



Danish National strategy for research data management 2015–2018

English summary





Contents

Preface	
Executive summary	
About the strategy	
Strategic focus areas—recommendations and implementation	5
Action plans and financing	10
Selected references	
List of annexes	





Preface

Research data are important assets for the Danish universities as well as for Denmark—both scientifically, economically, and financially. The amount of research data is increasing, as are the requirements for long-term preservation of the data. Data management is, for example, a key element in the 'Danish Code of Conduct for Research Integrity' published at the end of 2014, which poses common challenges of financial, technical, legal, and political nature for the institutions.

The purpose of this strategy is to ensure Denmark better and more competitive research through efficient collection, securing, dissemination, and reuse of relevant research data.

The strategy was adopted by DeIC (Danish e-Infrastructure Cooperation) and DEFF (Denmark's Electronic Research Library) on the basis of a draft prepared by the Steering Group for National Data Management, which has been submitted for consultation with the primary stakeholders—the Danish Rectors' Conference, the eight universities, and the preservation institutions (the Royal Library, the State and University Library, and the Danish National Archives).

Danish Regions, registers, research councils, foundations, and government research institutions were not represented, and any implementation of the strategy within the latter area should therefore be considered separately, and the dialogue with these parties should be promoted in the future process.

As a follow-up on the strategy work, DeIC and DEFF, in collaboration with universities and preservation institutions, have agreed to finance combined efforts in the data management area by contributing almost DKK 40 million in the period 2015–2018.

This English version of the strategy is a compressed version of the Danish, which, together with identification annexes and other annexes—primarily in Danish—is available at deic.dk/datamanagement.

DelC and DEFF, 30 January 2015.

DelC

DelC is established under the Danish Ministry of Higher Education and Science and provides einfrastructure (computing, data storage, and networks) for research and research-based teaching.

Via an agreement between the universities and the Danish Agency for Science, Technology and Innovation, DelC is required to perform development activities of national and inter-institutional nature, including in the research data management area.

DEFF

DEFF is an organizational and technological collaboration between Danish research libraries, education libraries, and special libraries with the overall objective of ensuring optimum utilization of research-based information resources.

DEFF is of the opinion that the data management area plays a key role, and has thus been involved in projects with this focus for a number of years.





Executive summary

The strategy's recommendations and proposals for action plans and financing cover the following six focus areas:

- Data management policies
- 2. Creation of incentives
- 3. Infrastructure for all stages of the research data life cycle
- Competence development and support for researchers
- Future management structure for the data management area 5.
- Pilot projects

On a national level, there is extensive variation within the main academic areas in respect of the conditions, needs, and preferences in the data management area, and the challenges should therefore primarily be addressed at a more discipline-specific level.

On an international level, national top-down policies without provision of infrastructure and support functions have proved ineffective, whereas parallel and gradual development of local and national policies, infrastructures, and support functions coupled with a strong partnership organization and considerable national financial support have proved highly effective.

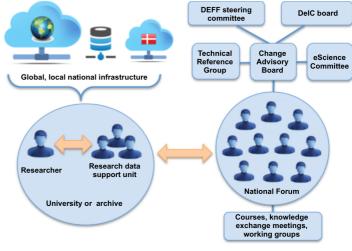
On this basis, the main points of the strategy are as follows:

- That local, discipline-specific and researcher-relevant initiatives at university level are coupled with collaboration at national level with focus on cross-organizational knowledge sharing, projects, and infrastructures.
- That the international nature of the research is taken into consideration to ensure that initiatives as far as possible are based on international experience and collaboration and aim at ensuring a correlation between local, national, and international activities; e.g. that international infrastructure is utilized when possible, and that national and local infrastructure is only established when necessary.
- That DEFF and DeIC facilitate and financially support the process in collaboration with the universities and the preservation institutions (the Royal Library, the State and University Library, and the Danish National Archives).

Provided that the universities and the preservation institutions co-finance the implementation and a viable model for data management going forward, the main efforts for 2015–2018 will concern:

- Establishment or expansion of support functions at the universities within the research data area, which advise researchers on infrastructures and IT tools, documentation (metadata creation/capture) and information organization, legislation, and legal issues.
- Establishment or expansion of similar support functions at the preservation institutions.
- Establishment of a unifying, national forum for the support functions' key figures for the purpose of knowledge sharing and exchange of experience across institutions, as well as for the

purpose of identifying and specifying common infrastructures and support functions.



Launch of a number of pilot projects—discipline-specific projects to support the clarification of best practice within the discipline as well as establishment of a Danish cloud infrastructure for storing and sharing of data.





About the strategy

Background—national and international developments

The website of the Ministry of Higher Education and Science states regarding 'Free access to research data'1:

'The development in digital technology has considerable potentials for scientific research. Methods for preserving, providing access to, and applying research data play a vital role in relation to our ability to exploit scientific research efficiently, including how to avoid double-financed research.

We live in an age where the amounts of data increase exponentially, and in relation to scientific research this both presents challenges and considerable opportunities in terms of making our research more efficient. The challenges consist not least of preserving and organising the enormous amounts of research data without losing sight of important issues in relation to origin, context, internationalization, and safety.

At the same time, the advantages are considerable. With the right infrastructure, researchers from many different research environments will be able to collaborate and share different types of data, thereby strengthening cross-disciplinary scientific research. The researchers will be able to use, reuse, and combine data, thus increasing the research productivity. In other words, an increased accessibility and openness in relation to research data will give researchers the possibility to engage in a new and improved scientific approach that will benefit society considerably.

Giving researchers access to data which have not necessarily been generated within their own field of research has an enormous potential. But in order to be able to realize such a potential, it is necessary to structure our information and data, in a long-term as well as in a global perspective.'

This reflects many of the assessments and expectations which Western governments and research-funding bodies have been communicating in recent years, and which are gradually being translated into requirements.

In Denmark, requirements for handling, archiving, and sharing of research data are seen, primarily on the part of the Danish Council for Independent Research—particularly Medical Sciences and Social Sciences (FSE). For other councils and foundations in general, setting out requirements is considered on a continuous basis, but there are no immediate plans for the implementation of such requirements.

Significant developments are seen abroad. The EU's Horizon 2020 Open Research Data Pilot sets out requirements for planning and executing data management with a view to the widest possible data sharing with other researchers, the business community, and the general public. There is a possibility that the pilot will be converted into a general requirement, as was the case with the Open Access pilot.

Many international journals offer authors the opportunity to describe and link to datasets as part of/annexes to articles, but this is increasingly escalating into a requirement—the prerequisite for peer review/publication, e.g. Nature's 'Policy on availability of data and materials' and PLOS One's 'Policy on sharing of data, materials, and software'.

Research data management is also an important element in the 'Danish Code of Conduct for Research Integrity', which was published in 2014²:

'Responsible conduct of research includes proper management of primary materials and data. The key purpose of data management is to guarantee credible and transparent research. ... Data and primary materials should be retained, stored, and managed in a clear and accurate form that allows the result to be assessed, the procedures to be retraced, and—when applicable—the research to be reproduced.'

The responsibility is distributed between the institutions, which are responsible for preparing research data policies and establishing infrastructures and support functions in the research data area, and the researchers, who are responsible for following the policies, using the infrastructures, and for assessing how much data should be stored for how long.

¹ http://ufm.dk/en/research-and-innovation/cooperation-between-research-and-innovation/open-science/free-access-to-research-data/free-access-to-research-data last modified 8.8.2014

² http://ufm.dk/publikationer/2014/the-danish-code-of-conduct-for-research-integrity





Strategy process

In November 2013, the Danish Rectors' Conference considered a proposal from DelC and DEFF regarding a 'National strategy and process for data management' (Annexe 03). As a follow-up on this, in February 2014, the Danish Rectors' Conference, DelC, and DEFF appointed a steering group for the strategy work, 'Steering Group for National Data Management', with eight members appointed by the Danish Rectors' Conference and three appointed by the Royal Library, the State and University Library, and the Danish National Archives (Annexe 01).

The terms of reference (→ Annexe 02) directed the Steering Group to deliver a draft national strategy, action plans, and financial estimates for six strategic focus areas with a view to adoption by DelC and DEFF and specific national follow-up.

The Steering Group carried out preliminary identification of a number of key conditions as the basis for its conclusions and recommendations:

- A. Grant givers' requirements
- B. Legal framework and challenges
- C. Foreign inspiration regarding policies
- D. Foreign inspiration regarding incentives
- E. Needs and preferences of the Danish academic environments

This identification process—particularly the identification of the needs and preferences of the academic environments—has had a major impact on the Steering Group's understanding of the challenges in the area and thus of the strategy. Several of the conditions identified are, however, based on a limited data basis, and reservations must therefore be made in respect of representativeness. The conditions identified are available at deic.dk/datamanagement (only C and D are in English).

In early September 2014, DeIC and DEFF submitted a draft strategy with associated action plans and financial estimates for consultation with the universities and the preservation institutions. The consultation responses (Annexe 11) showed overall satisfaction with the development of the strategy and its general content, but that an elaboration of the management structure was requested. The strategy was corrected accordingly and finally adopted in December 2014.

Needs and preferences of the academic environments

Key to the design of the strategy is the identification of data management needs and preferences within the five main academic areas—humanities, social sciences, health sciences, natural sciences, and technical sciences (→ Annexe 10).

Overall, the identification process confirmed the real and significant challenges in terms of handling research data within all main academic areas. However, there are examples of (narrower) disciplines where the challenges have been solved—typically in international collaboration, e.g. the European research infrastructure ELIXIR, of which Denmark became a member in 2014.

The variation in needs and preferences is huge, both between the main academic areas and within the individual main academic areas. It is therefore necessary to understand needs and preferences at a more discipline-specific level to ensure that the solutions actually address researchers' needs and promote research data management. This observation is the motivation behind the strategy's discipline-specific initiatives, which must be conducted in a national and/or international collaboration.

However, the identification process also showed that two needs are represented in all main academic areas:

- A dropbox-like infrastructure for easy storage and sharing of data with colleagues in Denmark and abroad—a secure, legal, powerful, user-friendly, and financially attractive solution.
- An offer of advice and instruction which address all phases of the data life cycle and are adapted to the conditions, rules, and best practice within the discipline.

Two of the strategy's focus areas aim at meeting these needs.





Strategic focus areas—recommendations and implementation

1. Policies

In the near future, the universities are expected to initiate processes with a view to drawing up policies on research data management. To facilitate collaboration between researchers across institutions, the universities should share knowledge and work together to harmonize the policies to the greatest possible extent. Information about the development of policies in countries with which research collaboration is practised to a particular extent should continuously be provided for this work with a view to ensuring harmonization, when possible and desirable.

Inspiration: Identification C 'Current Best Practice for Research Data Management Policies' by Simon Hodson and Laura Molloy, May 2014 (→ Annexe 08) and Identification B: 'Legal framework and challenges' (*Juridiske rammer og udfordringer*) (→ Annexe 07) (in Danish).

→ Implementation: Establishment of the National Forum for Research Data Management (see focus area 6).

2. Creation of incentives

Consistent efforts should be made (in national and international contexts) to create incentives for researchers in relation to research data management. Focus should be on:

- Clear and easy-to-understand policies at the universities with the best possible compatibility with the policies adopted by partners and research-funding bodies.
- Competent and easily accessible support functions at the universities, which advise researchers on infrastructures and IT tools, documentation (metadata creation/capture) and information organization, legislation, and legal issues.
- Efficient and attractive IT infrastructure offers that match the needs and preferences within the disciplines.
- Increasing the awareness of research areas in which processing, documentation, and sharing of datasets promote researchers' status and career—for example citation of research data as a means of obtaining academic merit.
- Securing the necessary infrastructure to ensure academic merit through citation of research data in the form of unique and globally recognized identifiers for researchers and datasets.
- Visualization of research data efforts through exposure of datasets and researchers across institutions, nationally and internationally, in accordance with best practice within the discipline.
- → Implementation: Several of the efforts could be implemented through the establishment of the National Forum for Research Data Management (see focus area 6). The remaining efforts are related to the infrastructure area (see focus area 3).

3. Infrastructure

The universities and the preservation institutions should collaborate on establishing clarity about:

- The needs and preferences of the individual research environments and specialized research areas—taking into consideration both local, national, and global solutions and their interaction. Identification of needs and preferences at main academic area level only is inadequate, due to the diversity of the research data challenges and traditions within the individual main academic areas.
- The existing offering of systems and services—locally, nationally, and globally. The most promising systems and services should be tested and evaluated in relation to the needs of the relevant disciplines.
- The systems and services currently lacking to ensure Danish researchers competitive conditions for handling and sharing research data and enabling them to comply with the 'Danish Code of Conduct for Research Integrity'.





→ Implementation:

- Establishment of the National Forum for Research Data Management (see focus area 6).
- Invitation to and funding for projects which, for delimited specialized disciplines, identify research datarelated challenges, needs, preferences, available/lacking systems/services (see focus area 6).
- Establishment of a cloud infrastructure in which Danish researchers can easily, securely, and legally store and share active research data, metadata, manuscripts, etc. with colleagues in Denmark and abroad (see focus area 6).
- Follow-up on and possibly intensification of two ongoing initiatives concerning globally recognized identifiers—e.g. in support of academic merit through citation of research data (see focus area 2):
 - Increased use in Denmark of ORCID, the global digital identifier for researchers (see focus area
 6).
 - Danish service in relation to assigning globally recognized DOI identifiers (see focus area 6).

4. Competence development and support for researchers

The universities and the preservation institutions should establish local offers of support for researchers in the research data management area and collaborate on developing these support functions and competencies. This has four aspects:

- Support functions at the universities and the preservation institutions which can assist researchers with challenges within the areas of information technology (IT infrastructure), information organization, research documentation (metadata creation/capture), and legislation.
- An efficient framework for national collaboration, knowledge sharing, and exchange of experience in the area competence development and support for researchers.
- Close collaboration with the emerging eScience competence centre under the auspices of DelC.
- Kick-start of the local competence development and of the national collaboration through the establishment of a joint train-the-trainer course for the universities' key figures.
- → Implementation: Establishment of the National Forum for Research Data Management (see focus area 6).

5. Future management structure

The local, national, and international efforts under the strategy justify a national management structure.

→ Implementation:

The National Forum for Research Data Management is established as a three-year pilot project which
reports on activities and deliverables to the DelC Board and DEFF's Steering Committee with a view to
annual evaluation and assessment of whether and how the project should be continued (see focus area
6).

The National Forum for Research Data Management is the focal point for the exchange of experience and collaboration on the development of competencies and infrastructures, and the Forum coordinates the Danish efforts in connection with international activities, participates in/follows relevant bodies, follows projects such as ELIXIR across borders, and follows the EU in the open data area. The Forum guarantees that local/national solutions are not developed if foreign solutions can be utilized.

The chairman is appointed by the DelC Board and DEFF's Steering Committee on the stakeholders' recommendation.

 The National eScience Committee under DelC is expanding its activities to include research data management with responsibility for the scientific aspects of the work carried out in the National Forum for Research Data Management.





• The **Technical Reference Group for Research Data Management** (DM TekRef) is established as an open reference group. The chairman is appointed by the DelC Board and DEFF's Steering Committee on the Steering Committee's recommendation.

The Management Change Advisory Board for Research Data Management (DM LedelsesCAB) is established as a management node and is responsible for supervising the national efforts. The Management Change Advisory Board considers recommendations from the National eScience Committee, the Technical Reference Group for Research Data Management, and the National Forum for Research Data Management, and submits its recommendations to the DelC Board and DEFF's Steering Committee for decision.

The Management Change Advisory Board consists of the three chairmen from the above forums and a representative from each of the following bodies:

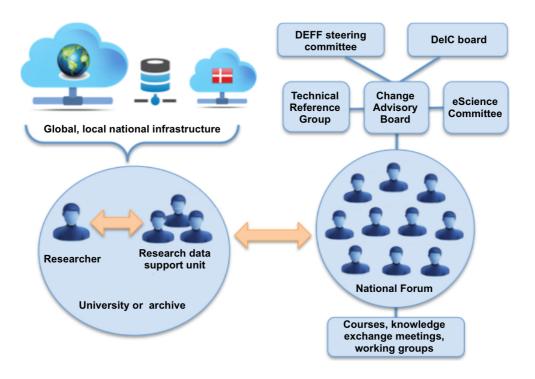
- The Danish National Archives
- The State and University Library and the Royal Library
- The Coordinating Body for Register-based Research (Det Koordinerende Organ for Registerforskning)
- The CIO Forum of the Danish Rectors' Conference

- The Forum operator
- DEFF
- DelC

The Management Change Advisory Board is headed by a chairman appointed by the DelC Board and DEFF's Steering Committee.

The DelC Board and DEFF's Steering Committee consider recommendations from the Management Change Advisory Board and continually evaluates efforts, results, and co-financing with a view to making decisions concerning continued financing of the activities. Two months prior to an upcoming grant period, the chairman of the forum must thus submit an evaluation and a plan via the Management Change Advisory Board to the DelC Board and DEFF's Steering Committee before funds for the next grant period can be released.

• The CIO Forum of the Danish Rectors' Conference is responsible for investigating and coordinating the choice of infrastructure solutions between the universities and for establishing common solutions together with DeIC where this makes sense.







6. Pilot projects

The following contains a more detailed description of the projects mentioned under focus areas 1-5. Generally, the pilot projects consist of a major consolidating pilot project, the National Forum for Research Data Management, which conducts the majority of the strategic recommendations, supplemented by a number of small, specific pilot projects.

National Forum for Research Data Management

The intention is to promote discipline-specific and researcher-relevant initiatives at university level and coupling these in a collaboration at national level with focus on cross-organizational knowledge sharing—as well as cross-organizational projects, where such projects can facilitate and qualify the work performed—and cross-organizational infrastructures, where these are in demand and can be established in a sustainable manner. The assumption is that universities and preservation institutions establish support functions targeted at researchers.

The National Forum for Research Data Management

- Brings together the universities' and the preservation institutions' practical key figures in the area—with competence support, project manager support, and secretarial services from the DelC Secretariat.
- Is the focal point for practical exchange of experience and practical collaboration in the focus areas.
- Is supported financially through the purchase of working time for a chairman (50 per cent of the time) to oversee the activities and for the institutions' key figures (up to 50 per cent of the time that they are allocated to research data management tasks).
- Is involved in areas such as:
 - Training and qualification within the data management area
 - Discipline-specific clarification of needs and identification of discipline-specific best practice
 - Advice and templates in connection with the preparation of data management plans
 - Clarification and advice in connection with metadata creation and identifiers
 - o Clarification and advice regarding legal aspects
 - o Clarification and advice within the technical field
 - o Optimization of the interaction between local, national, and global infrastructures
 - o Communication and marketing of the services offered by the local support units.
- Kick-starts the local competence development through a joint training programme for key figures.
- Identifies the need for common infrastructures and support functions, and is the venue for developing ideas.
- Coordinates the Danish efforts within international development and operating initiatives and follows international collaboration forums such as: Research Data Alliance, Knowledge Exchange, e-IRG, EUDAT, NeIC.
- Every six months, submits a report on the results achieved as well as a plan for the coming six months'
 deliverables and efforts, including project applications, for the approval of the Management Change
 Advisory Board.

Examples of deliverables:

- 1. Policies
 - o Cookbook/inspiration catalogue of elements in research data policies.
- 2. Creation of incentives
 - o Guidelines on management and citation of research data with a view to promote academic merit
 - o Discipline-specific clarification of researchers' needs and preferences.
- 3. Infrastructure
 - Discipline-specific best practice guidelines on the selection/use of research data infrastructure
 - Discipline-specific guidelines on metadata creation in relation to datasets—formats, ontologies, systems
 - o Testing and evaluation of available IT solutions in the data research area
 - o Overview of IT solutions (generic and discipline-specific) with Danish experience and evaluations
 - o Identification and specification of lacking IT infrastructure, if any





- o Guidelines on assigning unique identifiers to researchers and datasets.
- 4. Competence development and support for researchers
 - o Train-the-trainer course for forum members and other staff in the support units
 - o Collaboration on developing discipline-specific courses on research data management
 - o Common repository for course material within the data research area
 - Joint clarification of legal issues
 - Advice and templates in connection with the preparation of data management plans
 - o Common inspiration catalogue for marketing of support functions and services.
- 5. Future management structure
 - Semi-annual reports on performance and results for the approval of the Management Change Advisory Board
 - Semi-annual activity plans for the approval of the Management Change Advisory Board
 - Ad hoc proposals for new initiatives, project proposals, etc. for the approval of and follow-up on the Management Change Advisory Board.

Other pilot projects

- **Discipline-specific pilot projects** to support the development of best practice recommendations. Within well-defined disciplines and in close collaboration with research projects and their researchers. Practical testing of concepts and systems in connection with (potentially all) parts of the research data life cycle—from data management planning to publication and transfer to archive with a view to long-term preservation.
- Cloud infrastructure in which Danish researchers can easily, securely, and legally store and share active research data, metadata, manuscripts, etc. with colleagues in Denmark and abroad. As researchers can have significant other needs than those addressed by a commercial product such as Dropbox, a detailed needs analysis should be carried out prior to a cloud infrastructure being established.

Follow-up on and possibly intensification of two already launched initiatives concerning globally recognized identifiers:

- Global ORCID identifier for researchers, so that all researchers become uniquely identifiable. This has
 already been initiated with support from DEFF and follow-up and support from the Danish Agency for
 Science, Technology and Innovation and the National Steering Committee on Open Access. The National
 Forum for Research Data Management should monitor the project to ensure that any needs for
 supplementary initiatives are addressed.
- Danish service to support the assignment of globally recognized DOI identifiers (Digital Object Identifier) to datasets, so that all datasets become uniquely identifiable and citable. As part of a completed DEFF project, DTU, Technical University of Denmark, has established Danish membership of and a Danish office for DataCite. This task/service should be handled by DeIC in future.

In addition, the following general criteria apply to pilot projects:

- Duplication of work should be avoided to ensure that initiatives launched have the greatest possible impact on and generate the greatest possible benefit for Danish research.
- The solution must demonstrate added value over and above the value already inherent in the institution's portfolio of activities.
- The result must be widely applicable, i.e. useful across several institutions.
- The development and testing of infrastructure/services/competence development initiatives must be firmly anchored in the user base.
- A plan for long-term financial sustainability must be included in the project application and reporting.





Action plans and financing

Total finances for 2015–2018:

Activity	Activity content	Financed by DEFF	Financed by DEIC	Co-financing (in kind) from universities	Co-financing (in kind) from preservation institutions
Α	National Forum	DKK 9,500k		DKK 6,000k	DKK 2,250k
В	Train-the-trainer course	DKK 500k			
С	Discipline-specific pilot projects		DKK 5,000k	DKK 5,000k	•
D	Academic 'dropbox'		DKK 1,000k		
E	Project manager		DKK 2,250k		
F	'Data management in practice' project	DKK 4,522k		DKK 3,708k	
Total		DKK 14,522k	DKK 8,250k	DKK 16,958k	

The funds from DeIC and DEFF assume co-financing from the universities and the preservation institutions. Action plans appear from the Danish version of the strategy.





Selected references

Web documents

The Danish Code of Conduct for Research Integrity

The working group on a common national code of conduct for research integrity

The Danish Ministry of Higher Education and Science The Danish Agency for Science, Technology and Innovation Copenhagen, 5 November 2014.

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http://ufm.dk/forskning-og-innovation/samspil-mellem-viden-og-innovation/open-science/danmarks-nationale-strategi-for-open-access.pdf

How to Develop Research Data Management Services—a guide for HEIs

Sarah Jones, Graham Pryor and Angus Whyte Edinburgh: Digital Curation Centre, March 2013

http://www.dcc.ac.uk/resources/how-guides/how-develop-rdm-services

How to Discover Requirements for Research Data Management Services

Angus Whyte and Suzie Allard

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Literature

Delivering Research Data Management Services-Fundamentals of good practice

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London: Facet Publishing, December 2013

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256 pages

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Research Data Management: Practical Strategies for Information Professionals

Joyce M Ray (Editor)

West Lafayette, Indiana: Purdue University Press, January 2014

ISBN: 978-1-557536648

436 pages

http://www.amazon.co.uk/Research-Data-Management-Information-Professionals/dp/1557536643

Managing and Sharing Research Data—A Guide to Good Practice

Louise Corti, Veerle Van den Eynden, Libby Bishop and Matthew Woollard

London: SAGE Publications, March 2014

ISBN: 978-1-44626-726-4

240 pages

http://www.amazon.co.uk/Managing-Sharing-Research-Data-Practice/dp/1446267261





List of annexes

The strategy and all annexes are available at deic.dk/datamanagement.

Bilag 01.	Steering Group member list with contact details
Bilag 02.	Terms of reference of the Steering Group
Bilag 03.	DelC's and DEFF's proposal for a national data management strategy and process
Bilag 04.	Discussion paper on strategic focus areas
Bilag 05.	Proposals for identification needs and further progress
Bilag 06.	Identification A: Grant givers' requirements
Bilag 07.	Identification B: Legal framework and challenges
Bilag 08.	Identification C: Foreign inspiration regarding policies
Bilag 09.	Identification D: Foreign inspiration regarding incentives
Bilag 10.	Identification E: Needs and preferences of academic environments
Bilag 11.	Consultation responses