Hello, I am a Data Steward

Research Software Engineering and Data Stewardship Career Talk

Lars Schöbitz
Global Health Engineering - ETH Zurich

Prof. Elizabeth Tilley
Global Health Engineering - ETH Zurich

June 17, 2025

slides at:
ghe-open.ch

Meet a data steward

Meet a data steward

I have:

- 10+ years work experience (5 in research, at Eawag)
- empathy, compassion, patience, persistence
- an affinity for IT
- teaching experience
- learned how people learn

I don’t have:

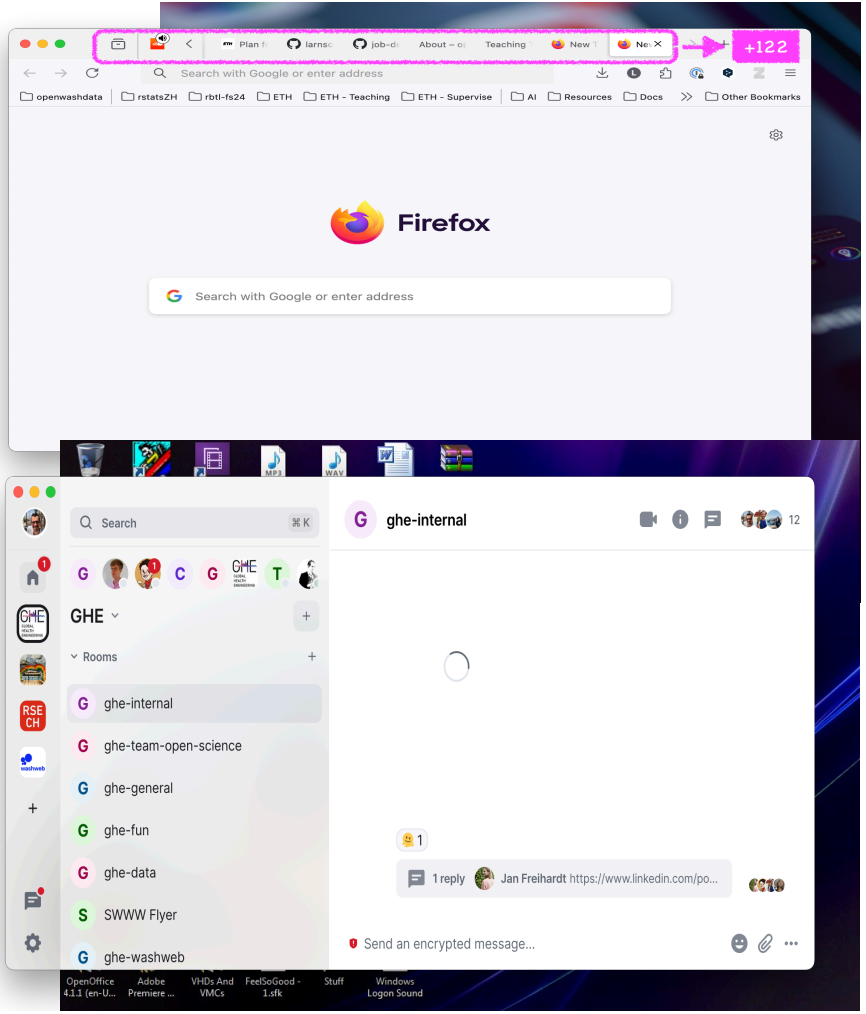
- a doctoral degree
- a qualification in computer science
- a qualification in statistics
- a lot of time

8 learnings from 4 years


#1 Technology is not on our side

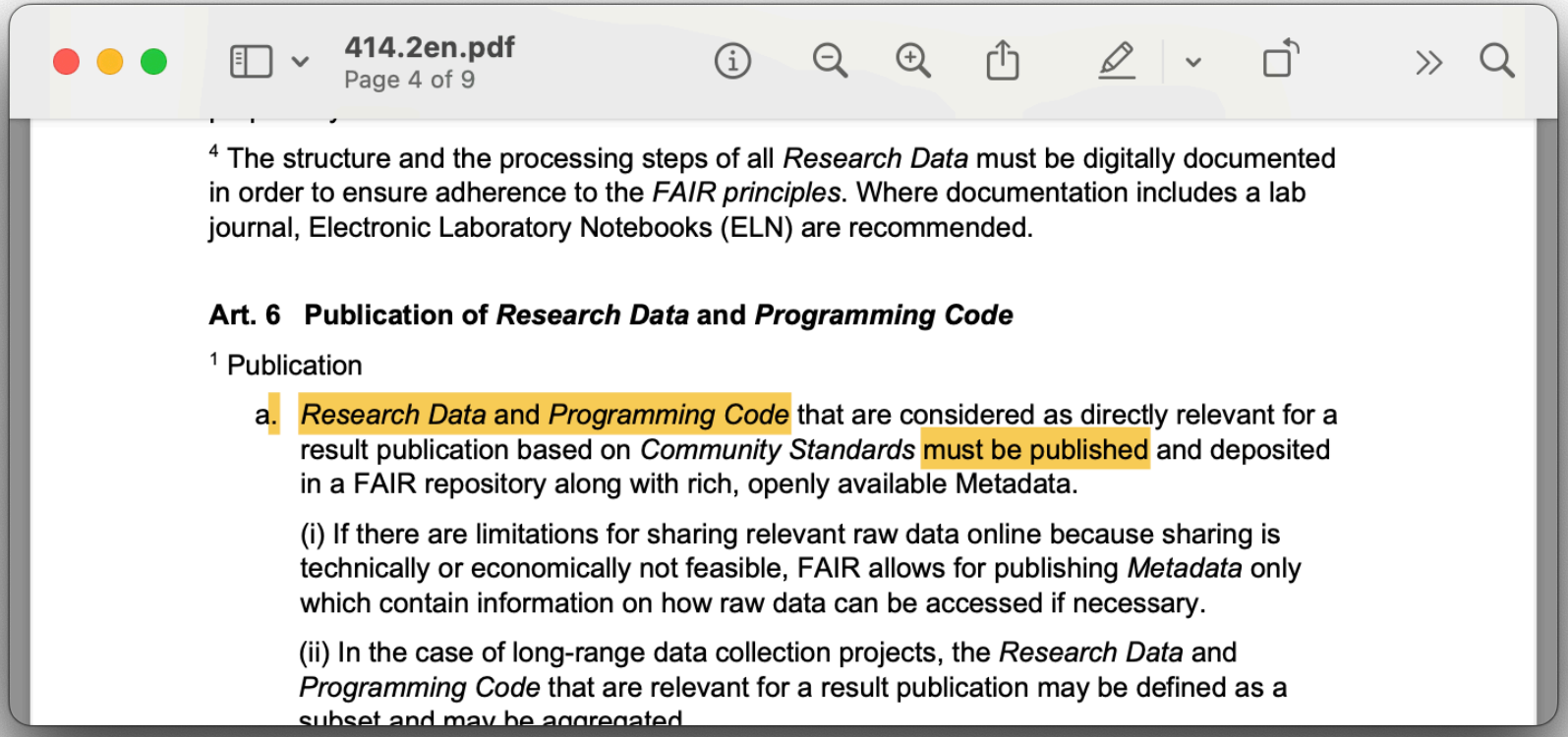
The Modern Academic's Challenges

- Overflowing email inboxes
- Browsers with hundreds of tabs
- Files on stored on Desktops
- MS Teams, Slack, Element, NAS, Google Drive, ...
- Credentials, Passwords, OTPs, 2FAs, PATs, ...




#2 ETH wants
reproducibility

ETH RDM Guidelines



[4] The structure and the processing steps of all *Research Data* must be digitally documented in order to ensure adherence to the *FAIR principles*. Where documentation includes a lab journal, Electronic Laboratory Notebooks (ELN) are recommended.

Art. 6 Publication of *Research Data* and *Programming Code*

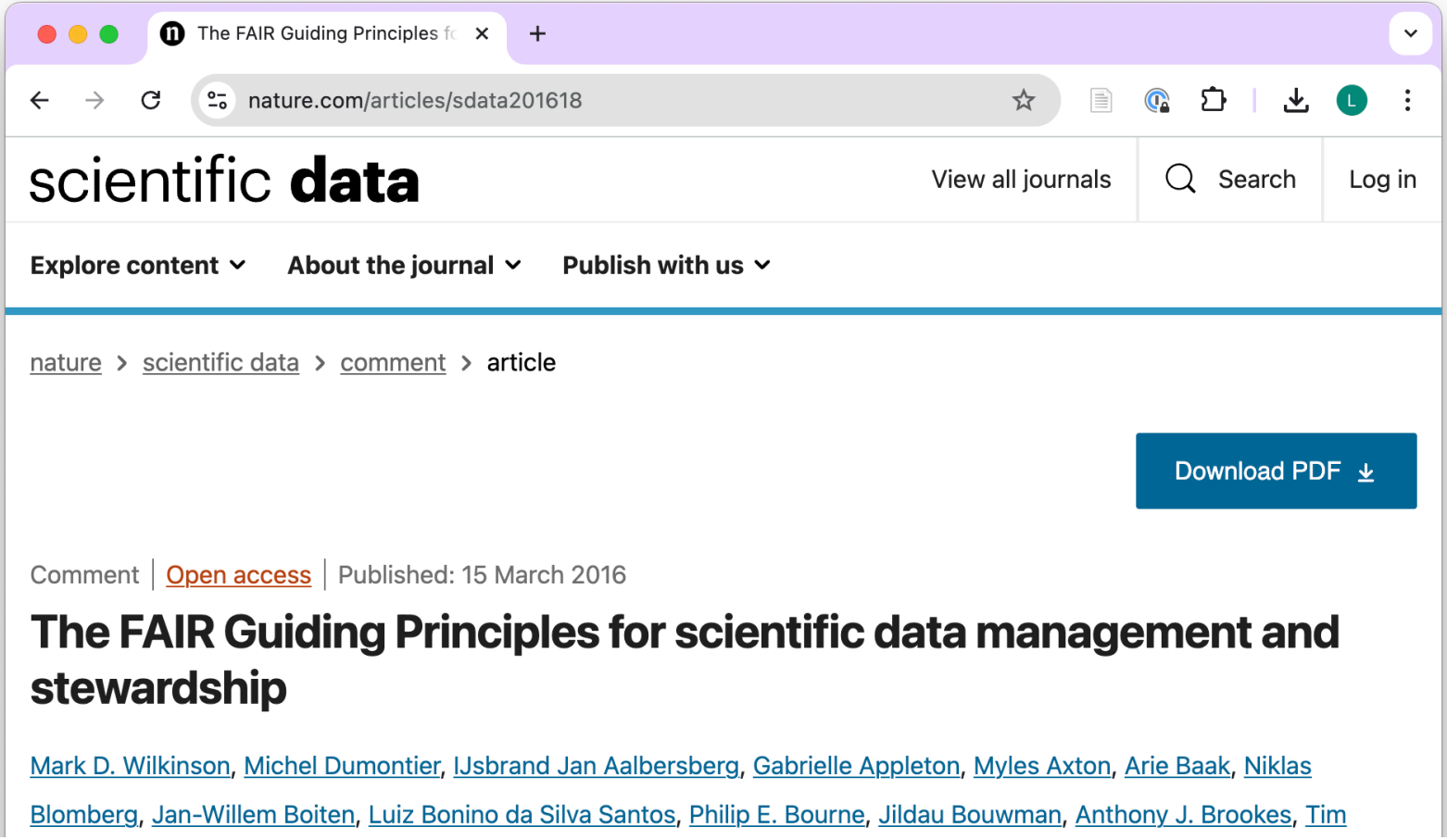
[1] Publication

a. *Research Data* and *Programming Code* that are considered as directly relevant for a result publication based on *Community Standards* must be published and deposited in a FAIR repository along with rich, openly available Metadata.

(i) If there are limitations for sharing relevant raw data online because sharing is technically or economically not feasible, FAIR allows for publishing *Metadata* only which contain information on how raw data can be accessed if necessary.

(ii) In the case of long-range data collection projects, the *Research Data* and *Programming Code* that are relevant for a result publication may be defined as a subset and may be aggregated

FAIR data sharing principles



FAIR data sharing principles

- Technical in nature
- Require data management strategy to establish workflows
- Not a checkbox, but a process

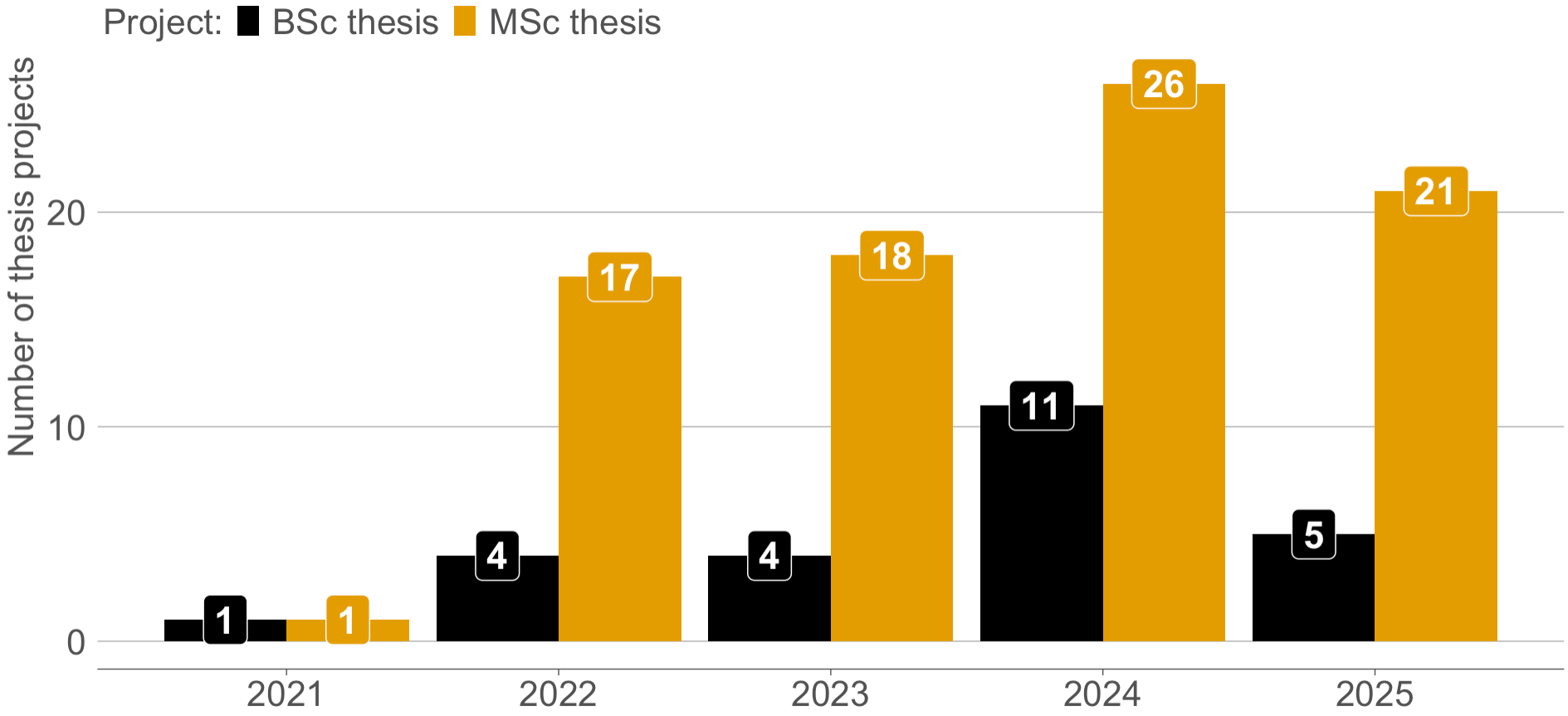
Findable

Accessible

Interoperable

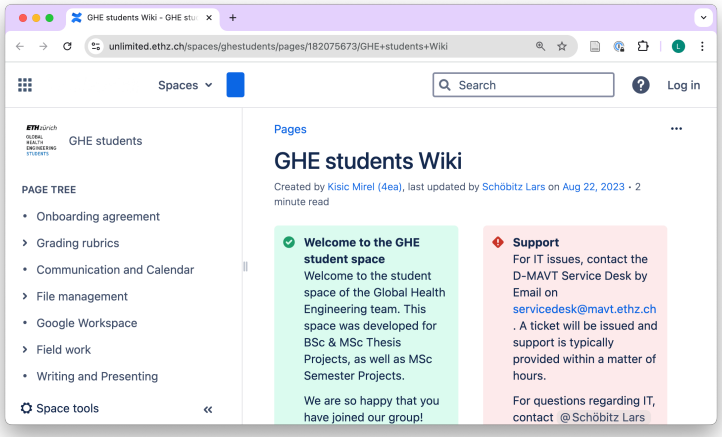
Reusable


#3 Data management is project management


Project: BSc thesis MSc thesis
Number of thesis projects
0
10
20
1
1
4
17
4
18
11
26
5
21
2021
2022
2023
2024
2025

GHE Student Wiki (public)

- Grading criteria
- Communication expectations
- Data storage and data management guidelines
- Presentation standards
- Proposal and thesis writing requirements



Grading rubric & data publication

Four areas of evaluation with 31 sub-areas

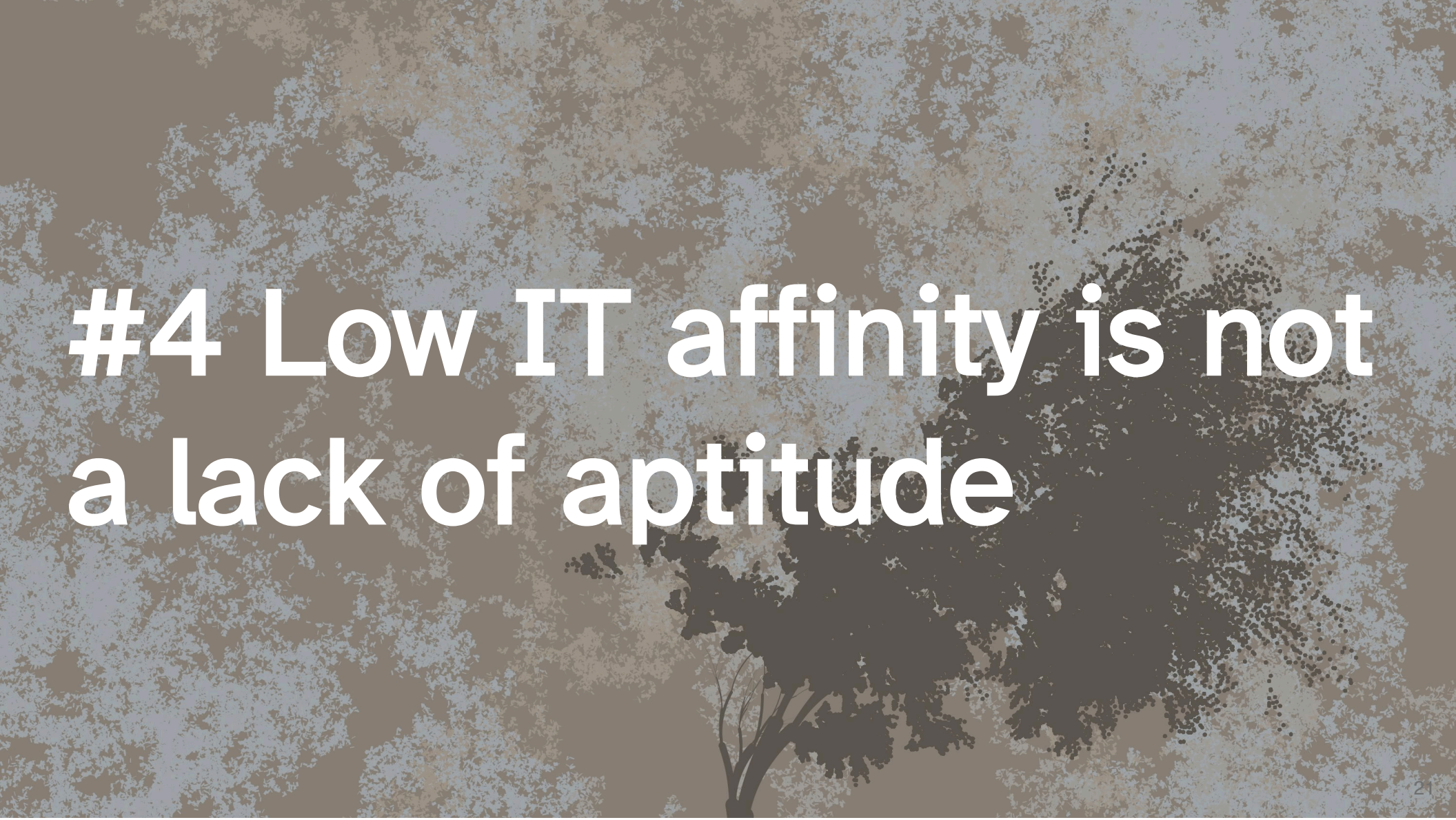
- 40/100: Research competence
- 40/100: Thesis report
- 10/100: Colloquium
- 10/100: Examination

‘Data Management’ under ‘Research Competence’

> 6: Data is fully documented, organized, easy to reproduce, and publication ready. Everything is stored on Google Drive.

But, data publication requirement

> Obtaining a 6 from all sub-areas but not publishing the data in the form of a repository will result in a maximum allowed grade of 5.75.


#4 Low IT affinity is not a lack of aptitude

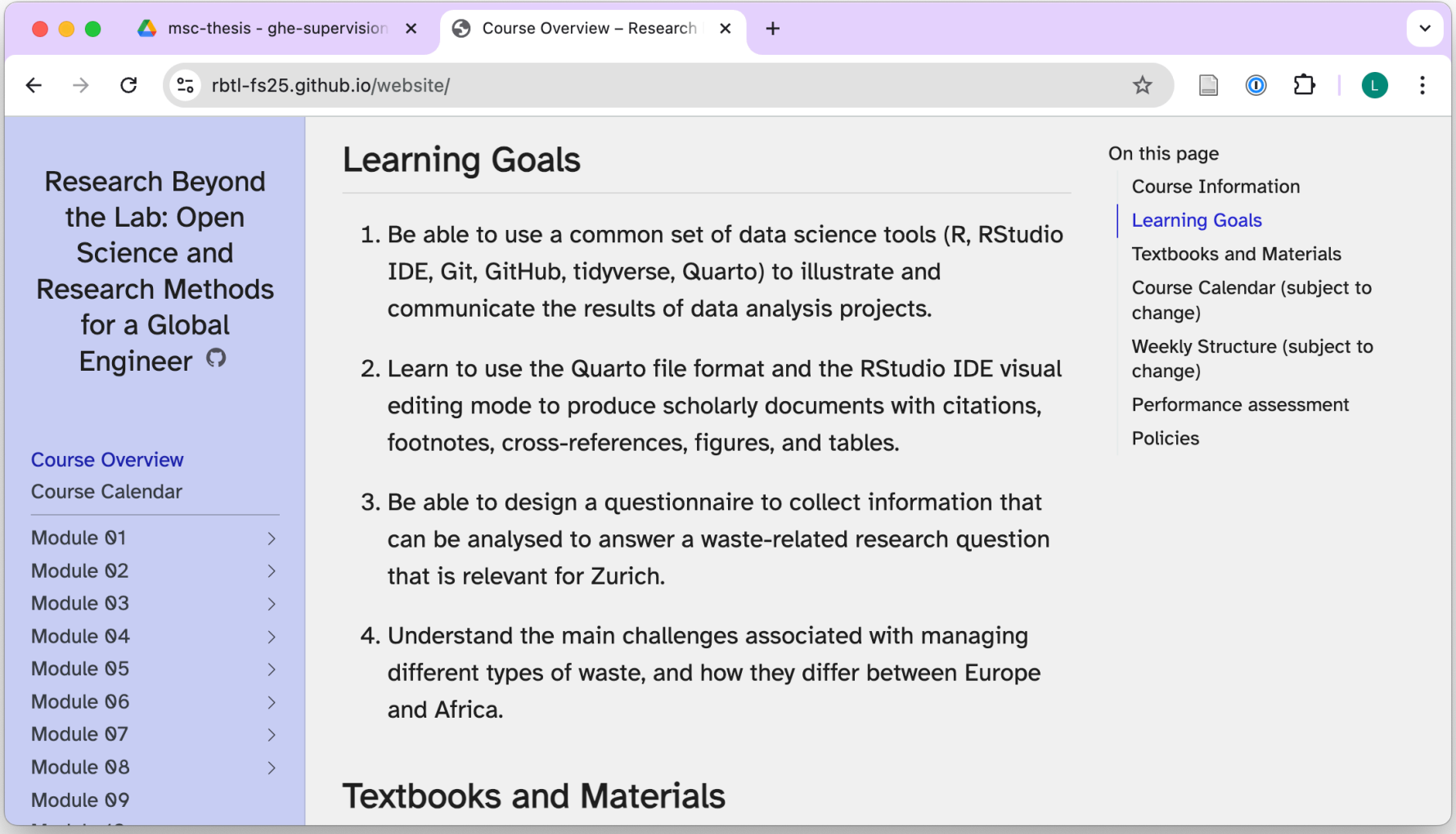
Safe learning environments

Growth-mindset for better learning outcomes

- **Fixed mindset**: ‘I’m not good’
- **Growth mindset**: ‘I can learn’

Create safe learner environments

- Regular 1:1 research data management meetings
- Bi-monthly half day team events
- Yearly retreat


msc-thesis - ghe-supervision
Course Overview – Research
rbtl-fs25.github.io/website/
Research Beyond the Lab: Open Science and Research Methods for a Global Engineer
Course Overview
Course Calendar
Module 01
Module 02
Module 03
Module 04
Module 05
Module 06
Module 07
Module 08
Module 09
Learning Goals
1. Be able to use a common set of data science tools (R, RStudio IDE, Git, GitHub, tidyverse, Quarto) to illustrate and communicate the results of data analysis projects.
2. Learn to use the Quarto file format and the RStudio IDE visual editing mode to produce scholarly documents with citations, footnotes, cross-references, figures, and tables.
3. Be able to design a questionnaire to collect information that can be analysed to answer a waste-related research question that is relevant for Zurich.
4. Understand the main challenges associated with managing different types of waste, and how they differ between Europe and Africa.
Textbooks and Materials
On this page
Course Information
Learning Goals
Textbooks and Materials
Course Calendar (subject to change)
Weekly Structure (subject to change)
Performance assessment
Policies


#5 Data != Data

Disclaimer: Data at GHE

- small (few MBs)
- tabular
- non-sensitive
- topics
  - waste management
  - sanitation
  - air quality
  - etc.

Three terms for three stages

Three terms for three stages

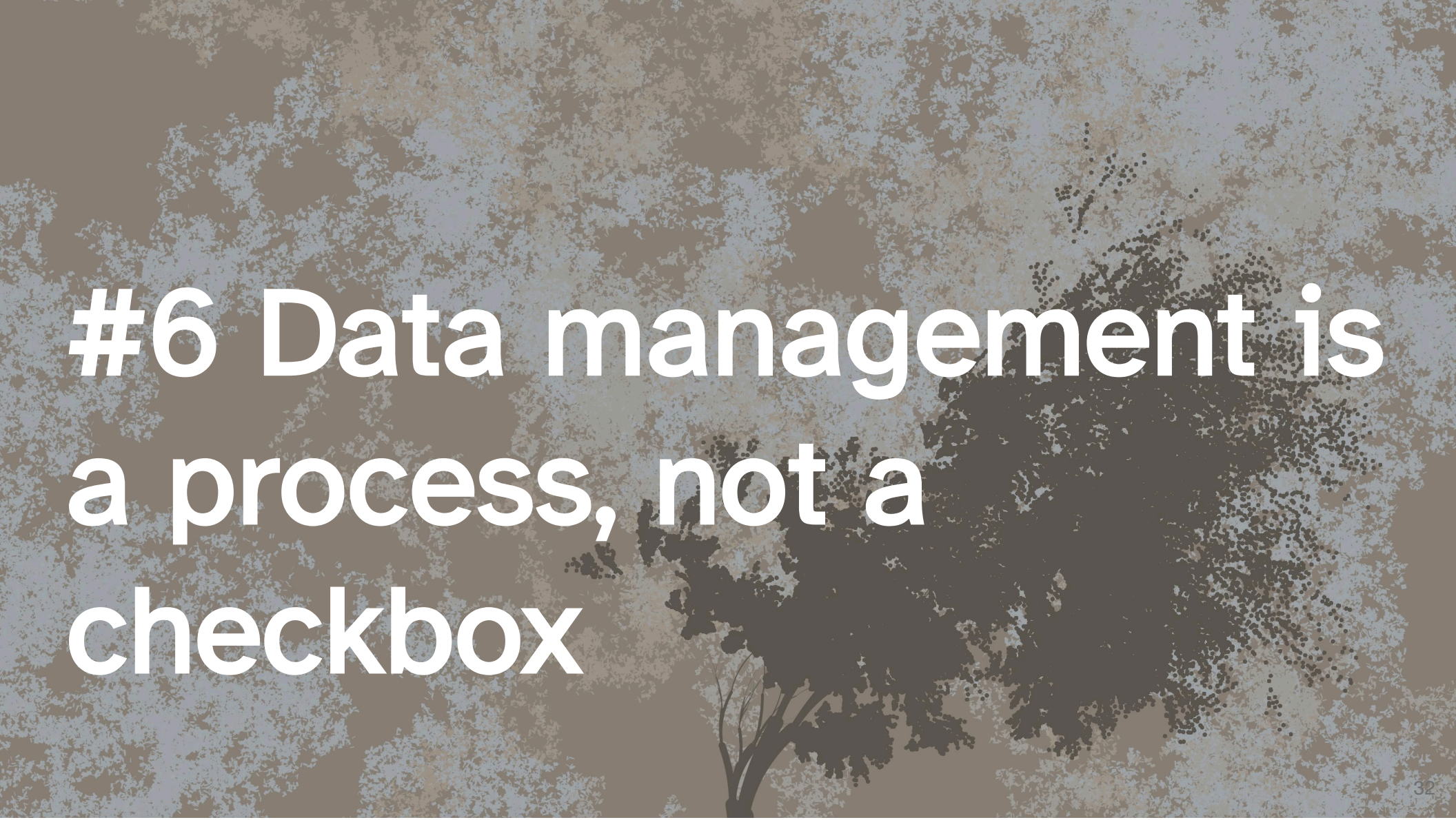
term	explanation	file format
unprocessed raw data	data that is not processed and remains in its original form and file type	often XLSX, also CSV and others

Three terms for three stages

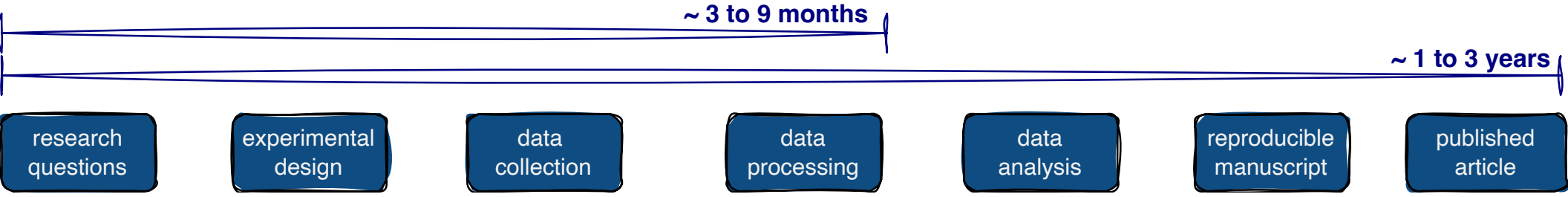
term	explanation	file format
unprocessed raw data	data that is not processed and remains in its original form and file type	often XLSX, also CSV and others
processed analysis-ready data	data that is processed to prepare for an analysis and is exported in its new form as a new file	CSV, R data package

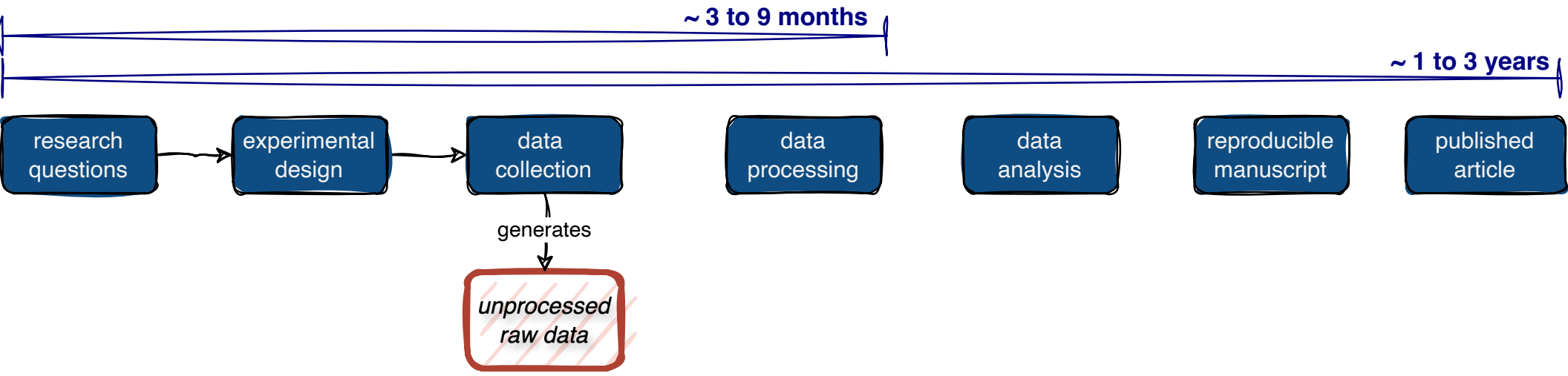
Three terms for three stages

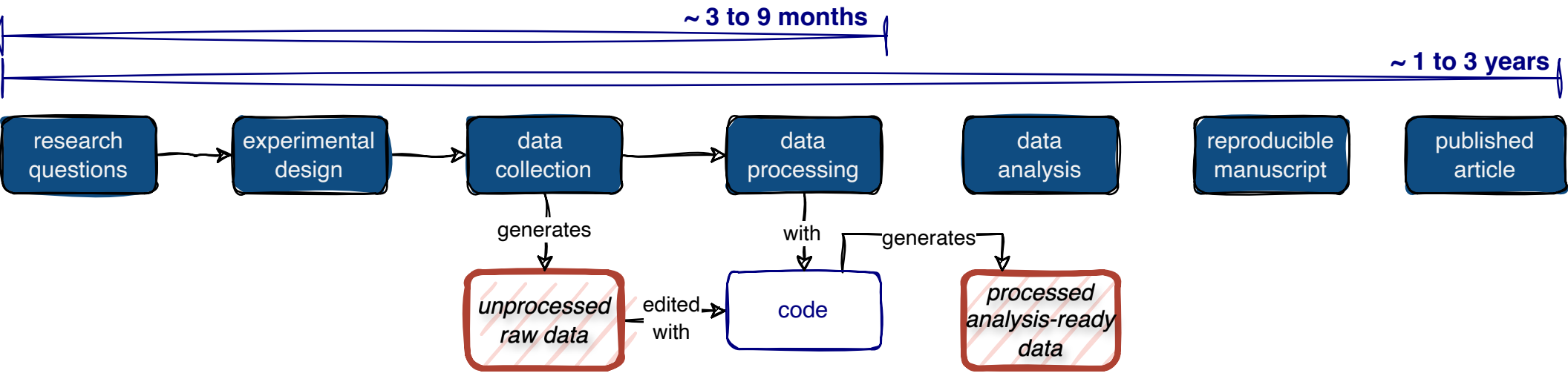
term	explanation	file format
unprocessed raw data	data that is not processed and remains in its original form and file type	often XLSX, also CSV and others
processed analysis-ready data	data that is processed to prepare for an analysis and is exported in its new form as a new file	CSV, R data package
final data underlying a publication	data that is the result of an analysis (e.g descriptive statistics or data visualization) and shown in a publication, but then also exported in its new form as a new file	CSV

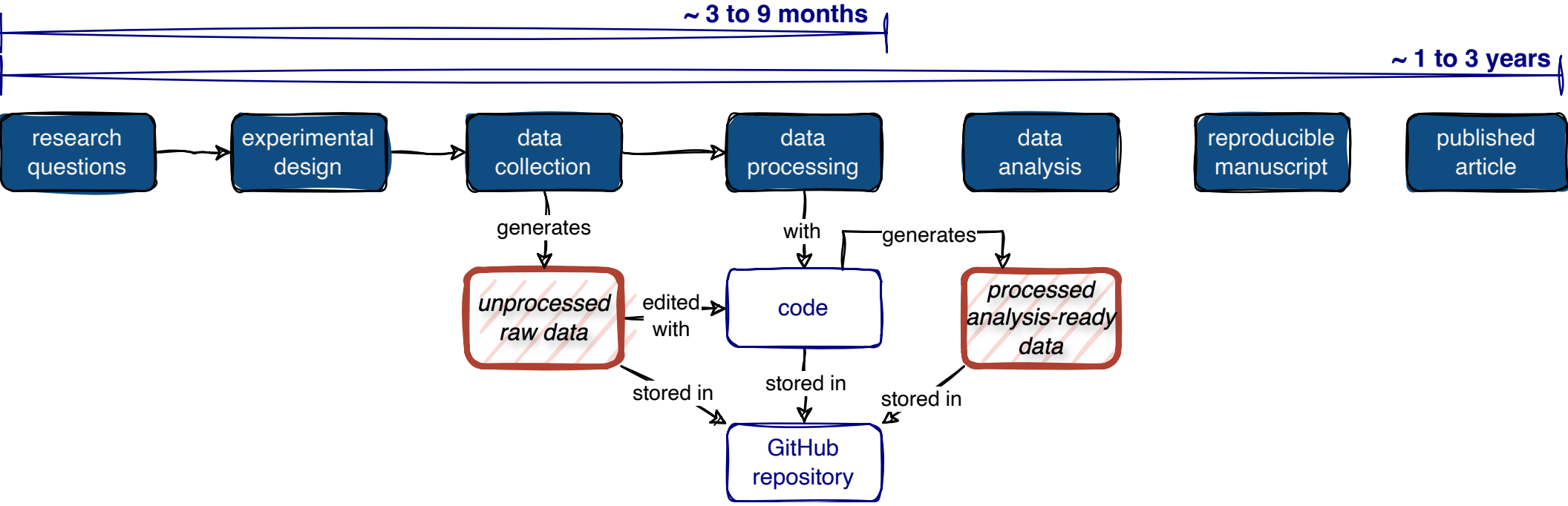

#6 Data management is a process, not a checkbox

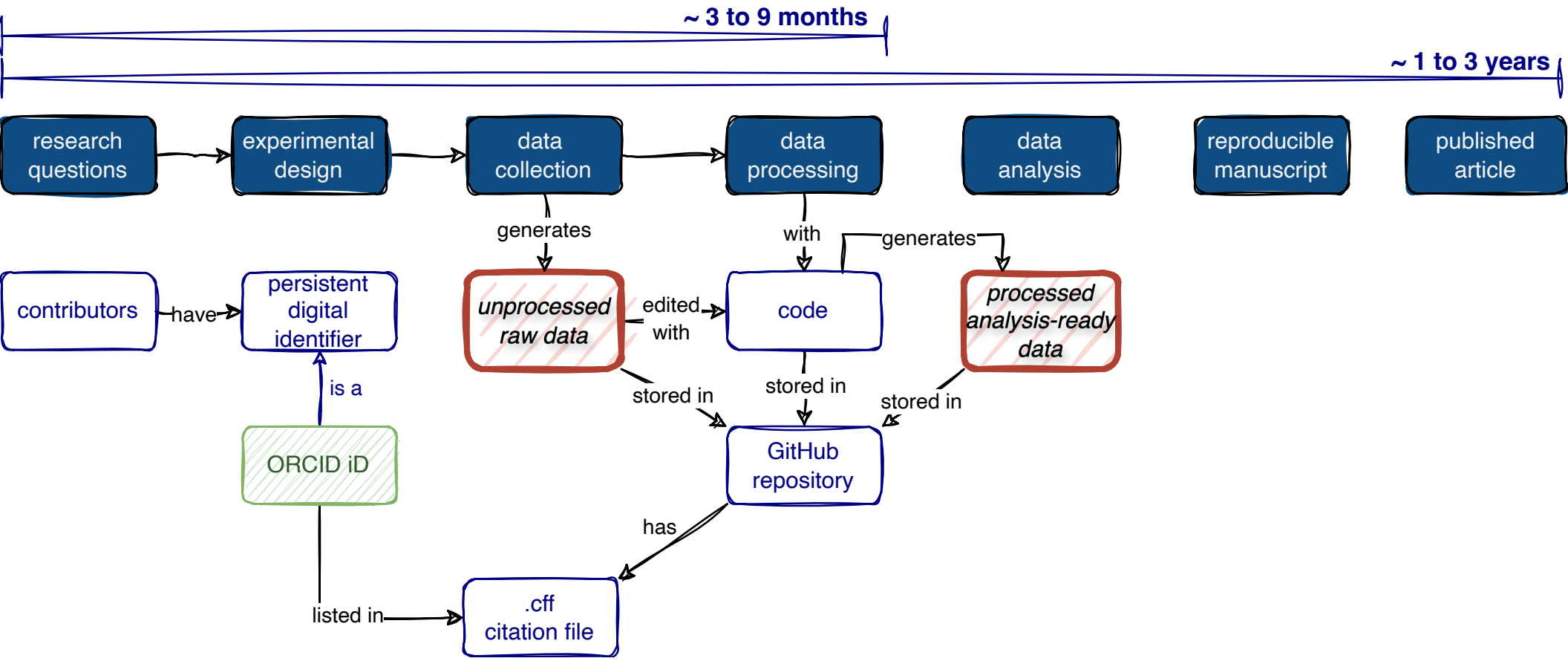

research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article

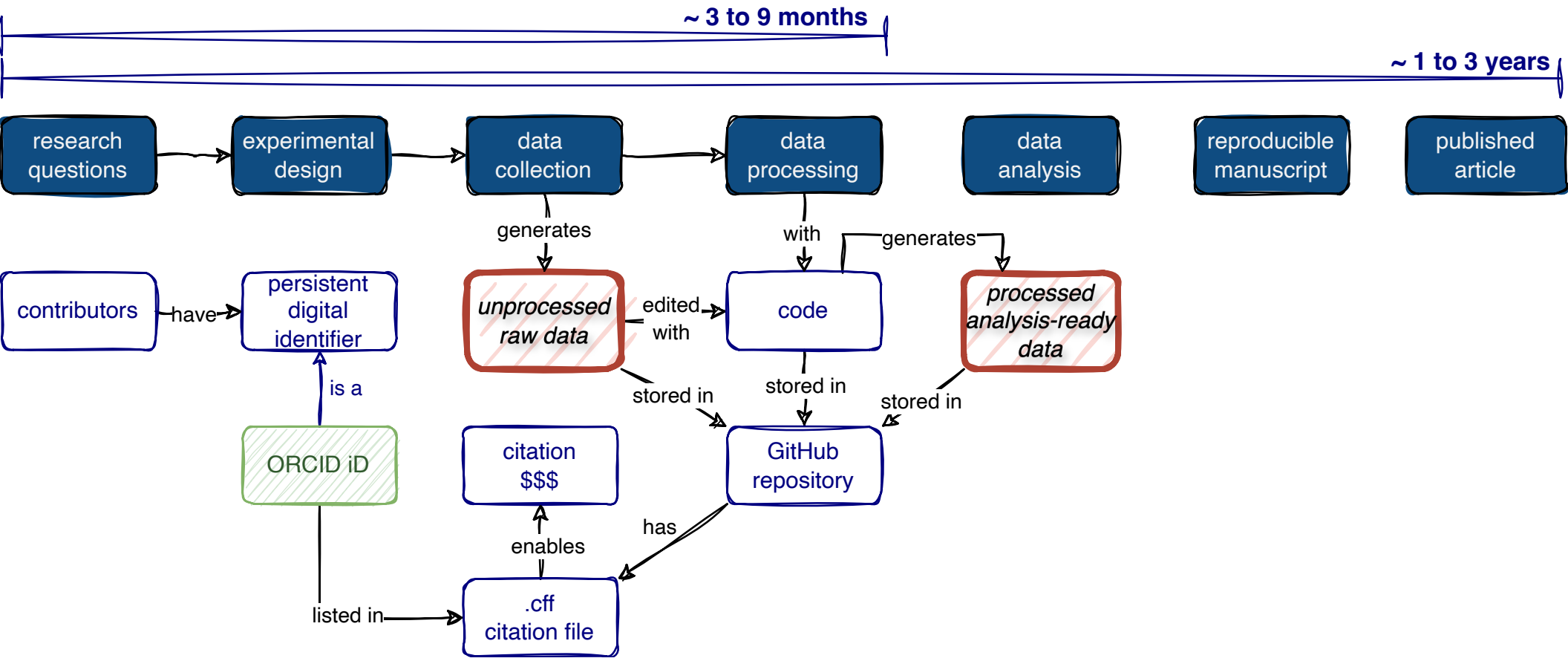

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article

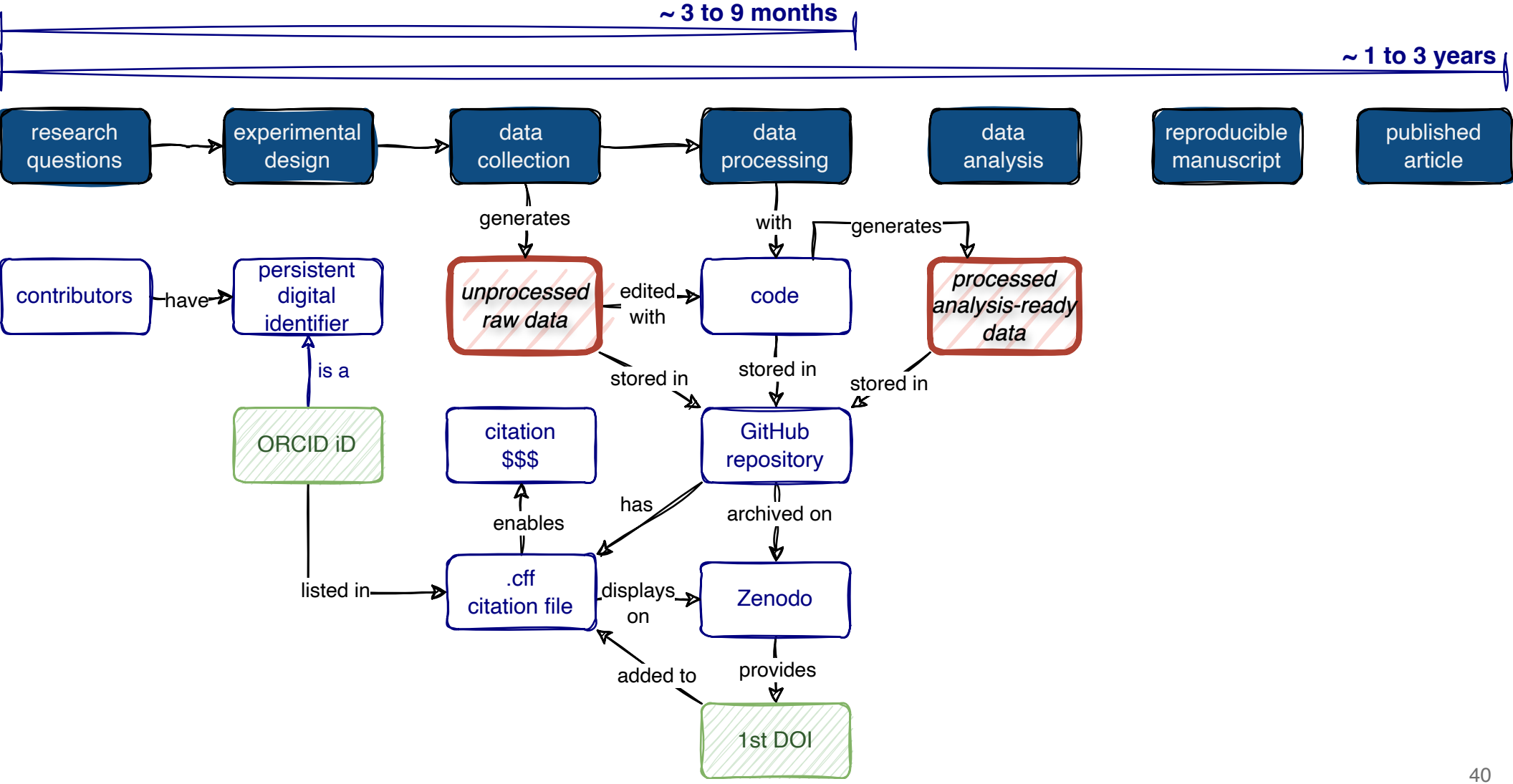

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
unprocessed raw data

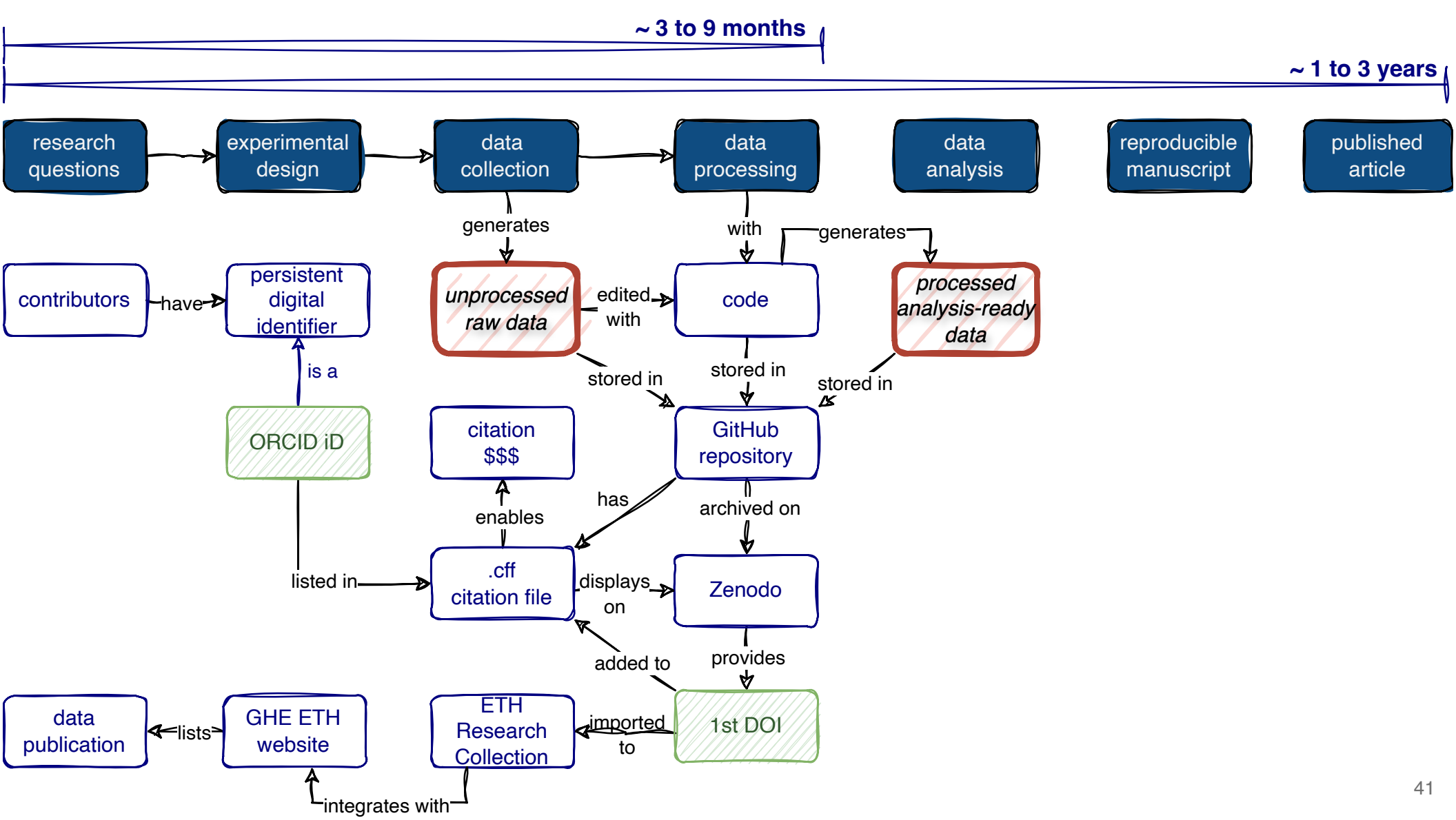

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
unprocessed raw data
edited with
code
processed analysis-ready data

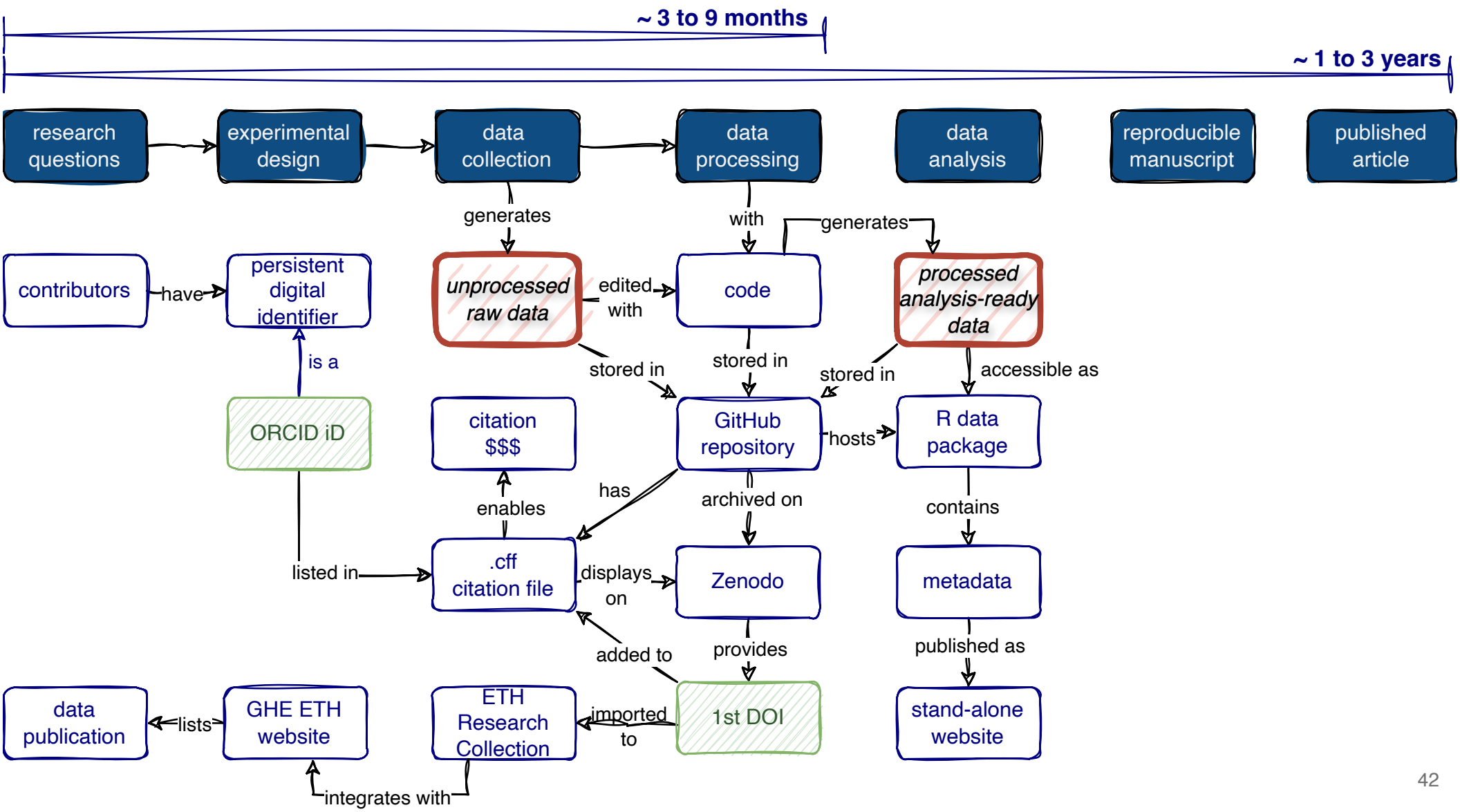

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
unprocessed raw data
edited with
code
processed analysis-ready data
stored in
stored in
stored in
GitHub repository

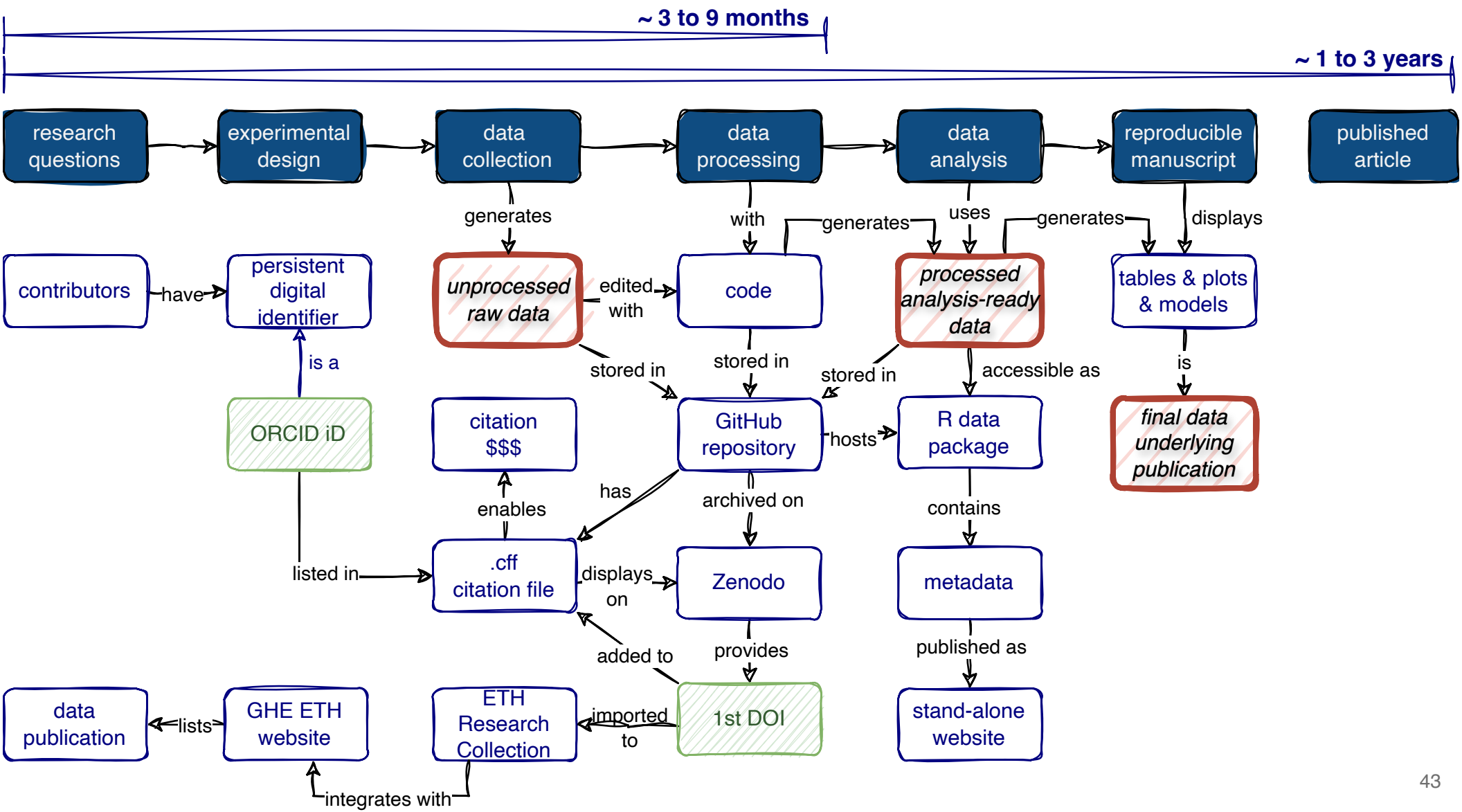

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
is a
stored in
stored in
stored in
ORCID iD
GitHub repository
has
listed in
.cff citation file

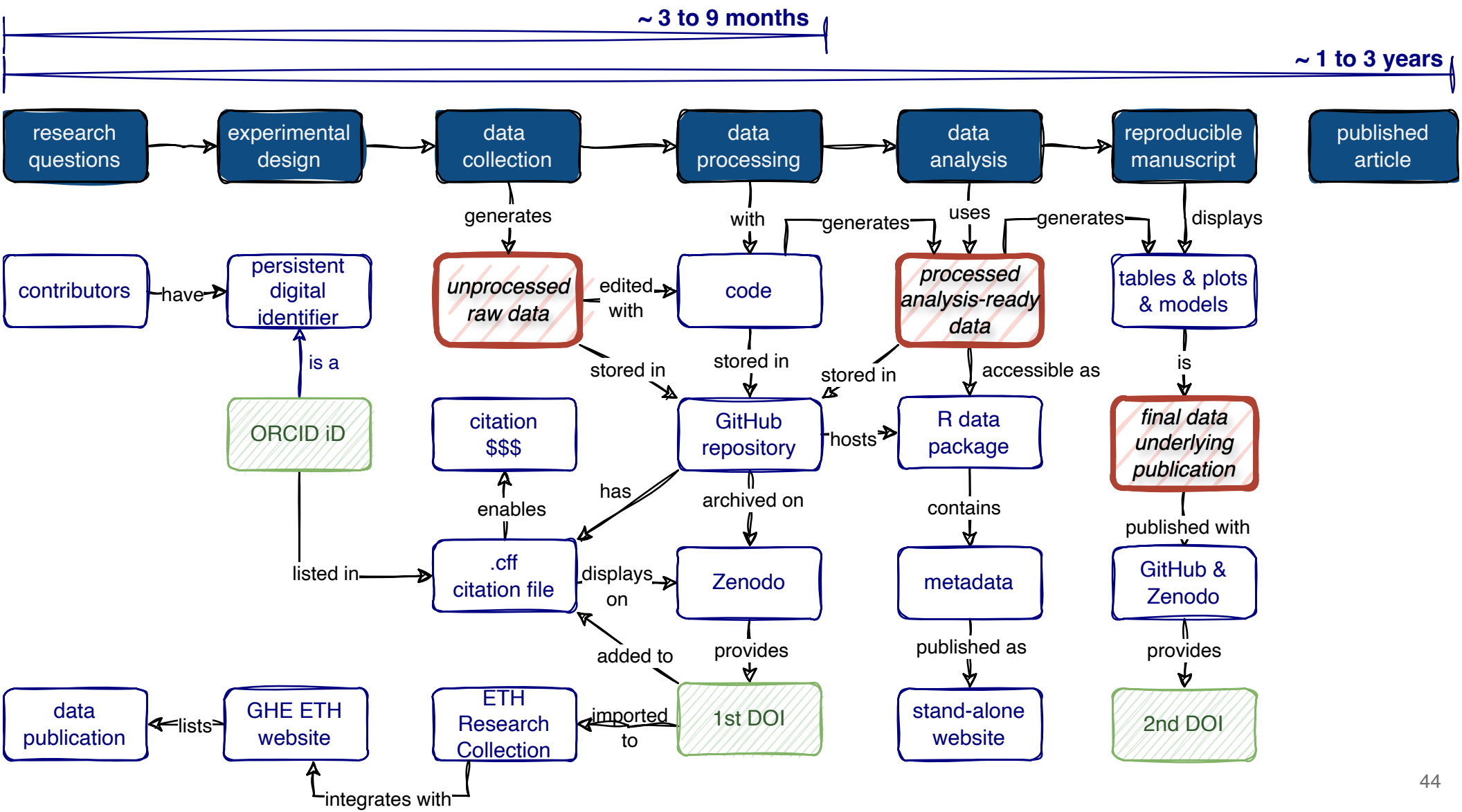

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
is a
stored in
stored in
stored in
ORCID iD
citation $$$
GitHub repository
has
enables
listed in
.cff citation file

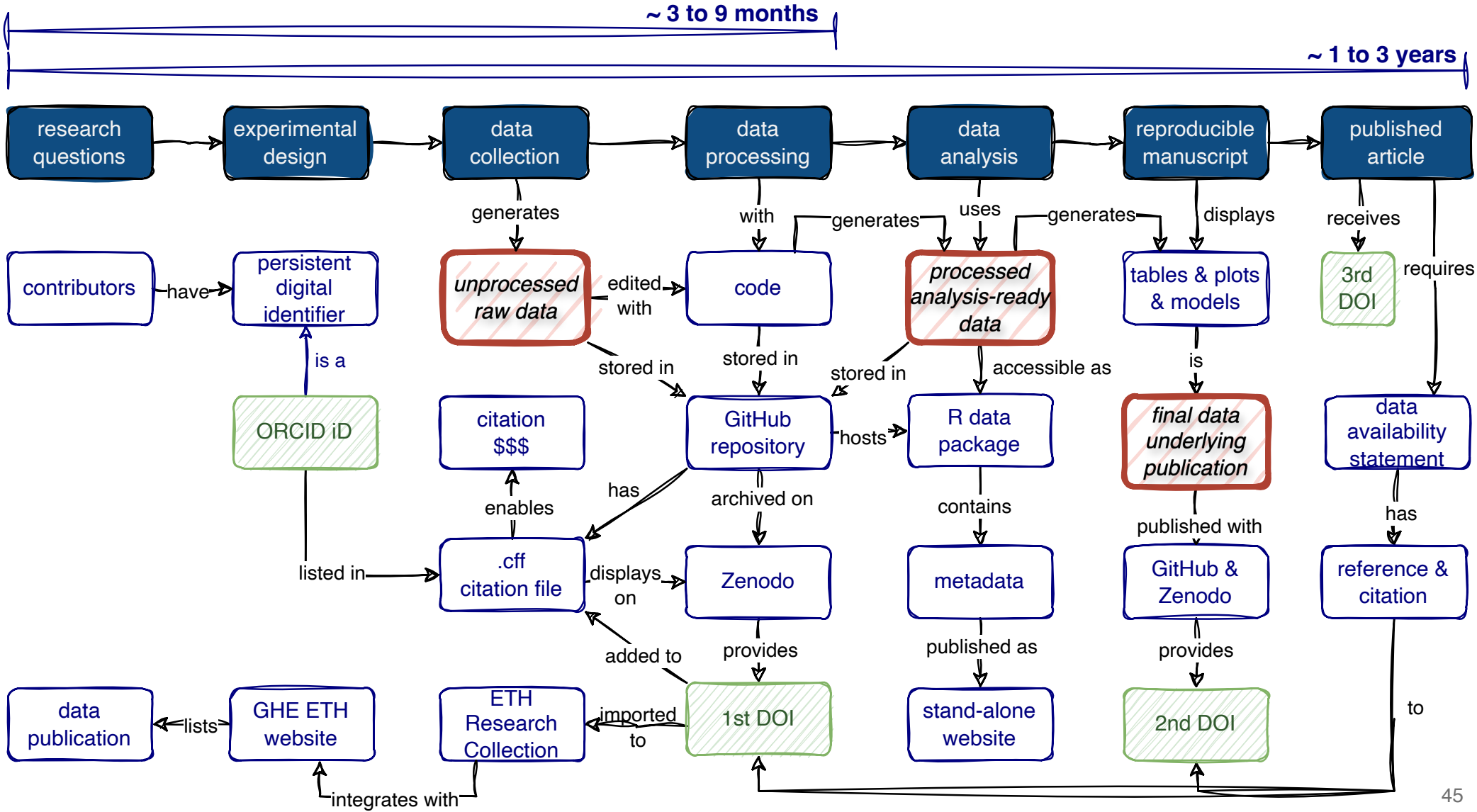

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
is a
stored in
stored in
stored in
ORCID iD
citation $$$
GitHub repository
has
archived on
enables
listed in
.cff citation file
displays on
Zenodo
added to
provides
1st DOI

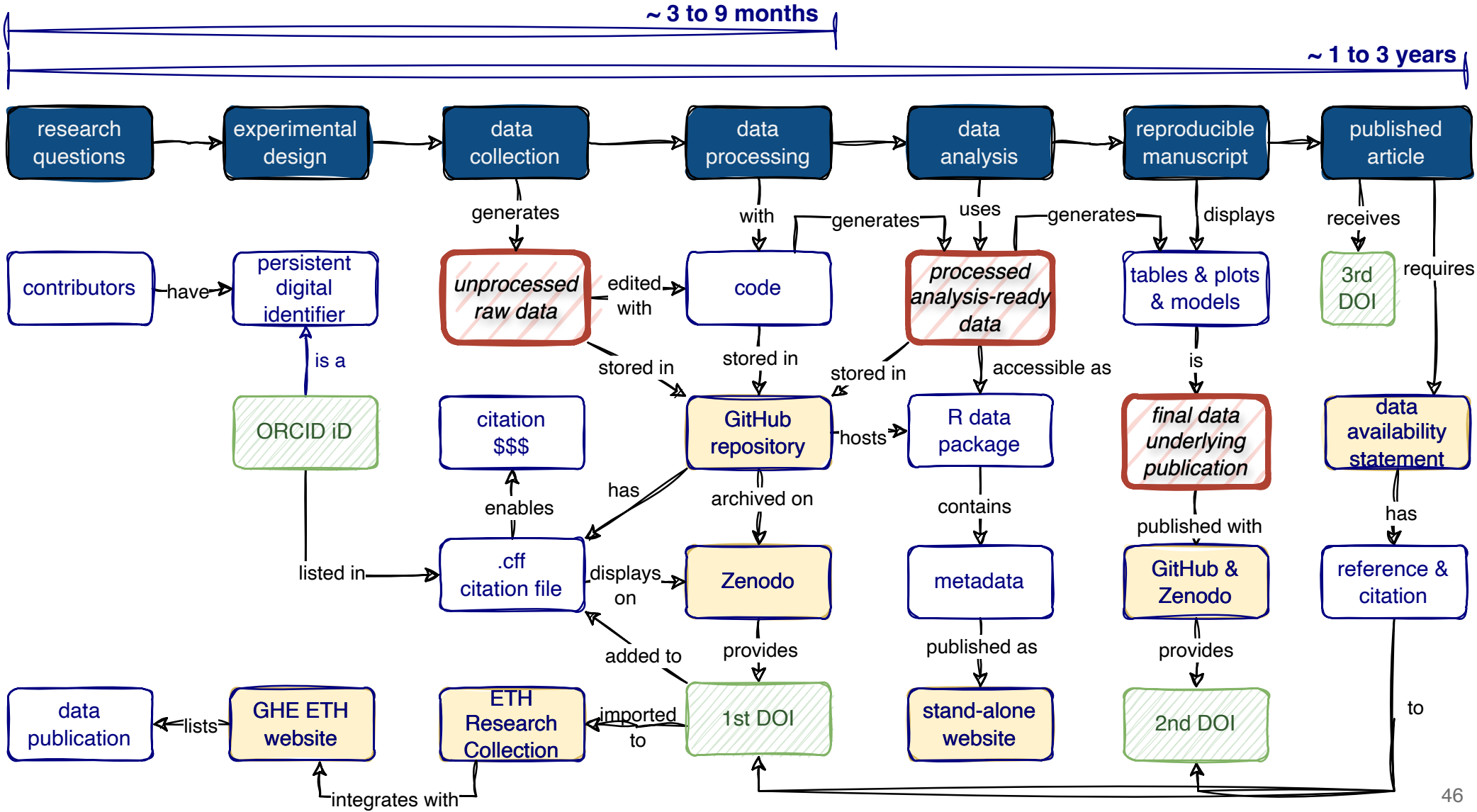

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
is a
stored in
stored in
stored in
ORCID iD
citation $$$
GitHub repository
has
archived on
enables
listed in
.cff citation file
displays on
Zenodo
added to
provides
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
integrates with


~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
is a
stored in
stored in
stored in
accessible as
ORCID iD
citation $$$
GitHub repository
hosts
R data package
has
archived on
enables
contains
listed in
.cff citation file
displays on
Zenodo
metadata
added to
provides
published as
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
stand-alone website
integrates with

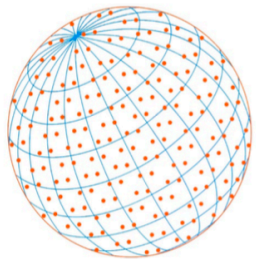

~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
uses
generates
displays
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
tables & plots & models
is a
stored in
stored in
stored in
accessible as
is
ORCID iD
citation $$$
GitHub repository
hosts
R data package
final data underlying publication
enables
has
archived on
contains
listed in
.cff citation file
displays on
Zenodo
metadata
added to
provides
published as
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
stand-alone website
integrates with


~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
uses
generates
displays
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
tables & plots & models
is a
stored in
stored in
stored in
accessible as
is
ORCID iD
citation $$$
GitHub repository
hosts
R data package
final data underlying publication
enables
has
archived on
contains
published with
listed in
.cff citation file
displays on
Zenodo
metadata
GitHub & Zenodo
added to
provides
published as
provides
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
stand-alone website
2nd DOI
integrates with


~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
uses
generates
displays
receives
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
tables & plots & models
3rd DOI
requires
is a
stored in
stored in
stored in
accessible as
is
ORCID iD
citation $$$
GitHub repository
hosts
R data package
final data underlying publication
data availability statement
has
enables
has
archived on
contains
published with
listed in
.cff citation file
displays on
Zenodo
metadata
GitHub & Zenodo
reference & citation
added to
provides
published as
provides
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
stand-alone website
2nd DOI
to
integrates with


~ 3 to 9 months
~ 1 to 3 years
research questions
experimental design
data collection
data processing
data analysis
reproducible manuscript
published article
generates
with
generates
uses
generates
displays
receives
contributors
have
persistent digital identifier
unprocessed raw data
edited with
code
processed analysis-ready data
tables & plots & models
3rd DOI
requires
is a
stored in
stored in
stored in
accessible as
is
ORCID iD
citation $$$
GitHub repository
hosts
R data package
final data underlying publication
data availability statement
has
enables
has
archived on
contains
published with
listed in
.cff citation file
displays on
Zenodo
metadata
GitHub & Zenodo
reference & citation
added to
provides
published as
provides
data publication
lists
GHE ETH website
ETH Research Collection
imported to
1st DOI
stand-alone website
2nd DOI
to
integrates with


#7 Findable: Publish for humans and computers



Aerosol and Air Quality Research

Special Issue:
Carbonaceous Aerosols in the Atmosphere (VII)

ORIGINAL RESEARCH
https://doi.org/10.4209/aaqr.240095

Absorption Ångström Exponent Values to Identify Light-absorbing Carbonaceous Aerosol Sources in Blantyre, Malawi

Saloni Vijay[1*], Lars Schöbitz[1], Hope Kelvin Chilunga[2], Elizabeth Tilley[1]

[1] Global Health Engineering, Department of Mechanical and Process Engineering, ETH Zürich, Zürich 8092, Switzerland
[2] Department of Computer Science and Information Technology, Malawi University of Business and Applied Science, Blantyre 265, Malawi

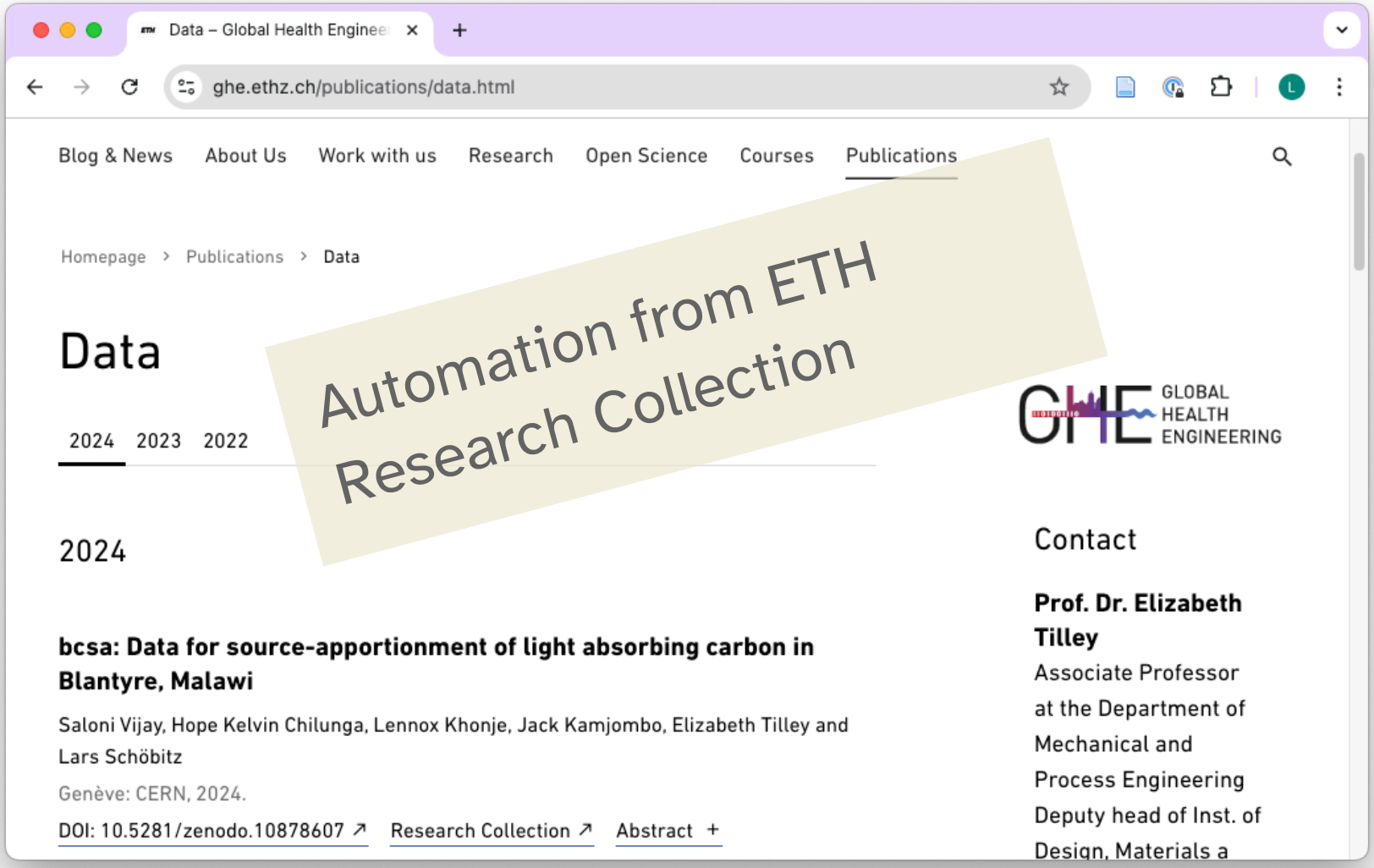
LAC aerosols concentration data acquired from the two MA200 monitors, we calculated the R^2 score between the monitored data from both devices at an 880 nm wavelength channel. An R^2 score of 0.97 both times was obtained implying high data reliability.

2.6 Computational Reproducibility and Data Availability

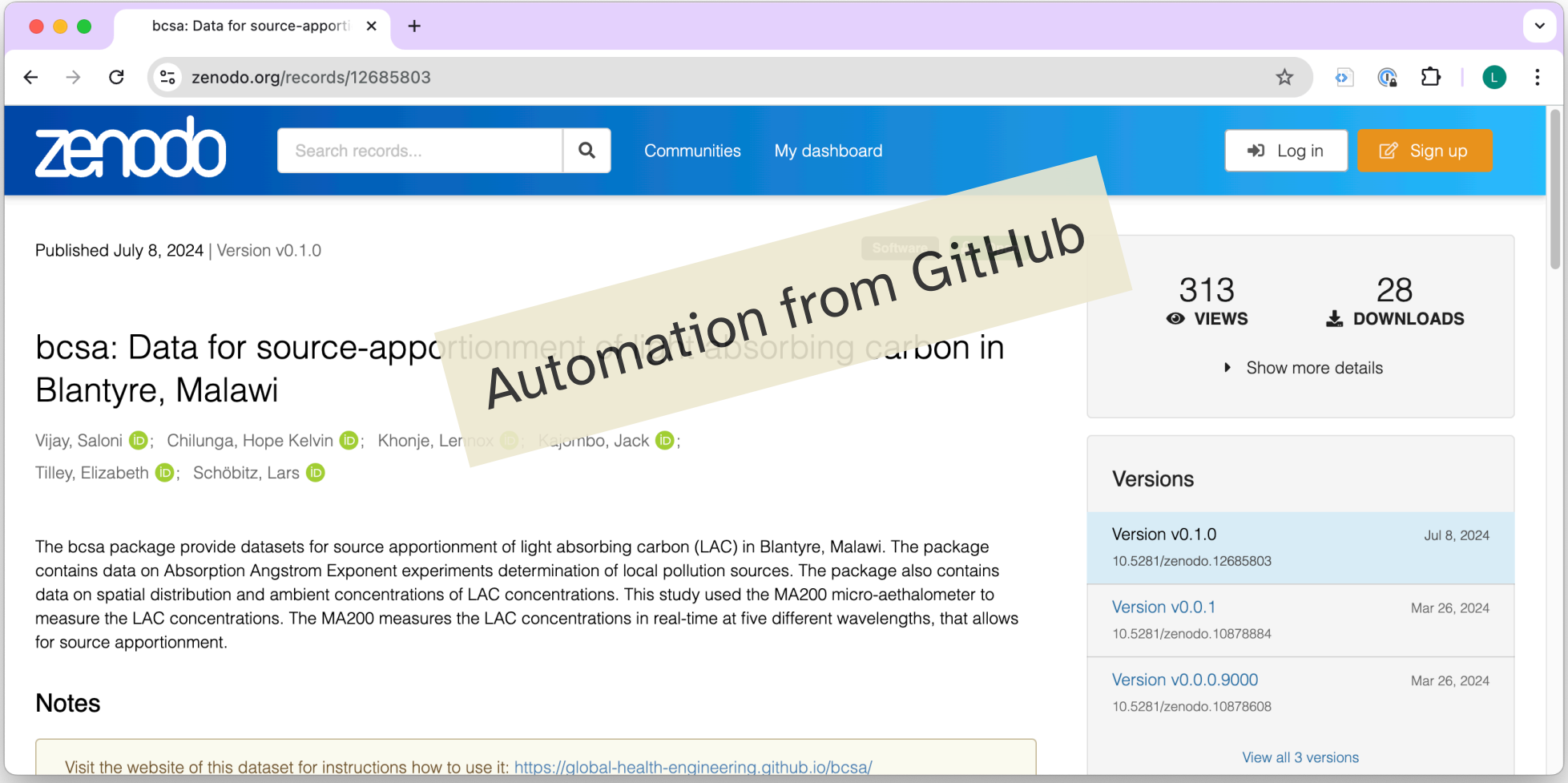
R Statistical Software version 4.3.0 and RStudio IDE version 2023.9.1.494 were used for quantitative data analysis to generate the results in the manuscript (Posit team, 2023). Several R packages were used for data processing, analysis, and visualization (Schwalb-Willmann, 2024; Müller, 2023; Pebesma, 2018; Robinson *et al.*, 2023; Spinu *et al.*, 2023; Wickham *et al.*, 2023b, 2023a, 2024).

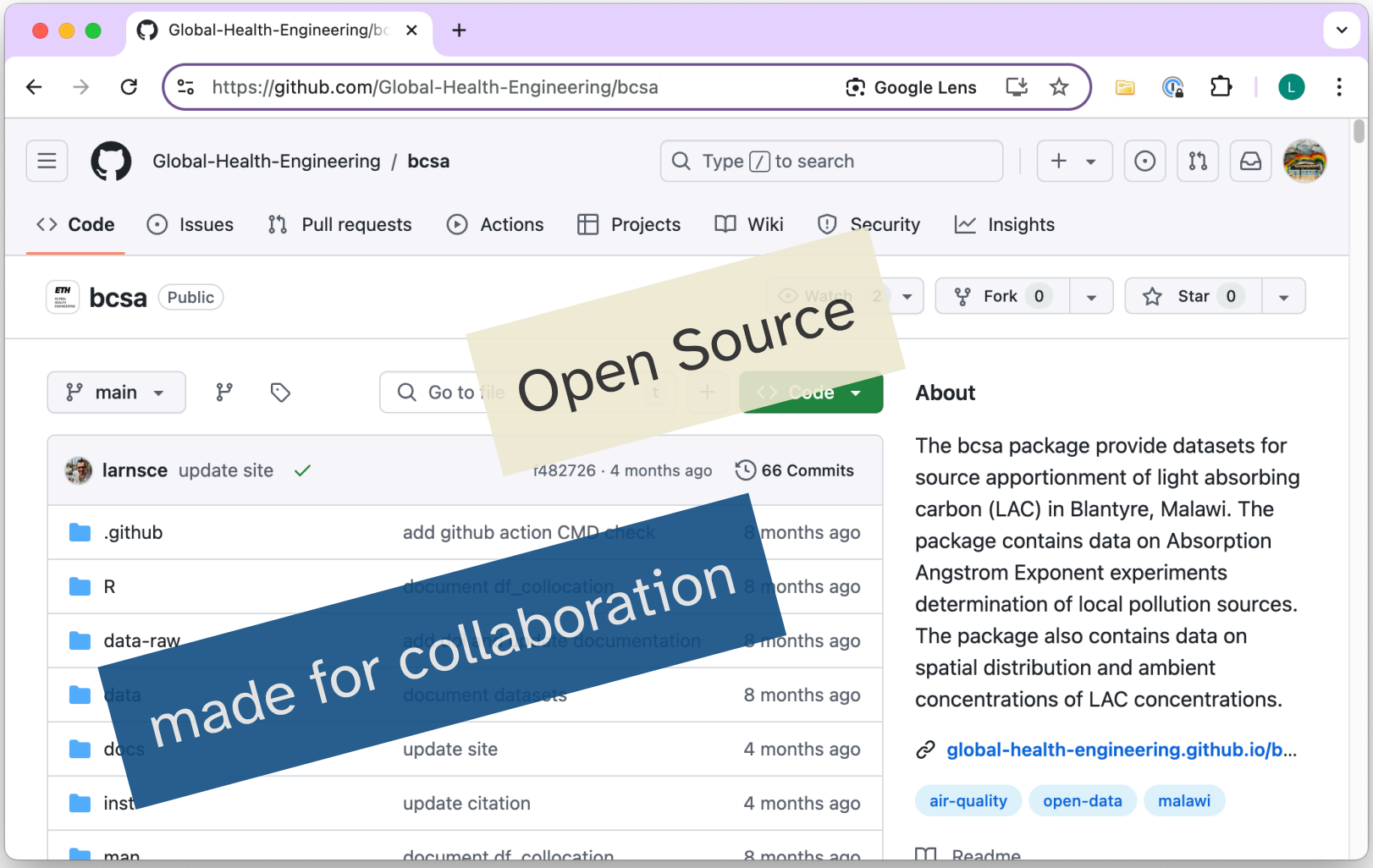
Raw data and processed data are available as an R package - Vijay *et al.* (2024a). The data analysis code used to generate the figures and tables of this manuscript are contained in a public GitHub repository (Vijay *et al.*, 2024b).

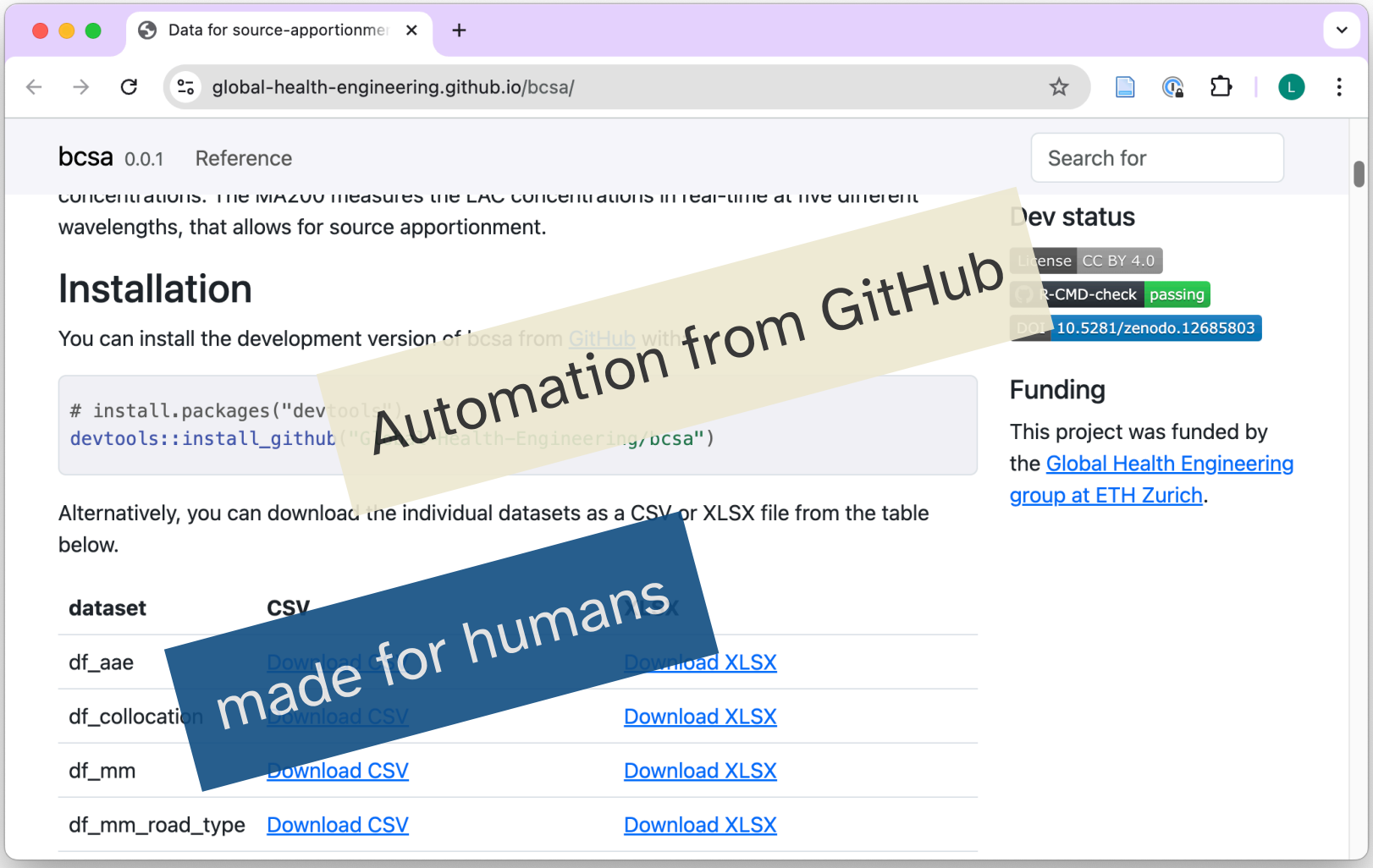
3 RESULTS AND DISCUSSION


Data – Global Health Enginee
ghe.ethz.ch/publications/data.html
Blog & News
About Us
Work with us
Research
Open Science
Courses
Publications
Homepage
Publications
Data
Data
2024
2023
2022
Automation from ETH
Research Collection
GLOBAL
HEALTH
ENGINEERING
2024
bcsa: Data for source-apportionment of light absorbing carbon in Blantyre, Malawi
Saloni Vijay, Hope Kelvin Chilunga, Lennox Khonje, Jack Kamjombo, Elizabeth Tilley and Lars Schöbitz
Genève: CERN, 2024.
DOI: 10.5281/zenodo.10878607
Research Collection
Abstract
Contact
Prof. Dr. Elizabeth Tilley
Associate Professor
at the Department of
Mechanical and
Process Engineering
Deputy head of Inst. of
Design, Materials a

Automation from Zenodo


bcsa: Data for source-apporti
zenodo.org/records/12685803
zenodo
Search records...
Communities
My dashboard
Log in
Sign up
Published July 8, 2024 | Version v0.1.0
Automation from GitHub
313
VIEWS
28
DOWNLOADS
Show more details
bcsa: Data for source-appo rtionment of li absorbing carbon in Blantyre, Malawi
Vijay, Saloni; Chilunga, Hope Kelvin; Khonje, Le nox; Kajombo, Jack;
Tilley, Elizabeth; Schöbitz, Lars
The bcsa package provide datasets for source apportionment of light absorbing carbon (LAC) in Blantyre, Malawi. The package contains data on Absorption Angstrom Exponent experiments determination of local pollution sources. The package also contains data on spatial distribution and ambient concentrations of LAC concentrations. This study used the MA200 micro-aethalometer to measure the LAC concentrations. The MA200 measures the LAC concentrations in real-time at five different wavelengths, that allows for source apportionment.
Versions
Version v0.1.0
Jul 8, 2024
10.5281/zenodo.12685803
Version v0.0.1
Mar 26, 2024
10.5281/zenodo.10878884
Version v0.0.0.9000
Mar 26, 2024
10.5281/zenodo.10878608
View all 3 versions
Notes
Visit the website of this dataset for instructions how to use it: https://global-health-engineering.github.io/bcsa/


Global-Health-Engineering/bc
https://github.com/Global-Health-Engineering/bcsa
Google Lens
Global-Health-Engineering / bcsa
Type / to search
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
bcsa
Public
Fork 0
Star 0
main
Go to file
Code
larnsce update site
r482726 · 4 months ago
66 Commits
.github
add github action CMD check
8 months ago
R
document df_collocation
8 months ago
data-raw
8 months ago
data
document datasets
8 months ago
docs
update site
4 months ago
inst
update citation
4 months ago
man
document df_collocation
8 months ago
About
The bcsa package provide datasets for source apportionment of light absorbing carbon (LAC) in Blantyre, Malawi. The package contains data on Absorption Angstrom Exponent experiments determination of local pollution sources. The package also contains data on spatial distribution and ambient concentrations of LAC concentrations.
global-health-engineering.github.io/b...
air-quality
open-data
malawi
Readme
Open Source
made for collaboration

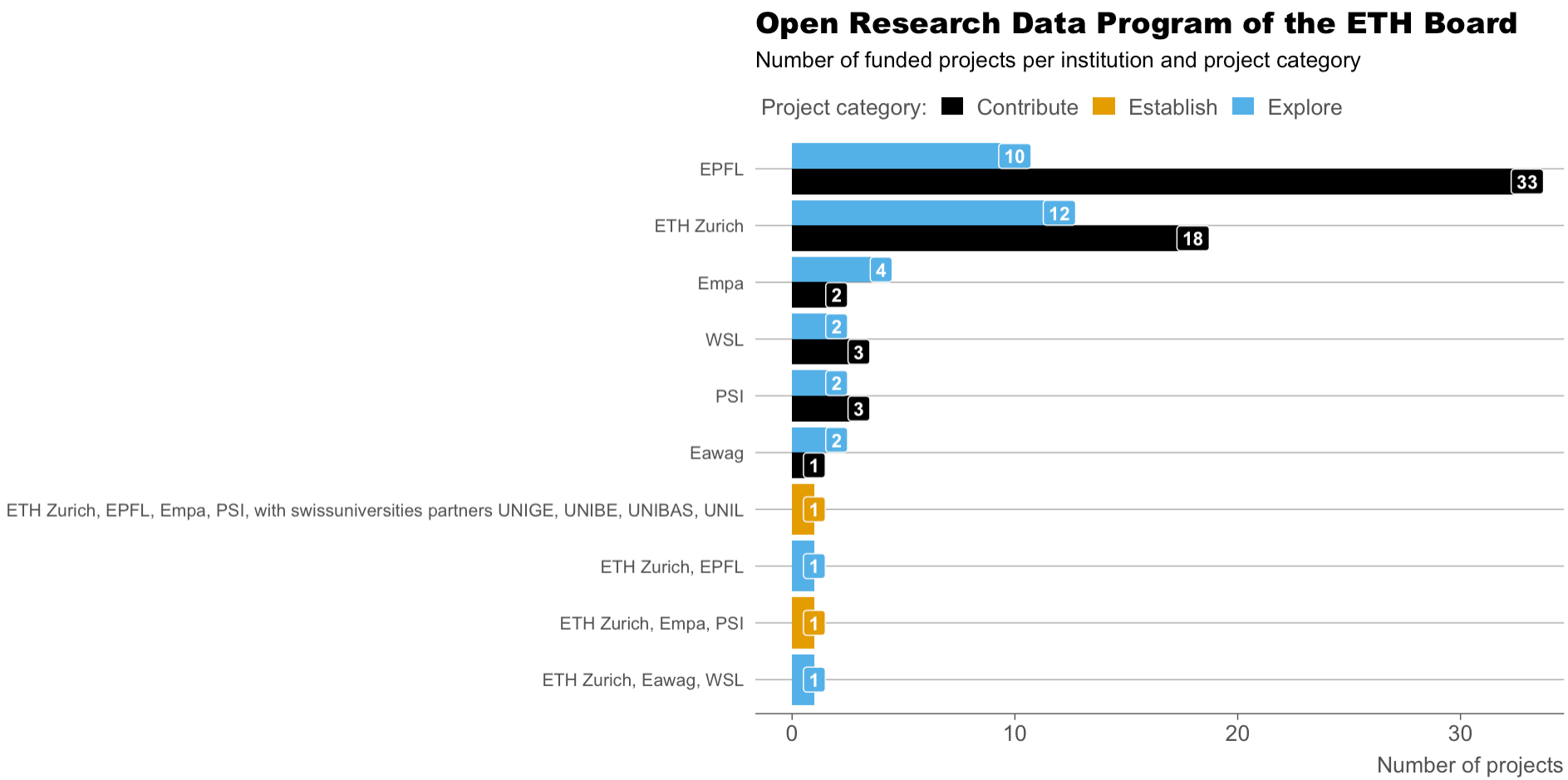

Data for source-apportionme
global-health-engineering.github.io/bcsa/
bcsa 0.0.1 Reference
Search for
wavelengths, that allows for source apportionment.
Installation
You can install the development version of
install.packages("dev
devtools::install_github
Alternatively, you can download the individual datasets as a CSV or XLSX file from the table below.
dataset
CSV
df_aae
df_collocation
df_mm
df_mm_road_type
Download CSV
Download XLSX
Dev status
License CC BY 4.0
R-CMD-check passing
DOI 10.5281/zenodo.12685803
Funding
This project was funded by the Global Health Engineering group at ETH Zurich.
Automation from GitHub
made for humans


#8 Funding for Open Research Data ~~exists~~ existed

Funding schemes

swissuniversities

- 2021 - 2024: swissuniversities - Open Science I
- 2025 - ~~2028~~ 2026: swissuniversities - Open Science II
- Watch: Action Line B5.2 - Professionalisation of ORD specialists and related services
- Newsletter sign-up: https://sympa.ethz.ch/sympa/subscribe/isci


Open Research Data Program of the ETH Board
Number of funded projects per institution and project category
Project category: Contribute Establish Explore
EPFL
ETH Zurich
Empa
WSL
PSI
Eawag
ETH Zurich, EPFL, Empa, PSI, with swissuniversities partners UNIGE, UNIBE, UNIBAS, UNIL
ETH Zurich, EPFL
ETH Zurich, Empa, PSI
ETH Zurich, Eawag, WSL
10
33
12
18
4
2
2
3
2
3
2
1
1
1
1
1
0
10
20
30
Number of projects

8 take-aways from 30 minutes

- #1 Technology is not on our side
- #2 ETH wants reproducibility
- #3 Data management is project management
- #4 Low IT affinity is not a lack of aptitude
- #5 Data != Data
- #6 Data management is a process, not a checkbox
- #7 Findable: Publish for humans and computers
- #8 Funding for Open Research Data ~~exists~~ existed

Thanks! 🌻

Slides created via revealjs and Quarto: https://quarto.org/docs/presentations/revealjs/

Slide background image taken from Danielle Navarro

Access slides as PDF on GitHub

References

Massari, Nicolo, Lars Schöbitz, and Elizabeth Tilley. 2025. “Ethord: ETH Board Open Research Data (ORD) Program Project Metadata and Report Data.” https://doi.org/10.5281/zenodo.15554776.