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Title
D8.3 Recommendations for a Collaborative Framework

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Abstract
This report presents strategies and recommendations that may be adopted by the DiSSCo Research Infrastructures and other stakeholders in order to develop and nourish industrial innovation.

Companies and the DiSSCo may benefit from the interaction in areas such as industrial supplies to DiSSCo, usage of DiSSCo facilities and knowledge, co-development, innovation activities, joint advocacy, etc. DiSSCo nodes may act as intermediaries between national companies and the DISSCo Coordination and support office, and this may be especially important for DiSSCo to reach out to suppliers and DiSSCo service users in industry and for the co-development of DiSSCo srvices. Inside DiSSCo, the function of an Indistrial Liason Officer is likely to be a key role in many of the proposed strategic recommendations.

The information has been collected from both desktop analysis and direct engagement with stakeholders within and affiliated with DiSSCo and from other entities working in the innovation ecosystem, such as Research and Technology Organisations (RTOs), universities, ministries, companies and regional business associations. The analyses gave input on the most relevant topics for treatment and discussion. The main input was extracted from the DiSSCo Stakeholders working group.

We arrive at five key recommendations under four themes which cover both the internal organisation and priorities within DiSSCo, and strategies and tools for engaging with companies and ecosystems surrounding DiSSCo and its national node activities:

1. Develop a strategy for innovation with industry
- implement measures concerning the DiSSCo internal structure and prioritisation of resources
2. Engaging the innovation ecosystem:
- critical to the interaction with stakeholders in the innovation ecosystem surrounding DiSSCo.
3. Industry collaboration models:
- examine options and perspectives on how to set up industry collaborations
4. Funding structures for increased industry collaboration:
- develop strategies for pursuing supplementary funding for innovation activities in collaboration with companies.

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Recommendations for a Collaborative Framework

DiSSCo Prepare WP 8 – Deliverable 8.3

Vincent Smith, Lisa French, Eva Alonso, Ana Casino, François Dusoulier, Quentin Groom, Anne Koivunen, Patricia Mergen, Katharine Worley

Task Lead: Natural History Museum

NATURAL HISTORY MUSEUM

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Keywords

Procurement, strategic partnerships, DiSSCo, legal
framework, industrial stakeholders

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1. Project Context

This report, alongside the milestones cited below, forms the deliverable of Task 8.3.

Built on the work performed by DiSSCo-related initiatives, Task 8.3 has developed processes to strengthen the linkages and build strategic partnership frameworks with relevant external stakeholders and communities.

The goal of these engagement activities has been to identify synergies, coordinate actions, and develop joint services. Alongside target audiences identified in Task 8.1, this activity has addressed three axes: a) legal: from private (IT partners and other industrial actors) to public (e.g. academia, citizen science); b) field of reference: domain-specific to related entities (e.g. Biodiversity Heritage Library-BHL, Open Access publishers as well as the Research Data Alliance (RDA) and European Citizen Science Association (ECSA), and c) geographical spread: from European to global international coverage.

The task looked at developing procedures to support DiSSCo external collaboration and tendering activities, both collectively and individually. DiSSCo facilities will partner and contract with third parties to obtain the necessary capabilities and services (e.g. computing capacity, collections management tools, digitisation, training and publishing). This task sets out procedures and frameworks to ensure consistent practice and maximise successful outcomes across the consortium. It also considers the wide variety of potential partners and contractors, from businesses of all sizes to publicly or philanthropically funded organisations, social enterprises, and research organisations.

The output forms a set of recommendations for alignment and cooperation with the different stakeholders as DiSSCo works towards the definition of a collaborative framework between DiSSCo and its related partners.

Task Partners
Natural History Museum, London (NHM)
Consortium of European Taxonomic Facilities (CETAF)
Finnish Museum of Natural History (Luomus)
Meise Botanic Garden (MeiseBG)
Muséum national d'Histoire naturelle (MNHN)
Naturalis Biodiversity Center (NBC)

2. External Stakeholder Groups

The Distributed System of Scientific Collections (DiSSCo) is part of an international landscape of bio-, geodiversity, environmental and life sciences-related research infrastructures and organisations. This report provides context on DiSSCo's current positioning within this landscape and identifies opportunities for future alignment and cooperation. The outputs from this report will help to inform future stakeholder engagement plans and prioritisation.

A stakeholder analysis workshop (Fitzgerald *et al,* 2021, von Mering *et al,* 2021) identified the key stakeholders within this domain, with the Global Biodiversity Information Facility (GBIF), Catalogue of Life (CoL) Geoscience Collections Access Service (GeoCASe), Biodiversity Information Standards (TDWG) and the International Barcode of Life all classified as having high influence and interest in DiSSCo.

From this work, seven user groups were identified through user stories, which include a mix of internal and external users from within and outside the DiSSCo Community. These user groups are:

- Research communities (academic and some non-academic, including citizen science communities)
- Collection management
- Technical support (IT & IM)
- Policy (institutional, national & international)
- Education (academic & non-academic)
- Industry
- External (media & empowerment initiatives)

3. Research Infrastructure & Bio/Geodiversity Organisations

DiSSCo operates within a complex landscape of biodiversity, geodiversity, environmental and life science research/data infrastructures and organisations. Milestone 8.6, "Identifying Indicators for Alignment", identified stakeholders within this domain in order to identify opportunities for alignment and cooperation within this sphere (French *et al.,* 2021a).

A stakeholder analysis map was created, analysing the influence and interest these organisations have in DiSSCo activity (Figure 1, French *et al.* 2021a).
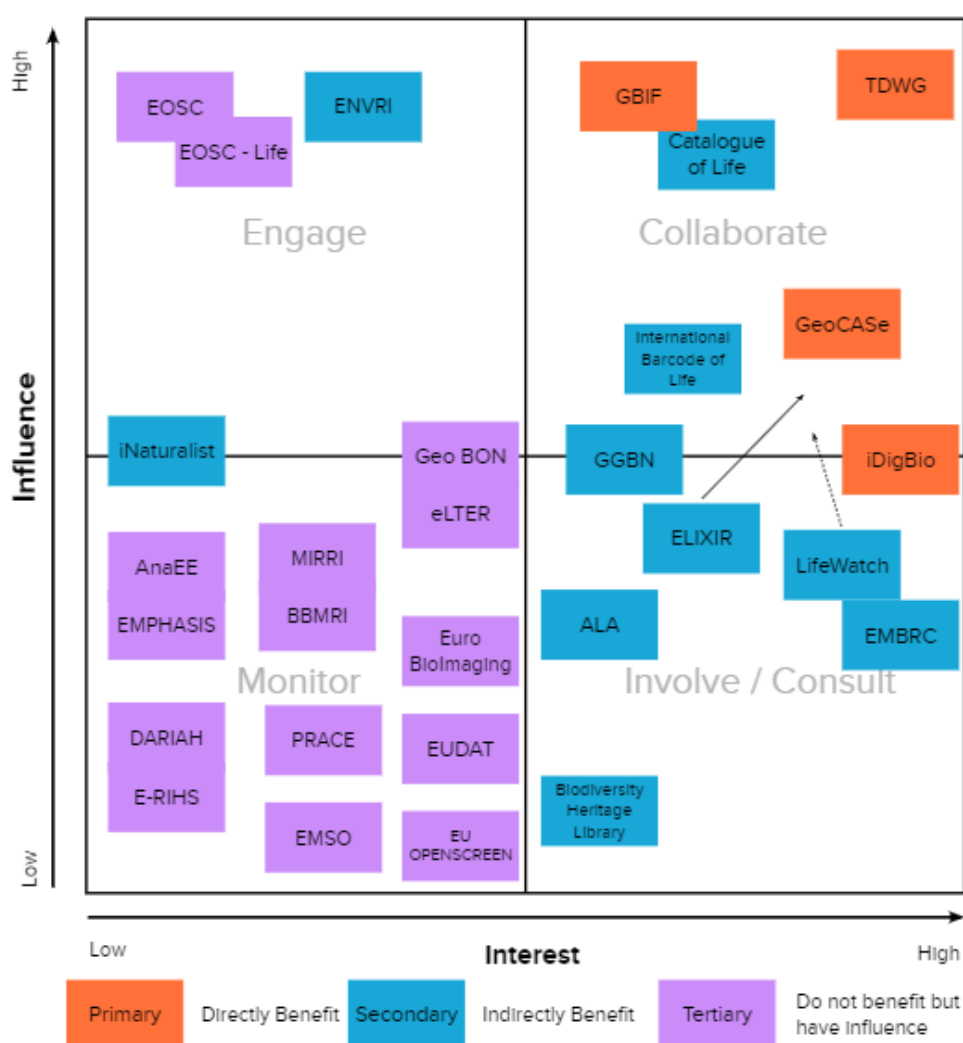

Figure 1: DiSSCo Research Infrastructure Stakeholder Map. Stakeholders were classified based on their level of influence and interest (indicated by the position on the map), and whether they were primary, secondary or tertiary stakeholders (indicated by colour). The arrows for ELIXIR and LifeWatch indicate these infrastructures are considered likely to have more influence in future. Taken from French *et al*, 2021.

The original version of the map was developed as a Mural dashboard and can be viewed at:
https://app.mural.co/t/nhmdissco2939/m/nhmdissco2939/1634304112815/c1f1930470d6efa853
ddb361d08137c2af2b32cd

4. Contact Zones

This stakeholder map was further supported by insight from the infrastructure contact zones analysis, which identified areas of contact between organisations and suggested areas where collaboration and strategic alignment would be beneficial (Smith *et al.,* 2021)

Since the publication of this milestone, the contact zones analysis has been published (Smith 2022). The survey assessed the contact between the infrastructure organisations by capturing the breadth of activities for each infrastructure across five categories (data, standards, software, hardware and policy) for nine types of data (specimens, collection descriptions, opportunistic observations, systematic observations, taxonomies, traits, geological data, molecular data and literature) and for seven phases of activity (creation, aggregation, access, annotation, interlinkage, analysis and synthesis). This generated a dataset of 6,300 verified observations, which have been scored and validated by leading members of each infrastructure organisation. The resulting data allow high-level questions about the overall biodiversity informatics landscape to be addressed, including the greatest gaps and contact between organisations.

This dataset and methodology for quantitatively assessing present and planned infrastructure activities hold considerable promise to support cooperation and planning amongst biodiversity informatics research infrastructures. In the first instance, expanding the dataset by adding closely related infrastructures and networks, such as TDWG (Biodiversity Information Standards; https://www.tdwg.org/), MIRRI (Microbial Resource Research Infrastructure; https://www.mirri.org/), iDigBio (Integrated Digitized Biocollections; https://www.idigbio.org/) and ALA (Atlas of Living Australia; https://www.ala.org.au/), would be beneficial to provide a more complete picture of the biodiversity informatics landscape. A more complete assessment of eligible infrastructures might draw on recent reviews of the biodiversity informatics domain, starting with the requirements set out in the OECD Megascience report from 1999 on biological informatics (OECD 1999).

Another limitation of our approach is that the methodology depends on self-assessments that were only validated and reviewed by the survey team. This could be improved through a larger community survey by asking more independent network stakeholders to assess a research infrastructure's coverage and maturity and by comparing these results with the self-reported scores of the research infrastructure. In the longer term, more automated methodologies, such as those used by various FAIR-metrics working groups within the Research Data Alliance (https://www.rd-alliance.org/), European Open Science Cloud (https://eosc.eu/) and Go-FAIR (https://www.go-fair.org/) communities might provide inspiration for building more objective evaluation criteria.

More refined data visualisations, dynamically constructed off of a growing dataset of research infrastructures would also be useful to support the strategic development of service provision by these infrastructures, as well as identifying gaps in the landscape.

Further generalisation of the method, including an expansion of the Scope, Phase and Category terms to encompass activities in other domains beyond biodiversity informatics, has the potential to broaden the application of this approach, potentially providing an evidence base when considering strategic investments in a much wider range of research infrastructures. For example, this approach has the potential to support investment decisions by funders (e.g. ESFRI, the European Strategy Forum on Research Infrastructures; https://www.esfri.eu/), which is a strategic instrument used in Europe to develop the scientific integration of research infrastructures. The dataset and tool also have the potential for associated infrastructures like EOSC, and the European Open Science Cloud (https://eosc-portal.eu/). EOSC's efforts to address the cloud-computing need of other infrastructures may benefit from a deeper understanding of the current and future of potential user communities when planning targetting application of their services.

The Contact Zone analysis identified a set of major stakeholders aligned to DiSSCo's area of operation. A summary of these associations is provided here;

Biodiversity Heritage Library

The Biodiversity Heritage Library is a worldwide consortium and aims to make biodiversity literature openly available through digitisation. This is reflected in their scoring in the contact zones analysis. Most of their current activities at a Maturity Index of 2 and above (P2 and above) are within the Literature scope (62%, 29 activities), and this remains the focus of BHL's future ambitions.

Catalogue of Life

 The mission of the Catalogue of Life is to provide a freely accessible list of species across all taxonomic groups. It currently has a tight remit, with P2 and above activities within two scopes: Biological taxonomy/classification (64%, 27 activities) and Literature (36%, 15 activities). Catalogue of Life has ambitions to slightly broaden this scope, with some presence in all scope areas apart from Geology and aims to increase its activity within Literature (from 15 activities to 22).

ELIXIR

ELIXIR aims to coordinate and develop life science resources in Europe, focusing on molecular/genomic bioinformatics resources. It has P2 and above activities in most of the scope areas, including Molecular (26%, 35 activities), Biological Taxonomy/ Classification (18%, 25 activities) and Biological Descriptions/Traits (17%, 23 activities). ELIXIR aims to keep this broad remit in future, with only a slight increase in the activities in which it has at least a presence - from 135 to 148.

eLTER

eLTER is a new European research infrastructure in its preparatory phase of development. It aims to improve the scientific understanding of terrestrial, freshwater and transitional water ecosystems through a socio-ecological approach to studying these systems. eLTER's current activities are highest in Literature (25%, 23 activities) and Observations (Systematic) (22%, 20 activities). In the future, Observations (Systematic) will remain important (18, 34 activities), but there is an increasing focus on Geology (from 13 to 34 activities). eLTER will continue to have many P2 and above activities within the context of Literature (17%, 33

activities) and will also increase its activities within the Observations (Opportunistic) scope (31 activities, 16%).

GBIF

GBIF is a global network and data infrastructure that provides open access to data about life on Earth, as well as common standards and open-source tools to enable the sharing of information about where species have been recorded. It currently has many activities at P2 and above (214 out of 315 possible activities). GBIF has the least concentration of activities within the scope of Geology. GBIF plans to continue this spread of activities in future and aims to increase its presence in Geology (from 4 to 12 activities).

GeoCASE

GeoCASE is designed to make data on collections of minerals, rocks, meteorites and fossils easily accessible online. In this regard, GeoCASE aims to be the Earth Science counterpart to GBIF. This mission is reflected in the P2 and above activities that GeoCASe has recorded in this dataset, with most of its ambition scores within the scope of Geology (28%, 24 activities), Specimens (25%, 16 activities) and Biological Taxonomy/Classification (23%, 15 activities). GeoCASE plans to maintain its presence in these areas, as well as increase activity within Biological Description/Traits (from 8 to 16 activities).

iBOL

iBOL is a global research alliance that builds DNA barcode reference libraries, sequencing facilities and informatics platforms with the aim of discovering and identifying multicellular life. iBOL's current P2 and above activities are within four scope areas: Molecular (30%, 34 activities), Observations (systematic) (25%, 28 activities), Biological Taxonomy/ Classification (24%, 27 activities) and Specimens (21%, 23 activities). This continues in future, with not much change in the activities it aims to be at P2 and above, although it does aim to slightly expand into the Biological Description/Traits scope (7 activities).

iNaturalist

iNaturalist allows naturalists and citizen scientists to record their observations of biodiversity via mobile apps or through their website, with their research-grade findings shared with GBIF. The majority of iNaturalist's P2 and above activities currently focused on Observations (Opportunistic) (28%, 21 activities), Biological Descriptions/Traits (28%, 21 activities) and Biological Taxonomy/Classification (25%, 19 activities). iNaturalist is a well-established infrastructure with a relatively narrow and distinct niche and does not aim to widen the breadth of its P2 and above activities in future.

LifeWatch

LifeWatch is a European Research Infrastructure Consortium (ERIC) that provides services to biodiversity and ecosystem researchers, helping to address planetary challenges. LifeWatch currently has a P2 and above in most activities relevant to the biodiversity informatics domain, with a presence in most activities in every scope (286 out of 315 activities). Although LifeWatch does not plan to significantly increase this breadth in the future, this survey was completed before the development of a new five-year Strategic Working Plan, launched in June 2022

5. Industry & Commercial

Industry as Partners and Suppliers

The DiSSCo RI will require strategic partnerships with industrial partners, and many of these partnerships will rely upon a procurement framework. DiSSCo will work with partners to co-create services and co-develop products such as software and will contract with third parties for goods and services. A clear procurement strategy allows an organisation to align its long-term priorities and objectives with its procurement processes, helping with partnership development, scaling up processes, risk mitigation and cost efficiency.

This document acts as a policy briefing on the key areas of a procurement strategy that DiSSCo will need to consider as it moves into the construction phase. There are close links with other DiSSCo Prepare (DPP) tasks. DPP Task 4.4 worked with a technical partner to develop a roadmap for pre-commercial procurement, and this milestone provides background material that will then be further developed as part of this task. DPP Task 7.2 analysed legal entity models for DiSSCo, and their suitability for achieving DiSSCo objectives, and this had a direct impact on the final procurement framework for DiSSCo. Similarly, this task has links and may build up on top of experiences gained in the SYNTHESYS+ project, and specifically from work developed in Task 5.3 devoted to industrial engagement.

This procurement framework is considered from the perspective of DiSSCo as a buyer of goods and services rather than as a supplier. However, many of the principles discussed in this document will apply to other types of partnership working.

Procurement Landscape

DiSSCo will operate in an environment which will bring both challenges and opportunities to procurement. Assessment of the procurement landscape can highlight areas where risk management is required and the potential opportunities that can be exploited through innovative procurement practices.

The timeline and procurement needs for DiSSCo will be identified throughout the preparation and construction phases. The DiSSCo Conceptual Design blueprint outlined three areas of potential future need for procurement:

- Access to storage capability through third-party repositories
- Digitisation processes and procedures
- Persistent identifier minting and resolution mechanism

There may also be requirements for the procurement of support and training services, as well as the construction of digital services supporting DiSSCo systems and processes. There is potential for co-creation with commercial innovators in areas such as artificial intelligence, software development, geo-localisation, imaging, and data storage (Hardisty *et al.,* 2020).

The creation of DiSSCo as a legal entity will shape the regulatory requirements of the organisation, and decisions will need to be taken on how procurement will operate between and within the distributed national nodes and with the institutions involved in DiSSCo. DiSSCo may adopt a 'Centres of Excellence' model, and the DiSSCo Conceptual Design blueprint identified four potential service clusters of digitisation-related services (digitisation, programme, infrastructure and data). These Centres of Excellence would operate at different organisational levels within DiSSCo, from institutional to pan-European. Digitisation services may be better suited at an institutional level, whereas the programme and data clusters are

likely to benefit at being organised at a pan-European level. A further consideration is required on how procurement will be aligned to these different levels of governance and coordination, as it is currently unclear where the boundaries will be between DiSSCo and institutional responsibilities (Hardisty *et al.*, 2020, Dixey *et al.,* 2020).

External factors will also impact the procurement landscape. The Covid-19 pandemic has resulted in disruptions to many supply chains, with organisations now investing in technologies to improve supply chain resilience. There is continuing regulatory uncertainty following Brexit, and there may be future divergences in the legislative environment around areas such as data sharing, General Data Protection Regulation (GDPR) and procurement directives. However, these are currently still closely aligned.

Ethical and sustainable issues are also becoming ever more critical as considerations for buyers, with organisations facing potential reputational risks. Given that DiSSCo aims to support research into biodiversity and climate change, it is important that sustainable practice is embedded into all organisational processes towards a green operational scheme. DiSSCo can use its purchasing power to motivate suppliers to reduce their environmental impact, and sustainability considerations should be integrated into all procurement activity. The European Commission, under the Green Deal framework, continues to encourage green public procurement and supports the inclusion of green requirements in technical specifications.

6. Recommendations

Based on the stakeholder analysis, contact zone study and analysis through related milestones, the authors of this work make the following series of recommendations to take forward as part of the construction stage for DiSSCo:

- **DiSSCo should consider developing a catalogue of services targeted at the private sector.**
  A dedicated catalogue of services is developed in the frame of DiSSCo to address DiSSCo private sector clients/users by defining and implementing strategies for strengthening RI innovation-cooperation awareness and preparedness and promoting industry uptake of DiSSCo services in compliance with FAIR standards. The data collection for the catalogue should be based on a survey aiming at analysing the current state of the relationship between DiSSCo and the private sector and drawing recommendations for strengthening this cooperation.

- **DiSSCo should create an Industry Strategy.**
  This should describe how DiSSCo will support innovation and collaborate with industry (including a specification of the industrial strategy for DiSSCo national nodes). The strategy should link to the business plan development specified in DiSSCo Prepare WP4.2. The strategy should also include objectives on how to increase usage of DiSSCo services by industry and a clear specification of how industry accesses DiSSCo services to provide them with a DiSSCo services access plan.

- **DiSSCo should consider hiring an Industrial Liaison Officer.**
  This function might sit within the DiSSCo Coordination and support office or sit in a distributed manner across DiSSCo national nodes. As part of the remit for this post, a business development function for DiSSCo should be considered. Likely, this will include building relationships with relevant companies and developing a market understanding. The remit should also cover collaboration with national nodes/institutions and other Research Infrastructures.

- **DiSSCo should develop a procurement Statement of Intent/Vision/Strategy.**
  This should outline objectives, goals and guiding principles of procurement. Our analysis by the stakeholder engagement group suggested this includes:

  - A supplier relationship management framework:
    - This would help to reduce costs, manage the performance of suppliers, manage supply risks, which we consider particularly important in the current environment, and encourage innovation with strategic partnerships. The framework should aim to foster collaboration and co-innovation with strategic suppliers and develop joint goals and objectives. To be effective, it would need appropriate governance processes, and it is clear who is managing supplier relationships.

- Innovation procurement:
  - This would consider how to encourage innovation in standard tenders, e.g. SME participation in procurement. Detailed options for this are outlined in MS8.4 [also PCP/PPI] and were also looked at in WP4.

- **Develop a stakeholder advisory body that includes relevant industrial representation.**
  Critically this advisory body should Include SME representation to ensure balanced representation and considerations from a wide selection of small and medium-sized businesses operating in a related sphere to DiSSCo.

7. Conclusions

The report has presented best practices and strategic recommendations that should be used by DiSSCo seeking an improved relationship with industry. We have focussed on four themes which cover both the internal organisation and priorities within the RI, and strategies and tools for engaging with companies and ecosystems surrounding the RI:

• Organisational support for innovation
Most important is to develop a strategy for long-term collaboration with industry and get buy-in from DiSSCo management and stakeholders – as well as the individuals working with industry at DiSSCo nodes. The internal organisation must support the strategy and, most importantly, define the role and responsibilities/expectations if DiSSCo prioritises this role. We also recommend setting up an industry advisory board and looking into other processes inside the RI for supporting innovation, e.g., if an incentive structure for creating spin-out companies should be developed.

• Engaging the innovation ecosystem
When it comes to industry collaborations and innovation, DiSSCo must recognise that they only represent part of the innovation landscape in this sector. Instead of investing huge efforts into building new portals and structures for industry engagement, it is considered more cost-effective to engage with the innovation ecosystems already in place. Industry clusters and universities represent the main actors, and every DiSSCo node should work out a plan for collaborations -especially for local systems.

Distributed facilities within DiSSCo must also align expectations with their partners on handling industrial collaborations. Special recommendations have also been made on further exploiting the already existing industrial networks.

• Industry collaboration models
Several pitfalls concerning making contracts with industry have been identified, the most significant being confidentiality and liabilities. For collaborations such as co-development/collaboration, innovation procurement and service models, we encourage DiSSCo to set up standard formats with clarity on what are the ultimate requirements and what is up for negotiation.

• Funding structures for increased industry collaboration
Additional public funding to support innovation and collaboration with companies should be pursued by DiSSCo. It is important to be aware of both national and European initiatives that support collaboration, especially SMEs in the interaction with DiSSCo.

For now, DiSSCo must decide which of the above measures to implement. But we encourage DiSSCo management to carefully examine each point and make an active choice on which items to focus.

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