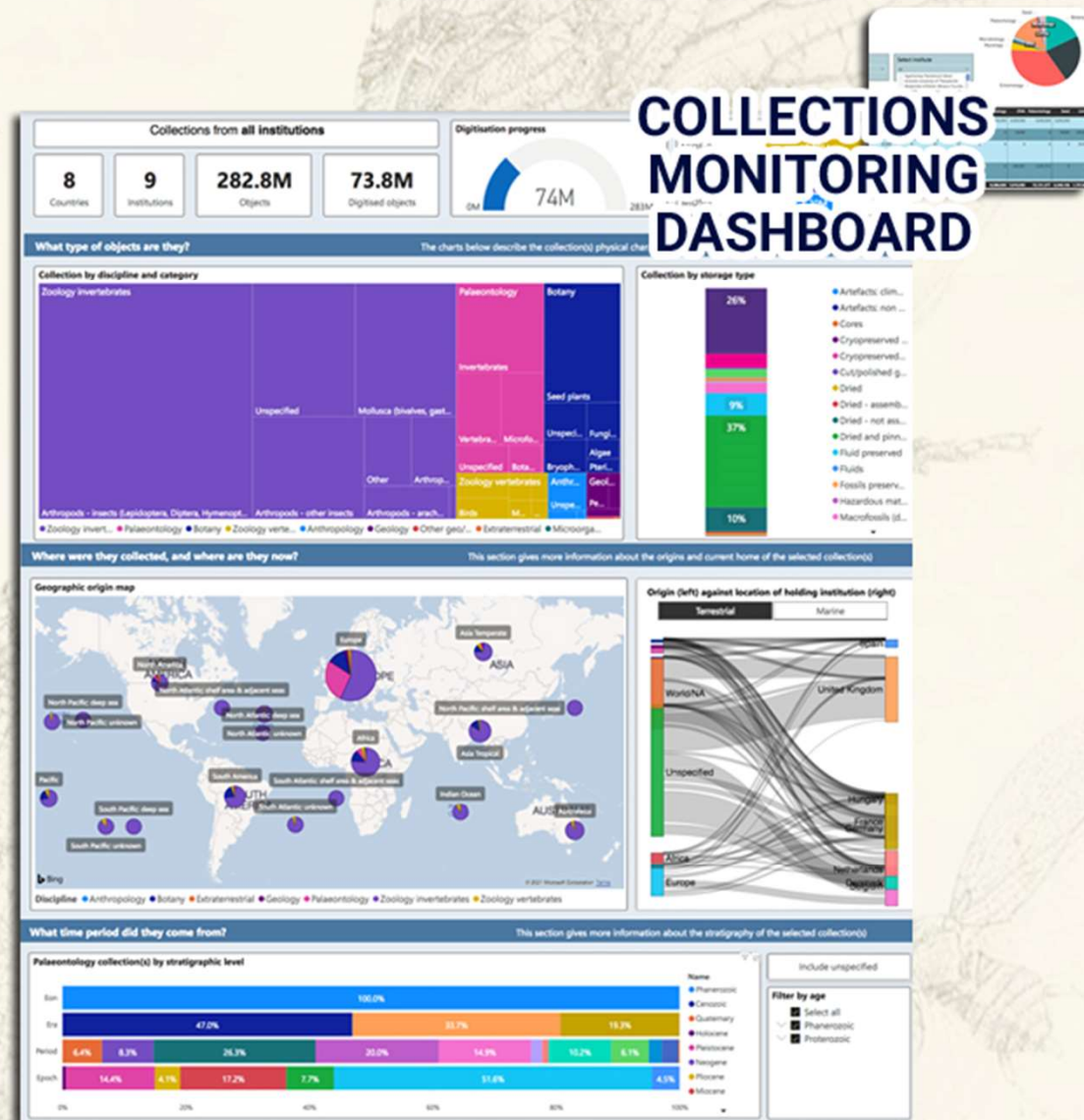
DiSSCo e-Services

**Wider, cheaper, greener:
The time for Virtual Access
to NSCs has arrived.**

- **ELViS provides:**
 - **Virtual Access Application as an addition to physical access to NSCs**
 - **One-stop shop for access to European NSCs**



Evidence base for decision-making (e.g. digitisation priorities)



HOW THE DASHBOARD WORKS:

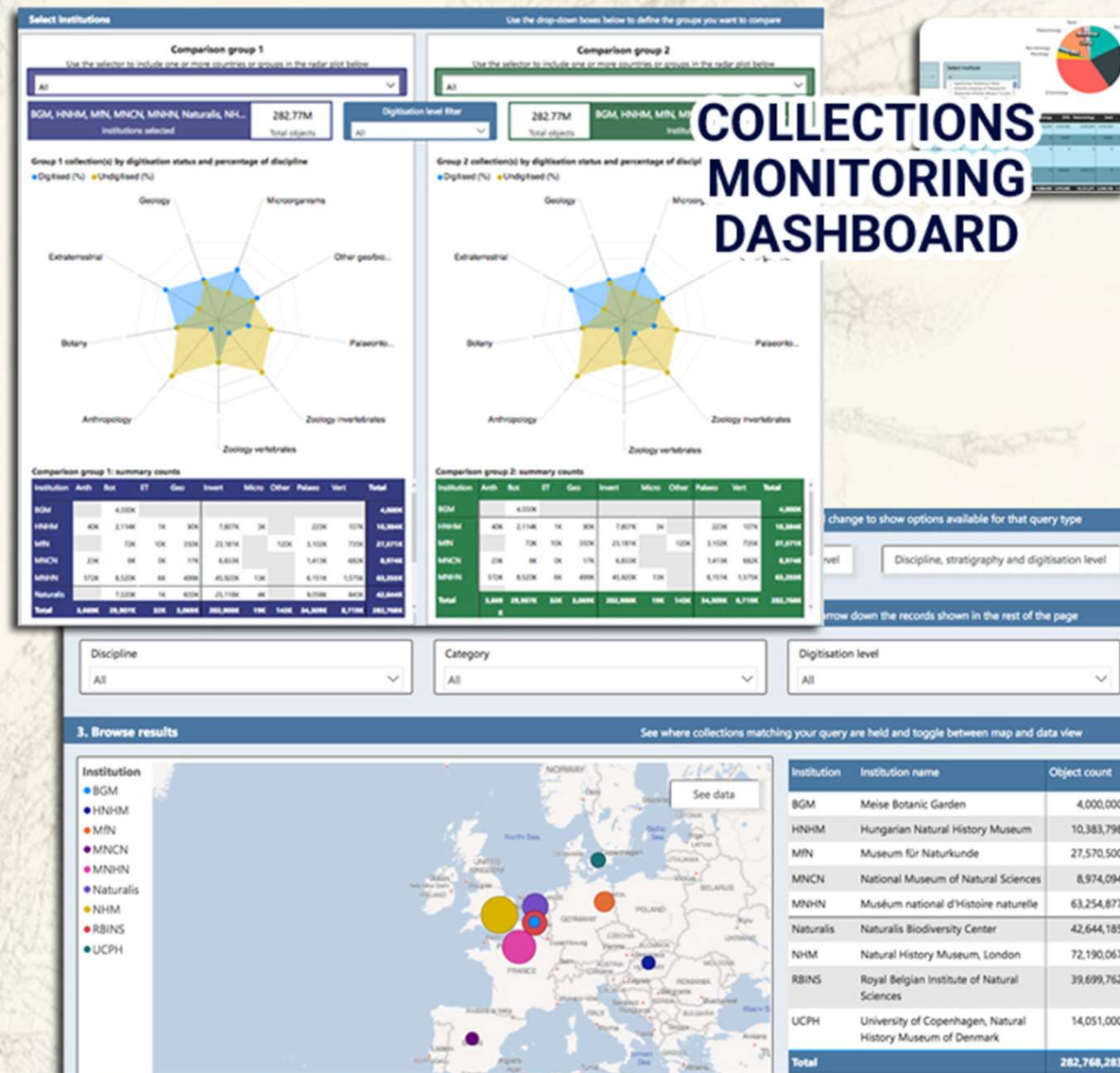
5 classification schemes: discipline, taxonomy, geographic origin, storage type and stratigraphy.

Combined data for all NSCs

Comparison of NSCs strengths

Search of collections based on storage type, digitisation level, classification, etc.

COLLECTIONS MONITORING DASHBOARD



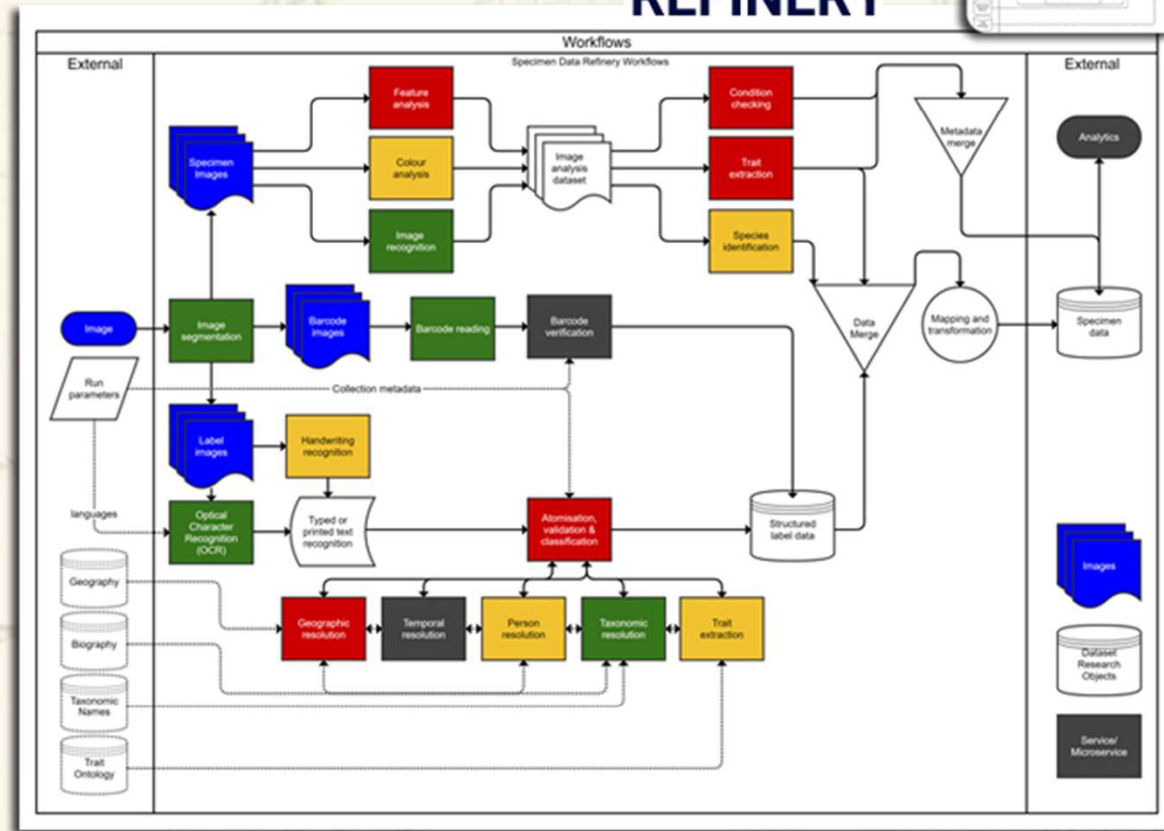
Digitisation *en masse*

- THE SDR provides:

- Extraction technology

Workflow: from image capture to a full specimen dataset.

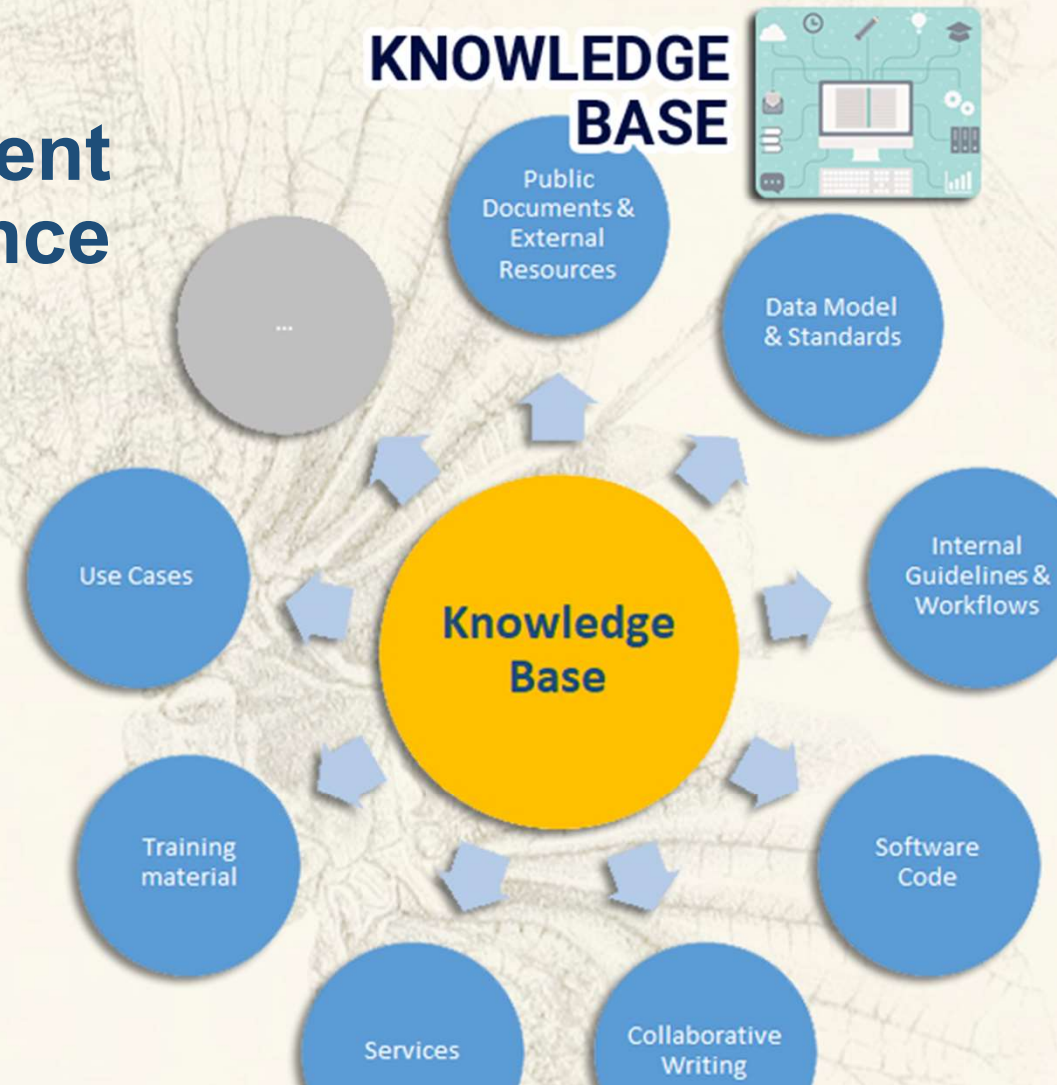
SPECIMEN DATA REFINERY



DiSSCo's commitment to Open Science

- **THE KNOWLEDGE BASE provides:**

- Multi-format outputs of DiSSCo projects and the DiSSCo community openly available
- ... and under FAIR principles

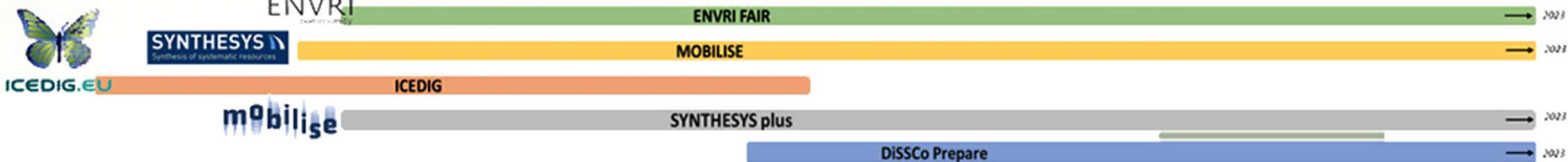
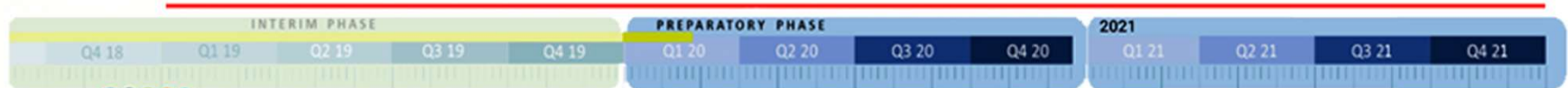
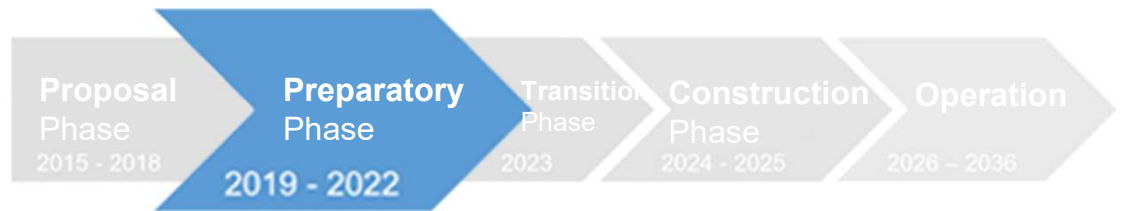


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DiSSCo's current development stage

A research infrastructure in the making...

DiSSCO

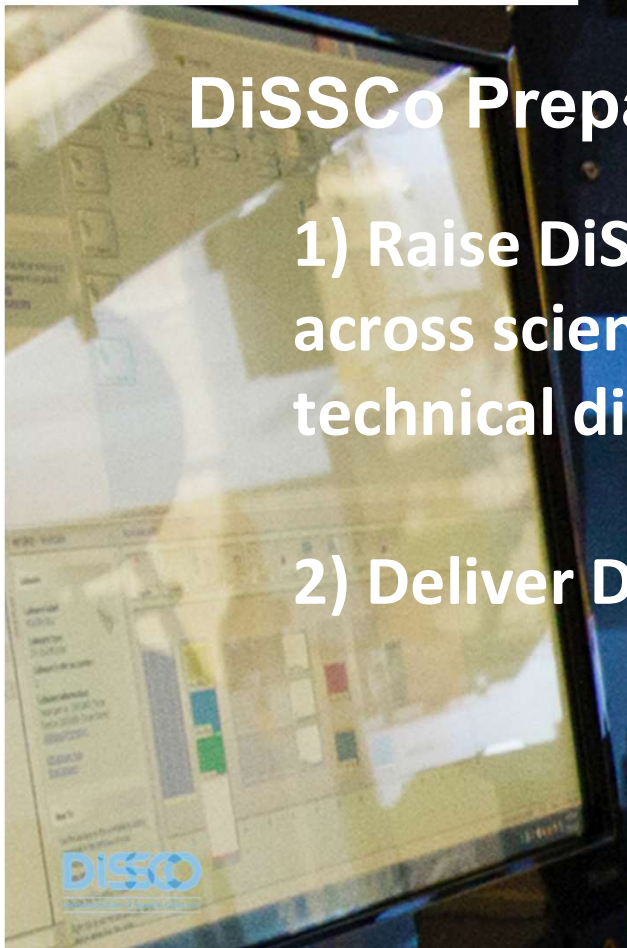


... with a masterplan

DiSSCO
PREPARE

DiSSCo Prepare will:

- 1) Raise DiSSCo's implementation readiness level (IRL) across scientific, data, financial, organisational and technical dimensions.
- 2) Deliver DiSSCo's Construction Masterplan.



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DiSSCo's governance and funding path

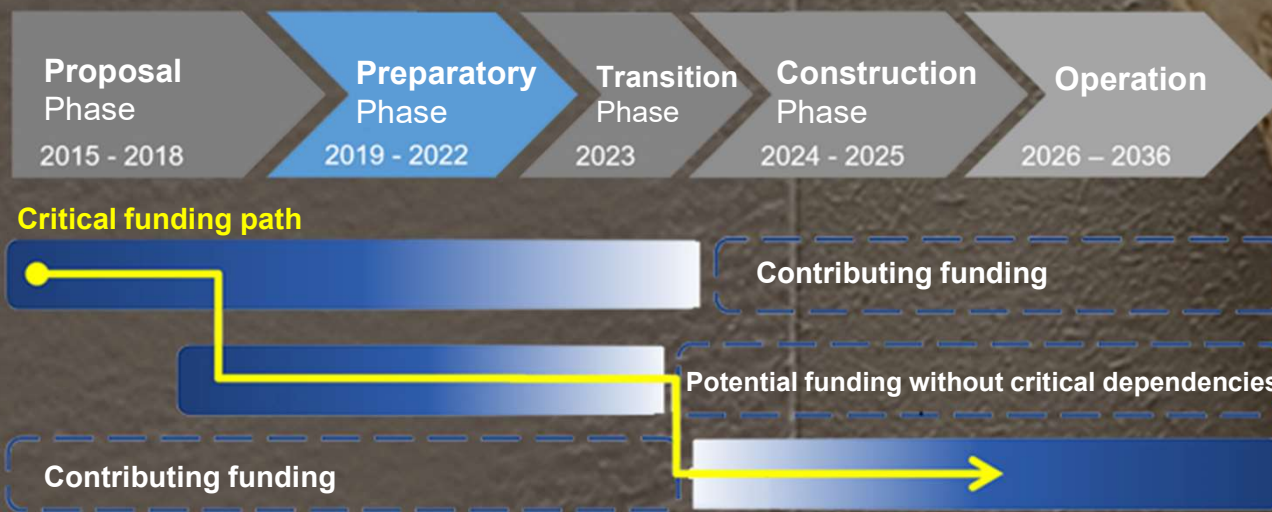
Governance



**Governance
Structures**



Critical funding path





DiSSCo's communications



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Distributed System of Scientific Collections

Providing hard evidence of our
planet's natural diversity



14 key messages

DiSSCo responds

Long-term investment in state-of-the-art science (1) Data research infrastructures are key investments in excellent research to respond to the ever-increasing demand from the scientific community for high volume interconnected information and interoperable tools. DiSSCo meets this need by providing integrated open access to comprehensive, precise and reliable data, services and expertise jointly compiled around a strong partnership that currently gathers 121 natural science collections-based institutions across 21 European countries.

DiSSCo promotes

Unification to complete the data aggregation value chain (2) DiSSCo unifies fragmented and scarce natural sciences collections-related information. DiSSCo adds unique value in the global data aggregation value chain (access, taxonomic curation, validation, data maintenance) by linking a physical specimen to its digital surrogate thereby making the whole greater than the sum of its parts.

DiSSCo opens-up

Liberation of integrated knowledge for complex analysis (3) The use in DiSSCo of shared, aligned and interoperable mechanisms, policies and strategies enables building a unified system that liberates data and interconnects multifaceted knowledge from varied sources, and finally provides access to digitized specimens that become a valuable resource for scientists to carry out large and complex analyses, interpretation and annotation of collections information.

DiSSCo's 14 key-messages

DiSSCo consolidates

Strong scientific community for collaborative work (4) DiSSCo's resilience and sustainability rely on the strength of its scientific community built around CETAF that unites distributed and specialized expertise in geo- and bio-diversity related sciences across Europe. This scientific union has been fortified by a long history of impactful collaboration, countless publications, joint discoveries, and co-development of scientific advancements.

DiSSCo drives

A transformative change in scientific paradigms (5) The realization of DiSSCo promises a paradigm shift to a 'new way of doing science' by enabling specimens to be studied in their rightful, holistic, environmental context where cross-linked information, based on integrated, FAIR and open data, effectively underpins the entire research life cycle yielding more reliable, robust and updated science.

DiSSCo facilitates

Better science from linked geo- and bio-diversity data in its environmental context (6) The 'digital' specimen opens the door to establishing permanent links to a specimen's related attributes (taxonomic, morphologic, geospatial, images, genomics, molecular, literature, etc.) allocated in distributed resources but unified in DiSSCo by means of shared, aligned and interoperable mechanisms, policies and strategies. Open access to this enriched, seamlessly integrated data resource allows scientists to conduct contextual, accurate, quality assured research at a scope and scale previously impossible to attain.

DiSSCo underpins

Good science is the foundation of informed decision-making and evidence-based policies (7) DiSSCo's unique enriched data resources and its associated services underpin informed decision-making and evidence-based implementation of policies. The fit-for-purpose information is not only essential in addressing today's global climate and environmental challenges supporting the tenets of the European Green Deal and European Biodiversity Strategy 2030, but is equally important in fertilizing deployment of the Strategic Research and Innovation Agenda (SRIA) and ensuring strong development of the European Research Area (ERA) over time.

DiSSCo mobilizes

Data mobilization and integrated analysis and modeling (8) DiSSCo is anchored in mass digitization of natural science collections and expert curation to produce a specimen's digital twin. It is therefore essential to clear the backlog of undigitized specimens through a harmonized digitization roadmap across countries, making investments in dedicated staff and equipment, training, capacity building, and systematic programmes, and developing digitization assessment tools.

DiSSCo serves

Convenient services for collections access to a variety of users (9) DiSSCo serves its members and the broader science community by providing a range of associated services, based on standards and protocols that are also aligned with overarching initiatives, specifically the European Open Science Cloud (EOSC). EOSC infrastructure clusters (such as the environmental-related ENVRI) will allocate their services catalogues for disparate communities of users.

DiSSCo fosters

Unified data promotes specialization, capacity enhancement and efficiencies

(10) The DiSSCo European unified collection enriches collective assets and fosters knowledge specialization strategies, capacity enhancement efficiencies in collection management and economies of scale in funding programmes through the alignment and coordination of natural science collection policies, processes, research, and prioritization strategies.

DiSSCo supports

Data hub access supports innovation that contributes to economic growth (11)

DiSSCo acts as a knowledge hub providing data access to multiple users thus contributing to economic growth by enabling knowledge transfer across domains and facilitating innovation as part of its continuing dialogue and cooperation with industry.

DiSSCo accelerates

Consolidated European resources and expertise (12) The consolidated structure, organization and specialization of natural sciences collections resources together with the related expertise through a collaborative pan-European endeavor, and the collaboration with cross-domain initiatives and data aggregators, accelerates discovery and improves scientific responses to urgent societal needs.

DiSSCo advances

Promoting science literacy (13) DiSSCo supports and advances scientific literacy through the educational and historical value of the data contained in the natural sciences collections, through its involvement in citizen-science initiatives for the co-creation of science with impact in social welfare, and through its adherence to the tenets of the Aarhus Convention, which establishes a number of rights of the public with regard to the environment.

DiSSCo amplifies

Global collaboration amplifies impact (14) DiSSCo underpins a global collaborative effort of natural science and other related research infrastructures (e.g. Lifewatch, LTER, ELIXIR) and data aggregators (e.g. GBIF) who are jointly forming a comprehensive Alliance for Biodiversity, anchored in a robust knowledge base that provides multiple top-class services and best practices for a variety of global user communities.

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Thank you!

