



# The challenges of open science for PhD students

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# What is Open Science?

# Several definitions ...

Open Science aims at transforming science through ICT tools, networks and media, to make research more open, global, collaborative, creative and closer to society

<https://ec.europa.eu/digital-agenda/en/open-science>

Open science is the movement to make scientific research and its dissemination accessible to all levels of an inquiring society, amateur or professional

[https://en.wikipedia.org/wiki/Open\\_science](https://en.wikipedia.org/wiki/Open_science)

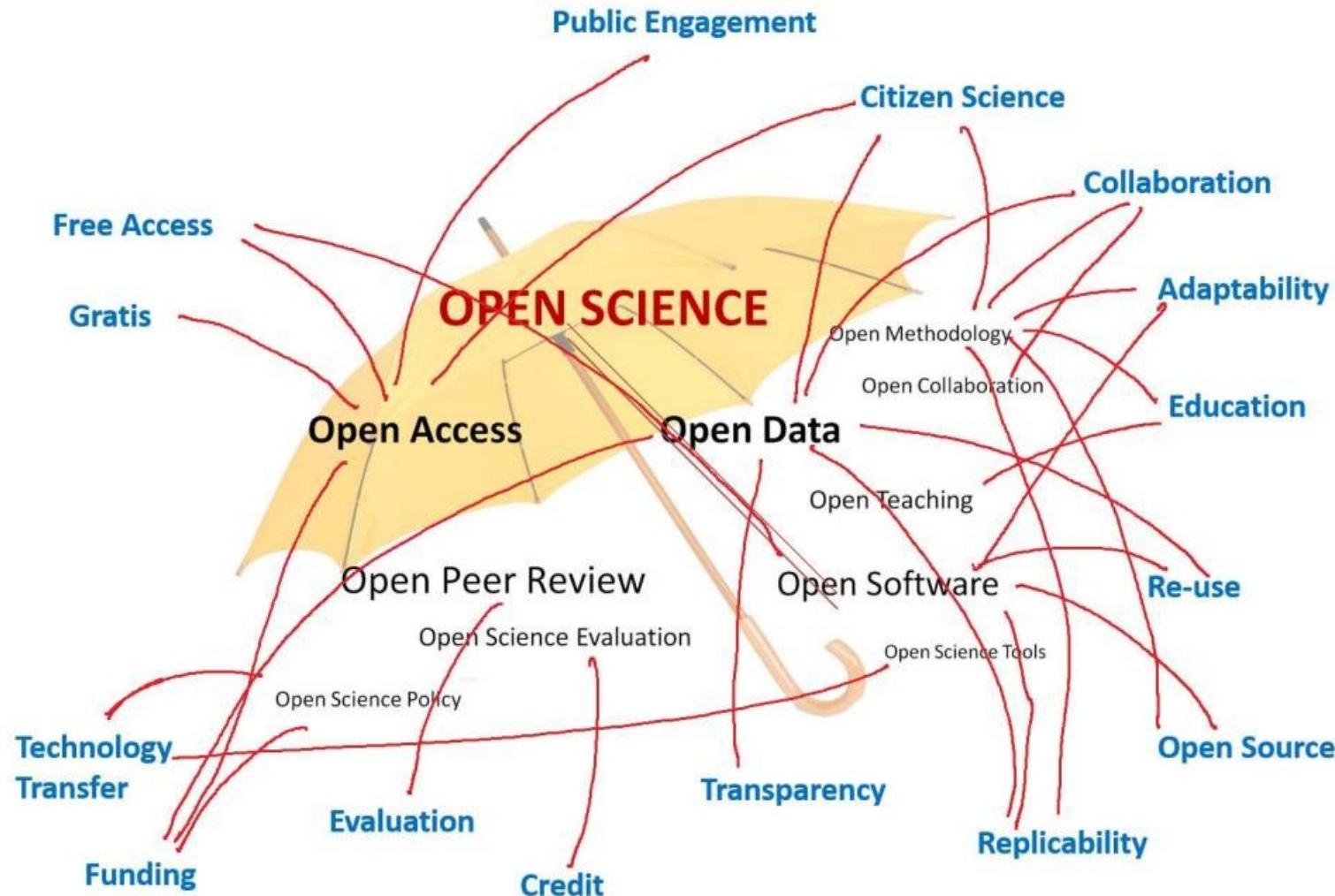
... and a clear one



**OPEN SCIENCE:  
JUST  
SCIENCE  
DONE RIGHT**

CCO Melanie Imming & Jon Tennant  
<http://doi.org/10.5281/zenodo.1285575>

# The «complexity» of open science



Koen Vermeier

[https://www2.helsinki.fi/sites/default/files/atoms/files/koen\\_vermeir\\_open\\_science\\_helsinki\\_newest2.pdf](https://www2.helsinki.fi/sites/default/files/atoms/files/koen_vermeir_open_science_helsinki_newest2.pdf)

# The scope of action

# The eight pillars from the Commission

The future of Scholarly Communications

FAIR Data

European Open Science Cloud

Incentives and Rewards

New generation metrics

Research Integrity

Education and Skills

Citizen Science

# ... can be reduced to six areas

Scientific Publications

Research Data

Research Evaluation

Research Integrity

Skills and Education

Social Impact and Public Participation in Research

# How open science can be followed by PhD students

# Before starting

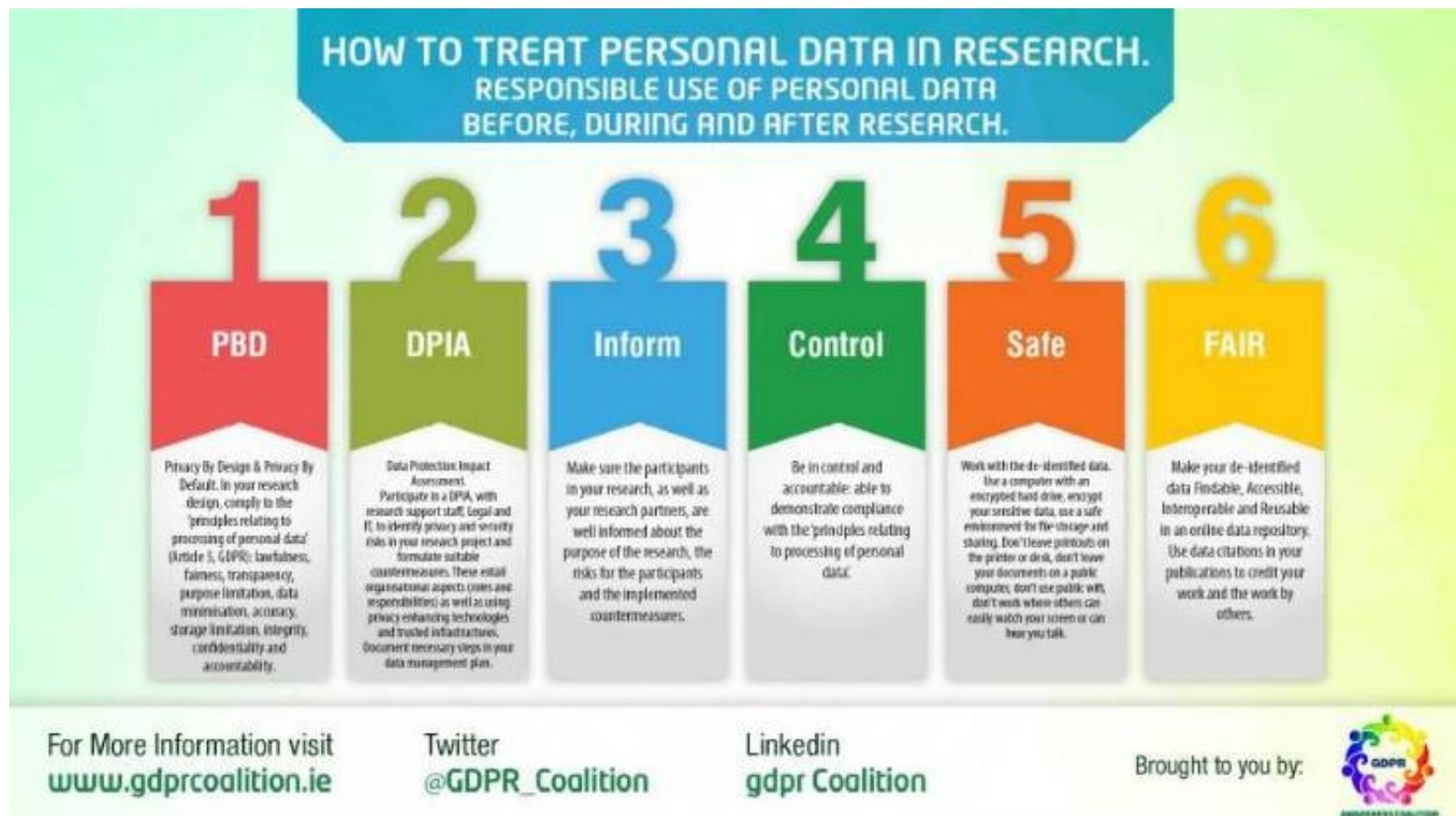
# What should I know before

## Integrity



# What should I know before

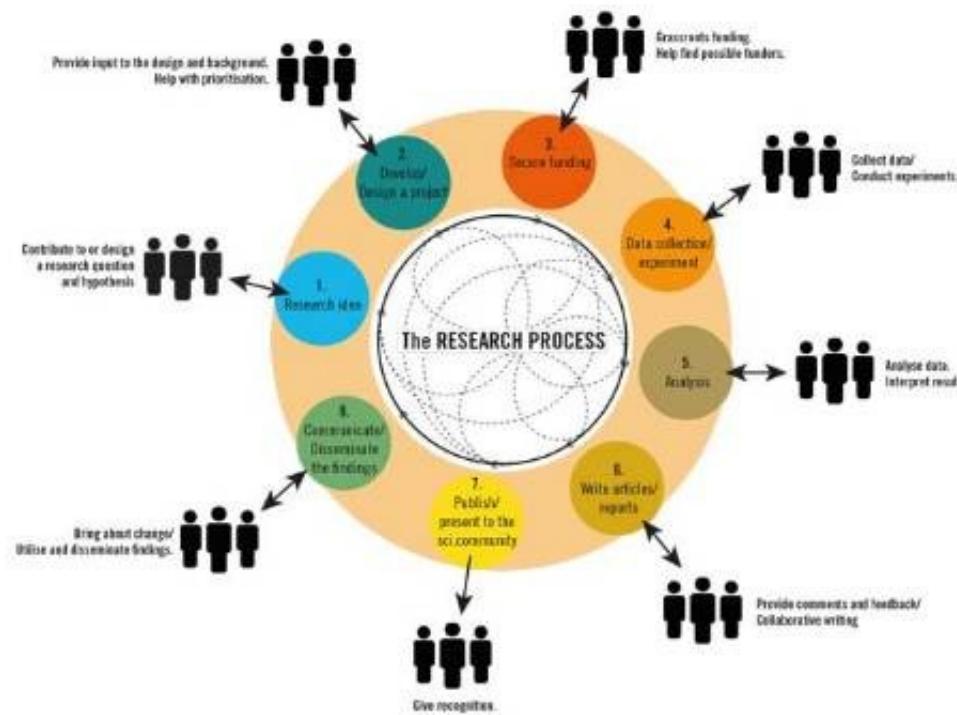
## Ethical and legal aspects



# What should I know before

## Citizen Science

**CITIZEN SCIENCE = co-creation with the public during the research process**



CC BY-NC Lotta W Tomasson/VA

<https://v-a.se/english-portal/citizen-science/>

# What should I do before

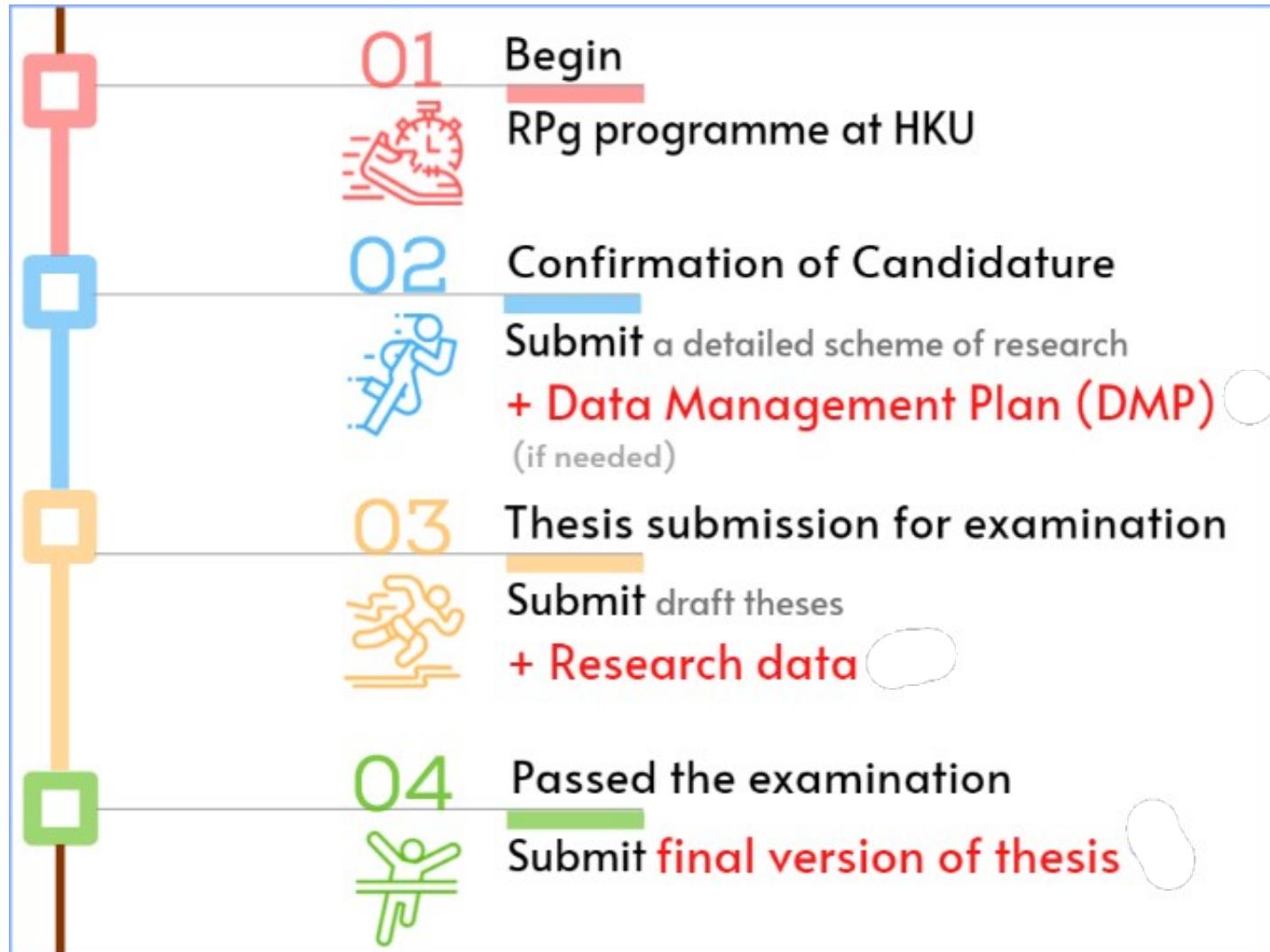
## Planning how to manage research data



CC BY Margaret Louise Fotland, UiO

<https://www.uio.no/english/for-employees/support/research/research-data-management/data-management-plan/>

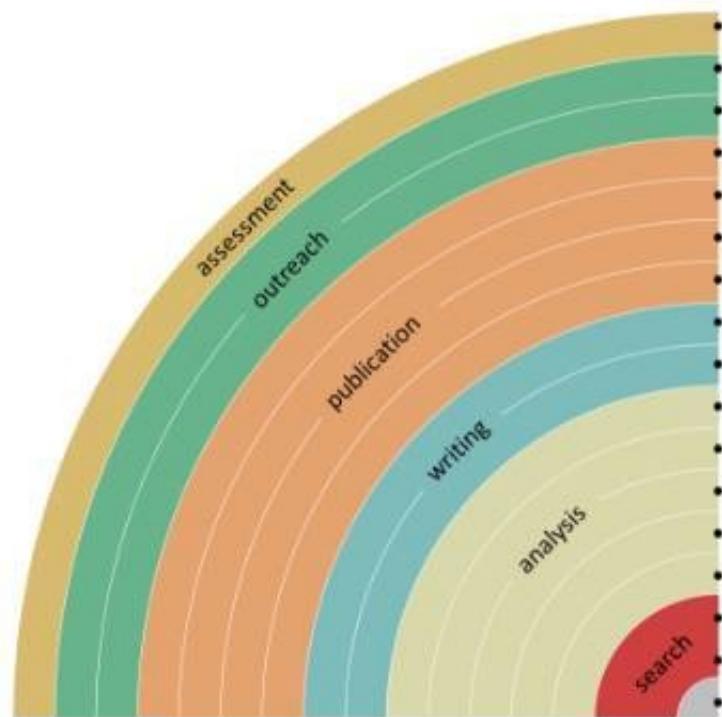
# Data management for PhD students



# During the research process

# Opening the process

You can make your workflow more open by ...



- adding alternative evaluation, e.g. with altmetrics
- communicating through social media, e.g. Twitter
- sharing posters & presentations, e.g. at FigShare
- using open licenses, e.g. CCO or CC-BY
- publishing open access, 'green' or 'gold'
- using open peer review, e.g. at journals or PubPeer
- sharing preprints, e.g. at OSF, arXiv or bioRxiv
- using actionable formats, e.g. with Jupyter or CoCalc
- open XML-drafting, e.g. at Overleaf or Authorea
- sharing protocols & workflows, e.g. at Protocols.io
- sharing notebooks, e.g. at OpenNotebookScience
- sharing code, e.g. at GitHub with GNU/MIT license
- sharing data, e.g. at Dryad, Zenodo or Dataverse
- pre-registering, e.g. at OSF or AsPredicted
- commenting openly, e.g. with Hypothes.is
- using shared reference libraries, e.g. with Zotero
- sharing (grant) proposals, e.g. at RIO



# Some advices for managing data

Use open and standard formats  
not proprietary formats, when possible

<https://dans.knaw.nl/en/about/services/easy/information-about-depositing-data/before-depositing/file-formats>

Organize your folders

Use meaningful names for folders and files

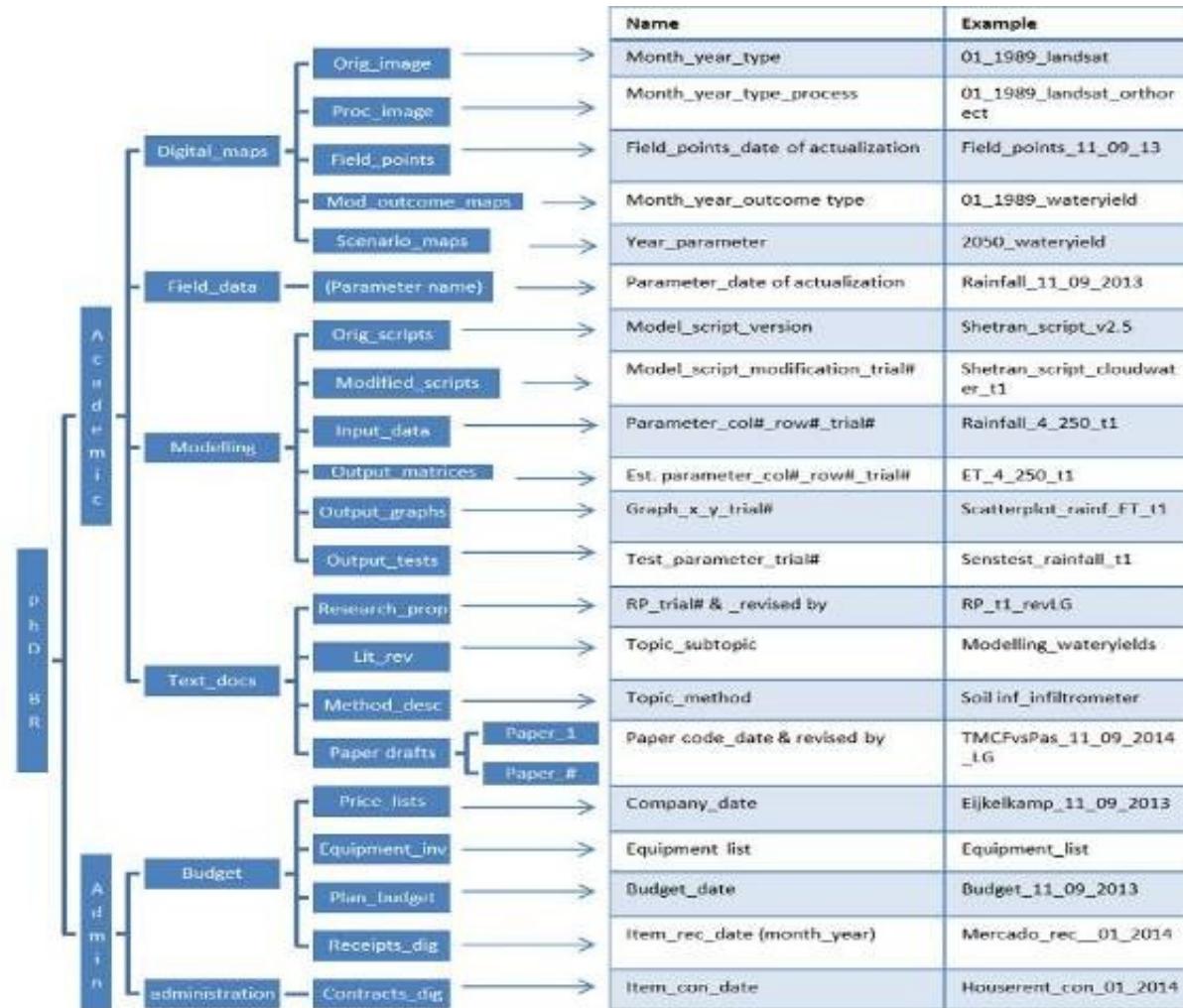
Use version control, when needed

# The choice of formats

Type	Preferred format(s)	Non-preferred format(s)
Text documents	<ul style="list-style-type: none"><li>PDF/A (.pdf)</li><li>ODT (.odt)</li></ul>	<ul style="list-style-type: none"><li>Microsoft Word (.doc)</li><li>Office Open XML (.docx)</li><li>Rich Text File (.rtf)</li><li>PDF other than PDF/A (.pdf)</li></ul>
Plain text	<ul style="list-style-type: none"><li>Unicode text (.txt)</li></ul>	<ul style="list-style-type: none"><li>Non-Unicode text (.txt)</li></ul>
Markup language	<ul style="list-style-type: none"><li>XML (.xml)</li><li>HTML (.html)</li><li>Related files: .css, .satz, .js, .es</li></ul>	<ul style="list-style-type: none"><li>SGML (.sgml)</li><li>Markdown (.md)</li></ul>
Programming languages	<ul style="list-style-type: none"><li>MATLAB</li><li>NetCDF</li><li>TextFabric</li></ul>	
Spreadsheets	<ul style="list-style-type: none"><li>ODS (.ods)</li><li>CSV (.csv)</li></ul>	<ul style="list-style-type: none"><li>Microsoft Excel (.xls)</li><li>Office Open XML Workbook (.xlax)</li><li>PDF/A (.pdf)</li></ul>
Databases	<ul style="list-style-type: none"><li>SQL (.sql)</li><li>SIARD (.siard)</li><li>CSV (.csv)</li></ul>	<ul style="list-style-type: none"><li>Microsoft Access (.mdb, .accdb)</li><li>dBase (.dbf)</li><li>HDFS (.hdfs, .hfs, .hs)</li></ul>
Statistical data	<ul style="list-style-type: none"><li>SPSS (.dat/.sav)</li><li>STATA (.dat/.DO)</li><li>R</li></ul>	<ul style="list-style-type: none"><li>SPSS Portable (.por)</li><li>SPSS (.sav)</li><li>STATA (.dta)</li><li>SAS (.7dat/.sd2/.cpt)</li></ul>
Raster images	<ul style="list-style-type: none"><li>JPEG (.jpg, .jpeg)</li><li>TIFF (.tif, .tiff)</li><li>PNG (.png)</li><li>JPEG 2000 (.jp2)</li><li>DICOM (.dcm)</li></ul>	
Vector Images	<ul style="list-style-type: none"><li>SVG (.svg)</li></ul>	<ul style="list-style-type: none"><li>Adobe Illustrator (.ai)</li><li>EPS (.eps)</li><li>WMF/EMF (.wmf, .emf)</li><li>CDR (.cdr)</li></ul>
Audio	<ul style="list-style-type: none"><li>BWF (.bwf)</li><li>MXF (.mxif)</li><li>Moraske (.mka)</li><li>FLAC (.flac)</li><li>OPUS</li></ul>	<ul style="list-style-type: none"><li>WAVE (.wav)</li><li>MP3 (.mp3)</li><li>AAC (.aac, .m4a)</li><li>AIFF (.aif, .aifc)</li><li>OGG (.ogg)</li></ul>
Video	<ul style="list-style-type: none"><li>MXF (.mxif)</li><li>Moraske (.mka)</li></ul>	<ul style="list-style-type: none"><li>MPEG-1 (.mpg, .mpe, .m1v)</li><li>MPEG-2 (.mpg, .mpeg, .m2v, .mpg2)</li><li>AVI (.avi)</li><li>QuickTime (.mov, .qt)</li></ul>
Computer Aided Design (CAD)	<ul style="list-style-type: none"><li>AutoCAD DXF version R12 (ASCII) (.dxf)</li><li>SVG (.svg)</li></ul>	<ul style="list-style-type: none"><li>AutoCAD other versions than R12 (ASCII) (.dwg, .dxf)</li><li>DWG (.dwg)</li><li>DGN (.dgn)</li></ul>

<https://dans.knaw.nl/en/about/services/easy/information-about-depositing-data/before-depositing/file-formats>

# Organizing files and folders

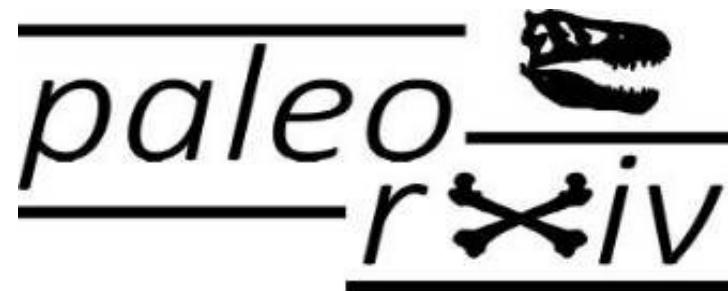


<http://www.wageningenur.nl/en/Expertise-Services/Data-Management-Support-Hub/Browse-by-Subject/Organising-files-and-folders.htm>

At the end of the process

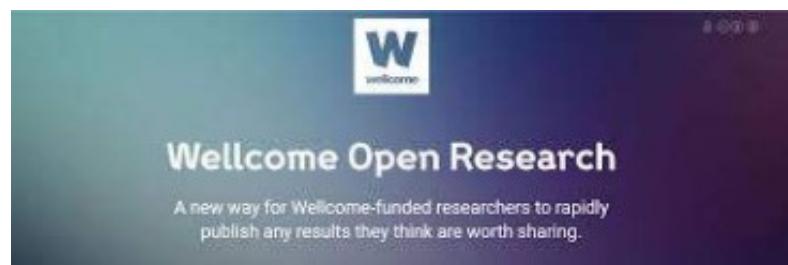
# Sharing and publishing outputs

## Publishing in preprints servers



# Sharing and publishing outputs

## Publish in platforms: beyond preprints



# Sharing and publishing outputs

Publish openly



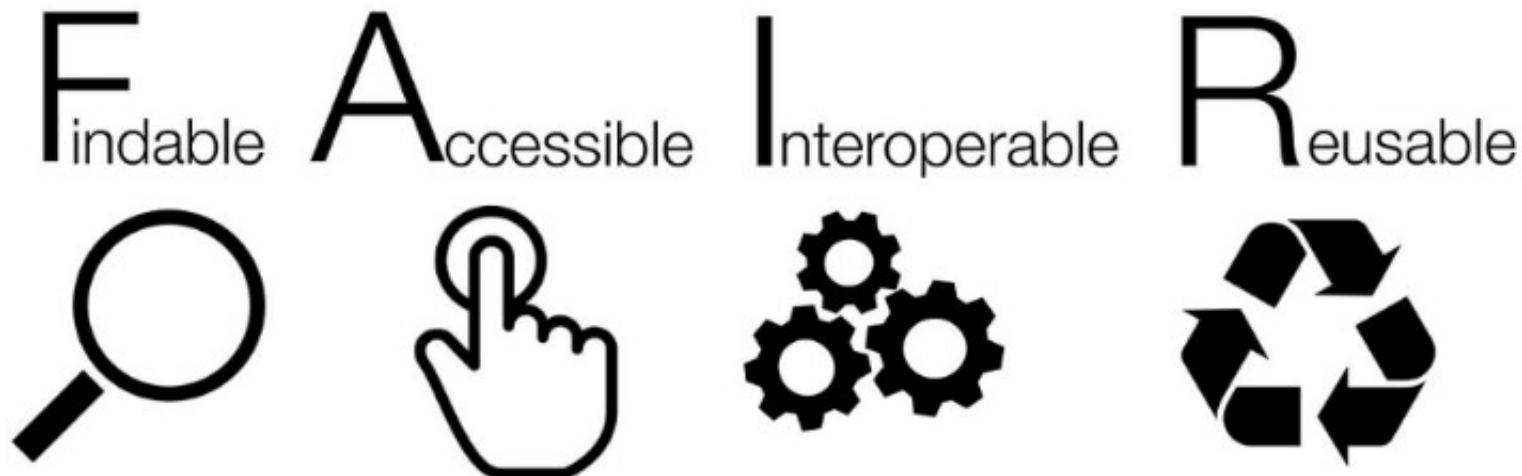
# Sharing and publishing outputs

Post and share in repositories



# Sharing and publishing outputs

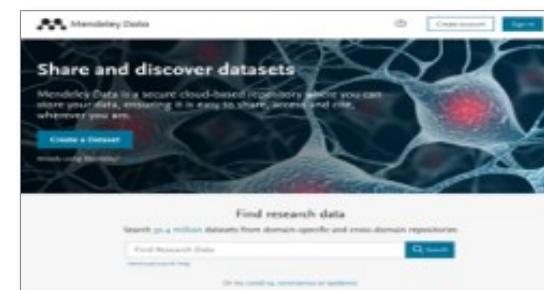
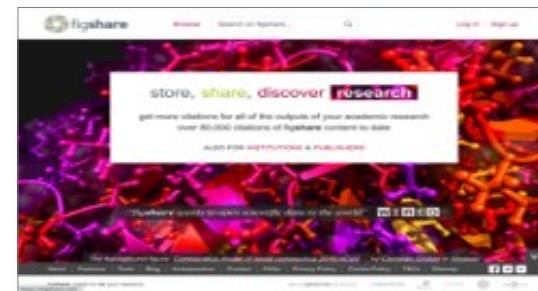
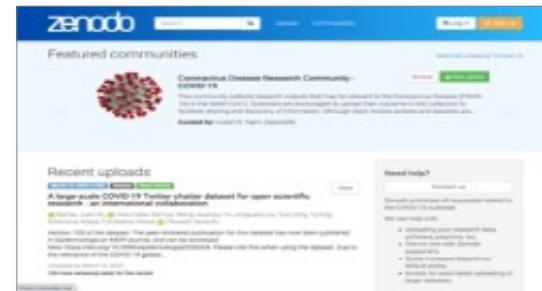
Sharing data as open as possible, as closed as necessary



CC BY-SA SangyaPundir

[https://commons.wikimedia.org/wiki/File:FAIR\\_data\\_principles.jpg](https://commons.wikimedia.org/wiki/File:FAIR_data_principles.jpg)

# Sharing and publishing outputs



# Sharing and publishing outputs

And share code, methodologies, and any other research output

# And, finally, publishing your thesis

Real Decreto 99/2011

## Art 14.5

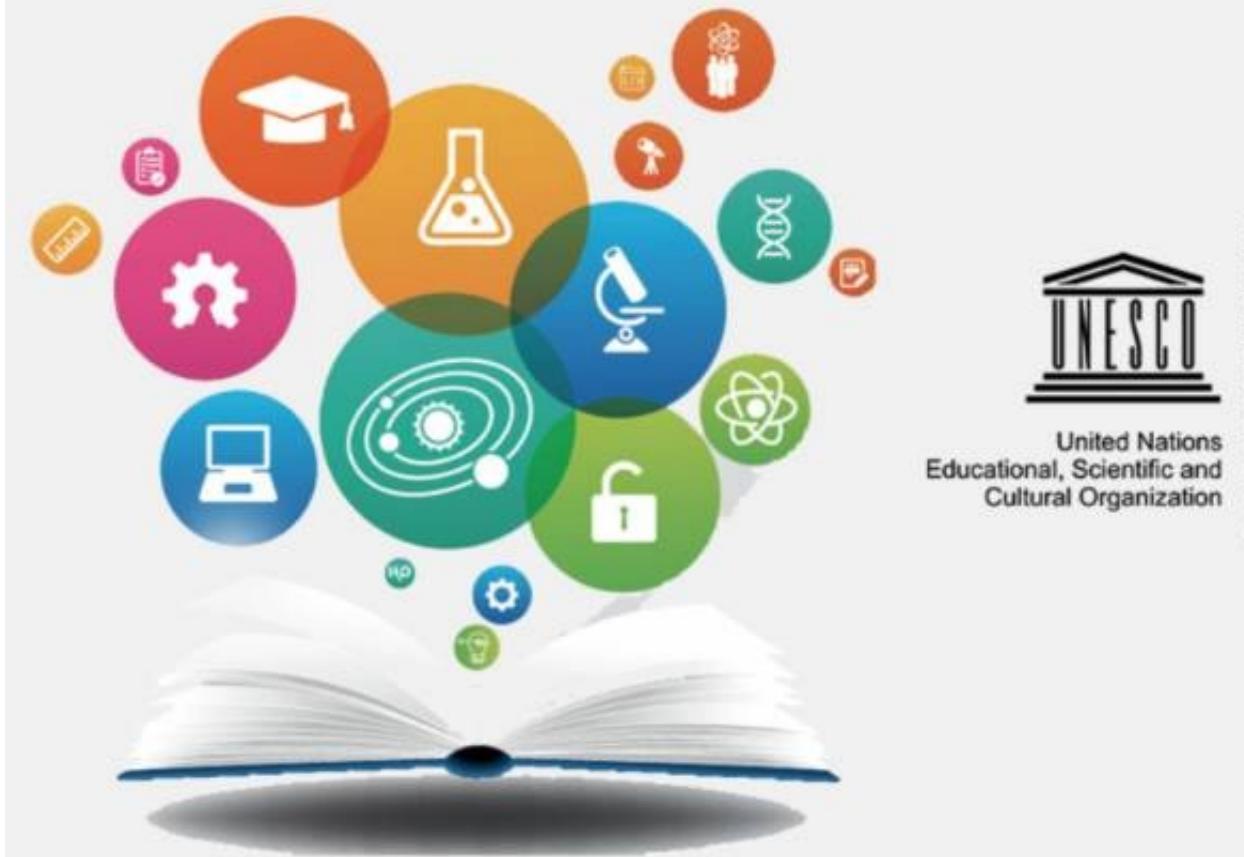
***Una vez aprobada la tesis doctoral, la universidad se ocupará de su archivo en formato electrónico abierto en un repositorio institucional y remitirá, en formato electrónico, un ejemplar de la misma así como toda la información complementaria que fuera necesaria al Ministerio de Educación a los efectos oportunos.***

## Art 14.6

***En circunstancias excepcionales determinadas por la comisión académica del programa, como pueden ser, entre otras, la participación de empresas en el programa o Escuela, la existencia de convenios de confidencialidad con empresas o la posibilidad de generación de patentes que recaigan sobre el contenido de la tesis, las universidades habilitarán procedimientos para desarrollar los apartados 4 y 5 anteriores que aseguren la no publicidad de estos aspectos.***

# Beyond the concept of Open Science

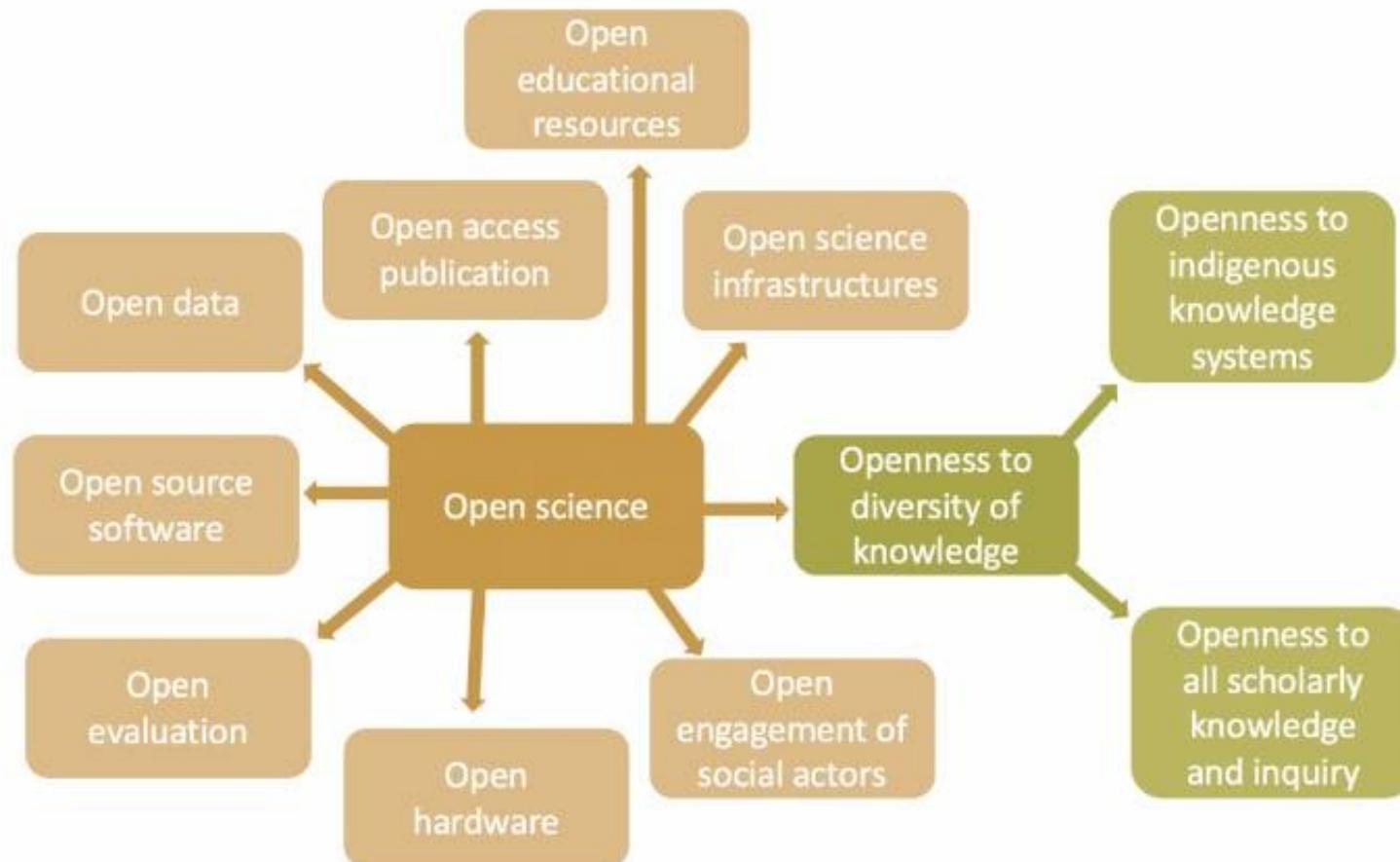
# The UNESCO recommendation



# Open Science

<https://en.unesco.org/science-sustainable-future/open-science>

# The UNESCO recommendation



<https://www.oerafrica.org/content/what-open-science-and-how-does-it-relate-open-knowledge>

Image adapted from Robbie Ian Morrison (<https://commons.wikimedia.org/wiki/File:Osc2021-unesco-open-science-no-gray.png>)

# Conclusions

# Conclusions

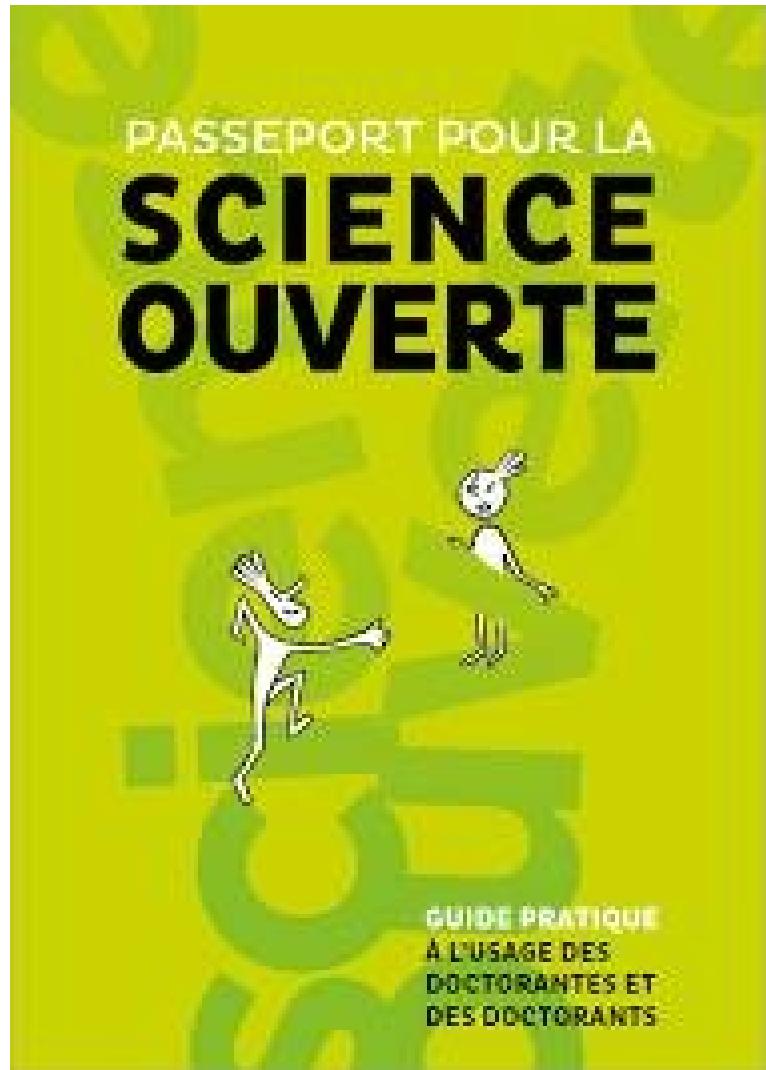
Open Science is not the future, it is the present

We must foster and enable open science by training PhD students and supervisors: the whole ecosystem

Institutions must enable and value open science practices

And a final reading

# Guidance for PhD students



<https://www.ouvrirlascience.fr/passport-for-open-science-a-practical-guide-for-phd-students/>

# Thank you

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