

# A PROTOTYPE SYSTEM FOR MASSIVELY INTERDISCIPLINARY DATA-LINKING

Philip Buckland & Mattias Sjölander  
Environmental Archaeology Lab.  
Umeå University

& others...

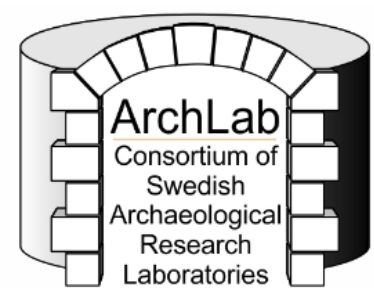
The logo for dataARC, featuring the word "data" in blue and "ARC" in red, with a blue arc passing through the letters.The logo for SEAD, featuring the word "SEAD" in a dark red serif font, with a grey sunburst or starburst graphic to its right.

# A PROTOTYPE SYSTEM FOR MASSIVELY INTERDISCIPLINARY DATA-LINKING

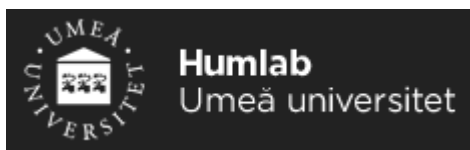
1. About SEAD (& VISEAD)
  - a. QSEAD – exploring single and multiproxy data
  - b. Bespoke analysis/visualisation tools
  - c. Linking SEAD to other databases
2. DataARC – massively multidisciplinary data discovery
  - a. Goals
  - b. International consortium
  - c. Concepts and links
  - d. Prototypes







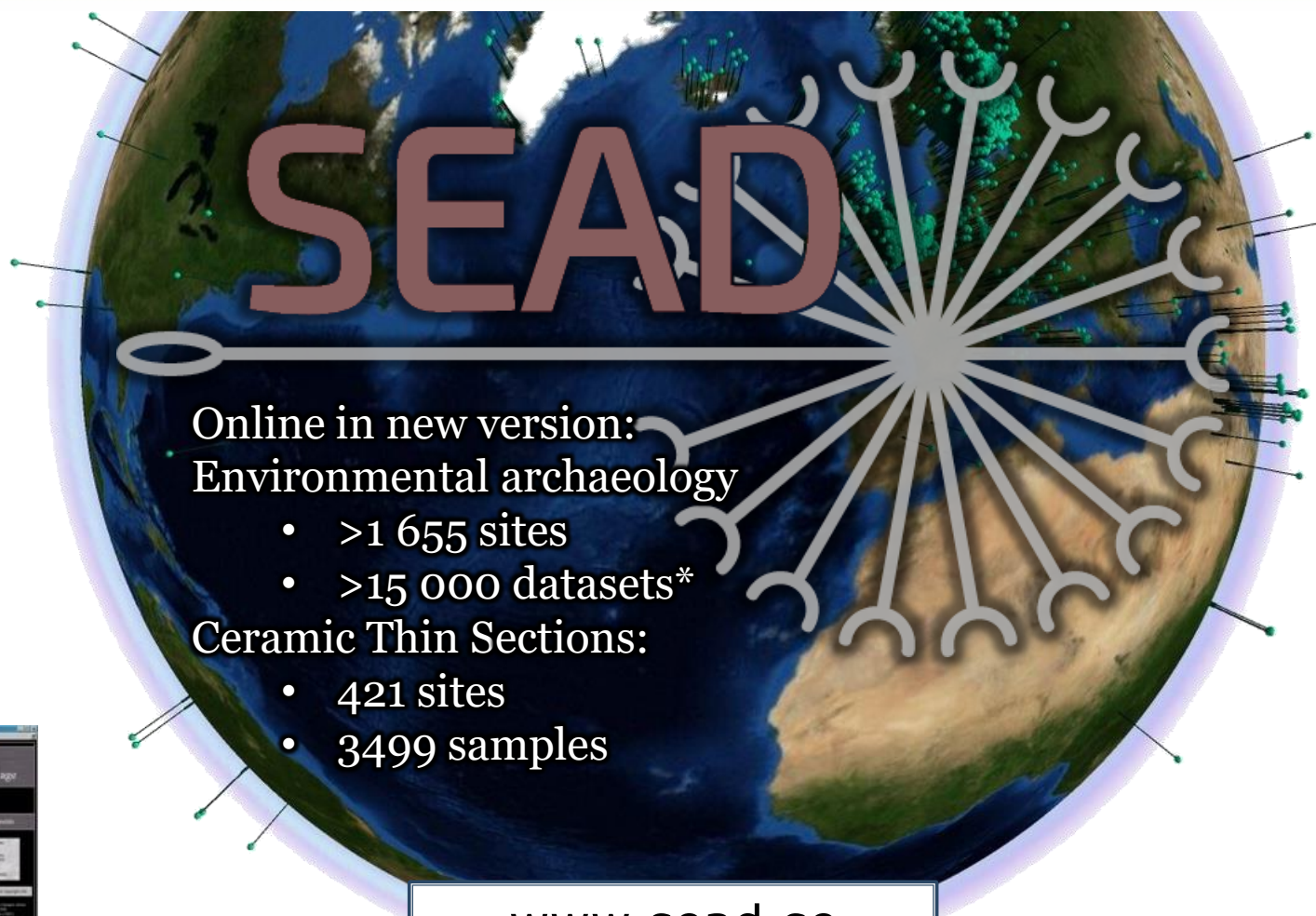
[www.archlab.se](http://www.archlab.se)



# The Strategic Environmental Archaeology Database

[www.sead.se](http://www.sead.se)

[qsead.sead.se](http://qsead.sead.se)



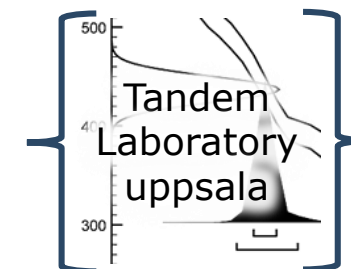
Online in new version:  
Environmental archaeology

- >1 655 sites
- >15 000 datasets\*

Ceramic Thin Sections:

- 421 sites
- 3499 samples

[www.sead.se](http://www.sead.se)  
[qsead.sead.se](http://qsead.sead.se)



# The Strategic Environmental Archaeology Database

www.sead.se

qsead.sead.se





# Exploring data online: qsead.sead.se

**SEAD - The Strategic Environmental Archaeology Database**

**Others**  
Proxy types  
Feature type  
Bibliography modern  
Bibliography sites/Sampleg...

**Space/Time**  
Sample group  
Site  
Country

**Time**  
Geochronology  
Time periods  
Seasons

**Ecology**  
Eco code  
Eco code system  
abundance classification  
Abundances

**Measured values**  
MS  
MS Heating 550  
LOI  
P<sup>a</sup>

**Taxonomy**  
Family  
Genus  
Taxa  
Author

**Eco code (1)** %

coprophilous	(1003)
corticolous	(985)
cortivorous	(41)
deserticolous	(474)
detriticolous	(503)
Disturbed/arable	(4452)
Dry dead wood	(1071)
Dung/foul habitats	(4685)
Ectoparasite	(532)
ectophagous	(82)
endophagous	(3)
entomophagous	(652)
euryhygric	(0)

[Show current selections](#)

**Site (3)** %

Fishervick	(2)
Fiskerton	(1)
Flag Fen	(7)
Flodden Hill	(1)
Four Ashes	(1)
Girton	(2)
Glanllynau	(2)
Glenarm: Deer Park Farms	(29)
Glen Ballyre	(3)
Goldcliff 1	(9)
Goldcliff 2007	(5)
Goldcliff 3	(1)
Goldcliff 4	(4)

**Seasons** %

May	(23)
June	(26)
July	(23)
August	(21)
April	(10)


**Map** **Table**

Search for and download data via the QSEAD interface

- New updated interface is currently under development
- Downloadable SEAD application discontinued
- New updated web based interface is under development
- Easiest solution is to contact us


**Summarize**


- ☐ Aggregate all
- ☐ Sample group level
- ☒ Site level



An international standard for environmental archaeology is under development at the Environmental Archaeology (MAL), in collaboration with HUMlab, at Umeå University, Sweden.

SEAD is financed by The Swedish Research Council and Umeå University Faculty of Human Sciences and Department of Historical, Philosophical and Religious Studies.





# Exploring data online: qsead.sead.se

SEAD - The Strategic Environmental Arch

Others

- Proxy types
- Feature type
- Bibliography modern
- Bibliography sites/Sampl

Eco code (1)

- coprophilous
- corticolous
- cortivorous
- deserticolous
- detriticolous
- Disturbed/arable
- Dry dead wood
- Dung/foul habitats
- Ectoparasite
- ectophagous
- endophagous
- entomophagous
- euryhygric

Site (3)

- Fisherwick
- Fiskerton
- Flag Fen
- Flodden Hill
- Four Ashes
- Girton
- Glanllynau
- Glenarm: Deer Park Farms
- Glen Ballyre
- Goldcliff 1
- Goldcliff 2007
- Goldcliff 3
- Goldcliff 4

Seasons

- May
- June
- July
- August
- April

SEAD

localhost:8080/viewstate/BJ2hW1Fhb

FILTER

ABOUT

?

Methods

Plant macrofossil 8

Fossil insect 11

Phosphates (Cit-P) 1

Magnetic Susceptibility 1

Pollen 1

XRF elements 2119

ICPMS elements 34

Dendrochronology 3146

Isotopes 11

Lipids 87

etc... 35

311

131

Elements

Group → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Period

1 1 H 2 He

2 3 Li 4 Be 5 B 6 C 7 N 8 O 9 F 10 Ne

3 11 Na 12 Mg 13 Al 14 Si 15 P 16 S 17 Cl 18 Ar

4 19 K 20 Ca 21 Sc 22 Ti 23 V 24 Cr 25 Mn 26 Fe 27 Co 28 Ni 29 Cu 30 Zn 31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr

5 37 Rb 38 Sr 39 Y 40 Zr 41 Nb 42 Mo 43 Tc 44 Ru 45 Rh 46 Pd 47 Ag 48 Cd 49 In 50 Sn 51 Sb 52 Te 53 I 54 Xe

6 55 Cs 56 Ba 57 La 58 Ce 59 Pr 60 Nd 61 Pm 62 Sm 63 Eu 64 Gd 65 Tb 66 Dy 67 Ho 68 Er 69 Tm 70 Yb 71 Lu

7 87 Fr 88 Ra 89 Ac 90 Th 91 Pa 92 U 93 Np 94 Pu 95 Am 96 Cm 97 Bk 98 Cf 99 Es 100 Fm 101 Md 102 No 103 Lr

Lanthanides

Actinides

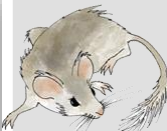
SEAD

Map of Europe with sampling locations marked by colored circles (pink, yellow, green).

# Landing pages

## Digital Object Identifier (DOI) via SND

- For each Site and Dataset (possibly more)
- New datasets generated when updated and issued new DOI  
→ provenance of data



### Neotoma Paleocological Database

Dataset Archiving  
<http://neotomadb.org>

## Neotoma Dataset 170

### Site 100 (Swain unpublished) pollen surface sample dataset

DOI: [10.21233/N3TT3W](https://doi.org/10.21233/N3TT3W)

Links: [View on Neotoma Explorer](#) | [Download JSON](#) | [Download zipped CSV](#)

Constituent Database: North American Pollen Database

Dataset Type: pollen surface sample

Latitude: 43.92

Longitude: -73.7

Age Range: No relevant chronology.

Description: NA

## Affiliated Researchers

Name	Affiliation	Contribution
Grimm, Eric Christopher	University of Minnesota, Department of Earth Sciences, 310 Pillsbury Drive SE, Minneapolis, Minnesota 55455-0231, USA	DataCurator
Swain, Albert M.	706 Kenwood Circle, Verona, WI 53393, USA	DataCollector
Swain, Albert M.	706 Kenwood Circle, Verona, WI 53393, USA	ProjectLeader


## Publications

## [1] "No publications in this record."

## Data Citation

### APA

Swain, Albert M.. 2017. Site 100 (Swain unpublished) pollen surface sample dataset. In, *North American Pollen Database*. Neotoma Paleocological Database. doi:10.21233/N3TT3W



## Grundsunda Raä 345

Site ID 92

[Download](#) [Disclaimer](#)

**Description**

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

**Sample groups**

**Archaeological site/Soil auger or probe**

Sample Group ID	Sample Group name	No. of Samples	Dataset ID
142	Survey	1003	254,269,315,1238

**Archaeological site/Grab samples**

Sample Group ID	Sample Group name	No. of Samples	Dataset ID
409	Features	99	647,743,1037,1109,1200,1502,1558,1722

**Stratigraphic seq./Monolith**

Sample Group ID	Sample Group name	No. of Samples	Dataset ID
210	Trapping pit stratigraphy 4, PJ3497	164	331,481,641,852,1061,1280,1531
284	Trapping pit stratigraphy 3, PJ3495	213	431,435,545,558,584,890,973

**Datasets**

**Loss on Ignition, heating at 550°C/Geochemistry**

**Description**

An evaluation of the proportion of organic matter present in a sample, measured by comparing...


Sample Group ID	Dataset ID	Dataset name
142	1238	Survey
210	481	Trapping pit stratigraphy 4, PJ3497
284	973	Features
409	1558	Features

**Magnetic Susceptibility/Geochemistry**

**Description**

A measurement of the ability of a sample to retain an induced magnetic field.

Sample Group ID	Dataset ID	Dataset name
142	315	Survey
409	743	Features
409	1073	Features



**Site ID:** 92

**Lat:** 63.3169444448

**Long:** 19.0086111111

**Altitude:**

**Location:** Mosjön, Lill Mosjön, Västernorrlands län, Grundsunda socken, Örnsköldsviks kommun, Ångermanland, Sweden

**Preservation status:**

**Dating**

Radiometric:

Calendar:

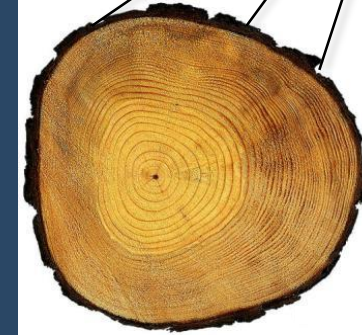
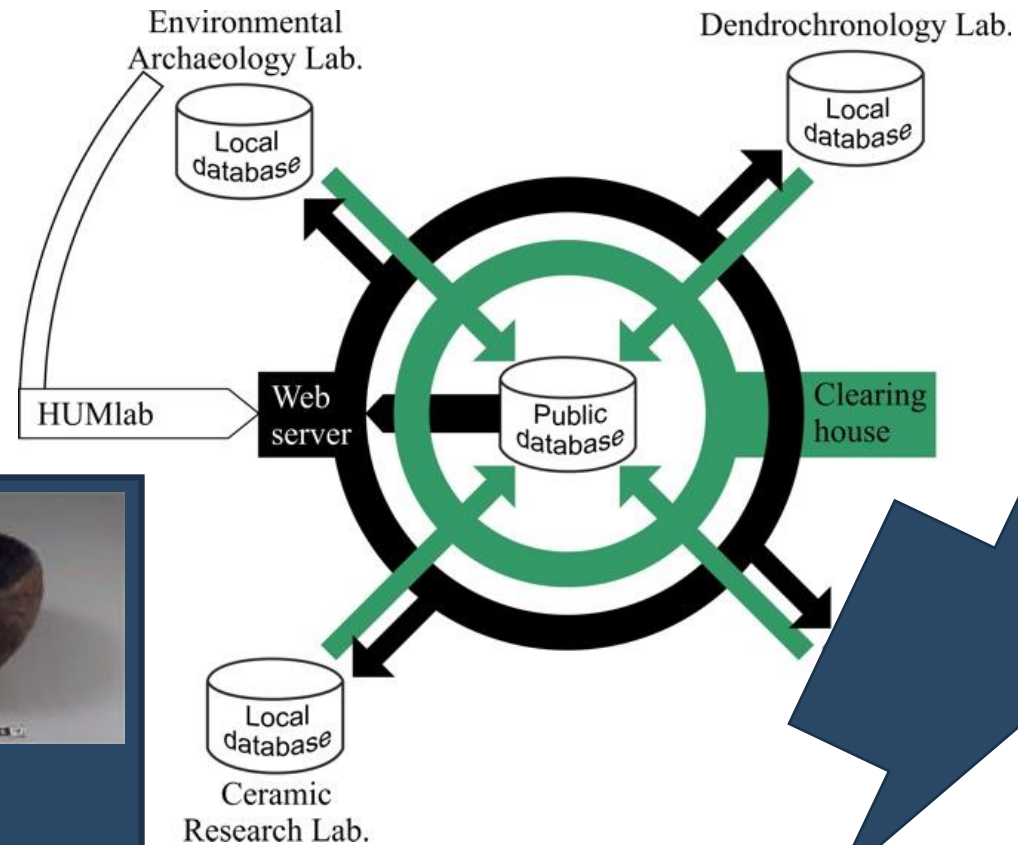
Relative:

**Publications**



# Multiple user groups - multiple entry points

Many different proxies  
Many different user groups  
Different analysis & visualisation needs



Show all related data  
in `qsead.sead.se`  
(Multiproxy nudging)



# Multiple user groups - multiple entry points

Domain science traditions, specific data and requirements, existing tools...

BugsCEP - [Bugs Coleopteran Ecology Package]

File Edit Window Help

Type a question for help

BugsCEP Site Manager BugsMCR BugStats Bibliography Search by Habitat etc... Tools

**Navigation**

Family  
CIMICIDAE

Genus  
Cimex

Species in Genus...

lectularius L.  
columbarius Jen.  
pipistrelli Jen.  
hemipterus (F)  
sp.

**Current Taxon:** *Cimex lectularius* L.

Species Associations

Biology & Distribution Synonyms Rarity Fossil/Site Records Ecology Summary Taxonomic Notes

**Biology Data:**

Henriksen 1939: Holsteinborg, W Greenland 1935) Eskimo houses so heavily infested that 23 out of 71 had to be evacuated and treated with sulphur.

Southwood & Leston 1959: also known as 'wall lice', 'mahogany flats' and 'crimson ramblers'. Carried throughout World by man, largely in bedding; nocturnal, spending day, often in numbers, in cracks in walls, behind skirting boards, under beds, sucking human blood by night; if undisturbed will take more than twice their weight in blood. For edevelopment, at least one meal is required per instar and the adult female must feed before oviposition. Starved bugs may live for a considerable time at 13 C, average life of adult is one yr, instars 3 months. In heated rooms, where temperature does not fall below 13-15 C during winter, breeding continues throughout yr, but at lower temperatures there is a break in development and eggs and intars die and females loose power of oviposition. White egg covered in spines attached to suitable surface, insensitive to dryness, hatching after 3-4 days at 35 C. Not known to transmit disease. As well as man will feed on mice, poultry, and a large number of zoo animals. Subsp columbarius Jenyns is recorded from pigeon lofts.

Vernacular name: The bed bug.

**Distribution Data:**

Henriksen 1939: Greenland: W.

Southwood & Leston 1959: Cosmopolitan. First recorded in England 1503, but recorded from ancient China and Greece. Subsp. columbarius is recorded from Yorks southwards in England.

▲ Prev. Sp. (PgUp)

(PgDown) Next Sp. ▼

Taxonomic Code  
2018.00100100

TaxoBrowser CODEBrowser

Bibliography for panel

Synonyms Browser

Export

Administrator Tools Add/Edit Data

Form View

BugsCEP - [BugsMCR - Climate from Beetles]

File Edit Window Help

Type a question for help

BugsCEP Site Manager BugsMCR BugStats Bibliography Search by Habitat etc... Tools

**BugsMCR**

SCR Explorer Close BugsMCR

**1. Choose source data** Refresh sites list

Site: Sandnes (V51) Kilaersarvik

Number of Countsheets: 2 at site.

Select Countsheet: Sandnes Felt I

Activate this countsheet

**2. Select options**

**Calculations**

Acceptable Overlap %

or

Default = 100%

☒ Closest to 100%

**Output**

☒ TMax & TMin Graphs

☒ Sample envelopes

☒ Sample species lists

**3. Perform calculations**

An Output filename will be requested when you click...

Run MCR on All Samples Run MCR on Species List only

**Tools** Show All MCR Species Predictions

Show Current Countsheet Advanced MCR

**Active Species List** Show only MCR species

CODE	Species Name
01.0290143	Bembidion grapii Gyll.
01.0440020	Trichocellus cognatus (Gyll.)
04.0080131	Hydroporus morio Aubé
04.0270040	Colymbetes dolabratus (Payk.)
23.0100310	Eusphalerum sorbi (Gyll.)
23.0170030	Xylodromus concinnus (Marsham)
23.0190020	Micralymma brevingue Schöidte
23.0820040	Othius angustus Steph.
23.0880250	Philonthus politus (L.)
23.1040675	Quedius fellmanni (Zett.)
23.1040712	Quedius sp.
23.1601010	Boreophilina islandica (Kr.)
23.2100020	Ocalea picata (Steph.)
47.0040033	Simplicaria metallica (Sturm)
47.0110010	Byrrhus fasciatus (Forst.)
55.0140590	Atomaria sp.

Record: 1 of 62

Currently active countsheet: Sandnes (V51) Kilaersarvik: Sandnes Felt I

Please remember to always cite BugsMCR AND the original MCR method papers (e.g. Atkinson et al., 1987) - see Help for details.

Form View

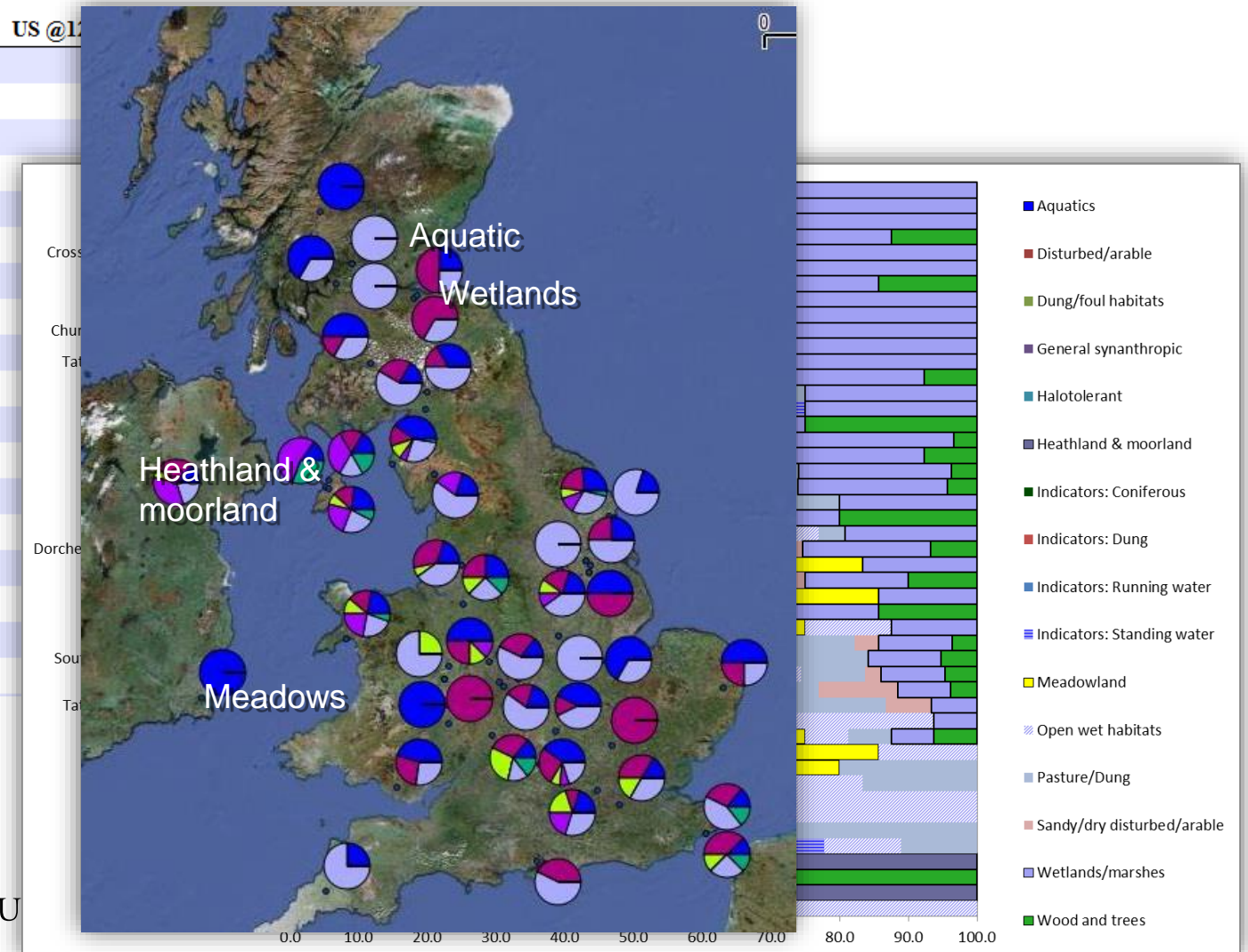
# How do we best present the data?

Only raw data & metadata?

Taxon    Physical sample	▲ MH @1265	◆ MN @1265	◆ US @1265
Agabus sp. (MNI)		1	1
Aleocharinae indet. (MNI)		86	188
Amara quenseli (MNI)		1	1
Amara sp. (MNI)			3
Anthicus flavipes (MNI)		1	4
Aphodius spp. (MNI)		47	26
Apion (s.l.) sp. (MNI)		2	3
Bembidion bipunctatum (MNI)		9	7
Bembidion hastii (MNI)		1	
Bembidion lapponicum (MNI)		1	
Bembidion lunatum (MNI)			3
Bembidion spp. (MNI)		2	
Bembidion transparens (MNI)			
Bembidion virens (MNI)			
Bledius sp. (MNI)		2	20
Boreaphilus henningianus (MNI)		2	4
Carpelimus/Thinobius sp. (MNI)		5	4
Cercyon sp. (MNI)		1	1

What about integrated analysis tools?

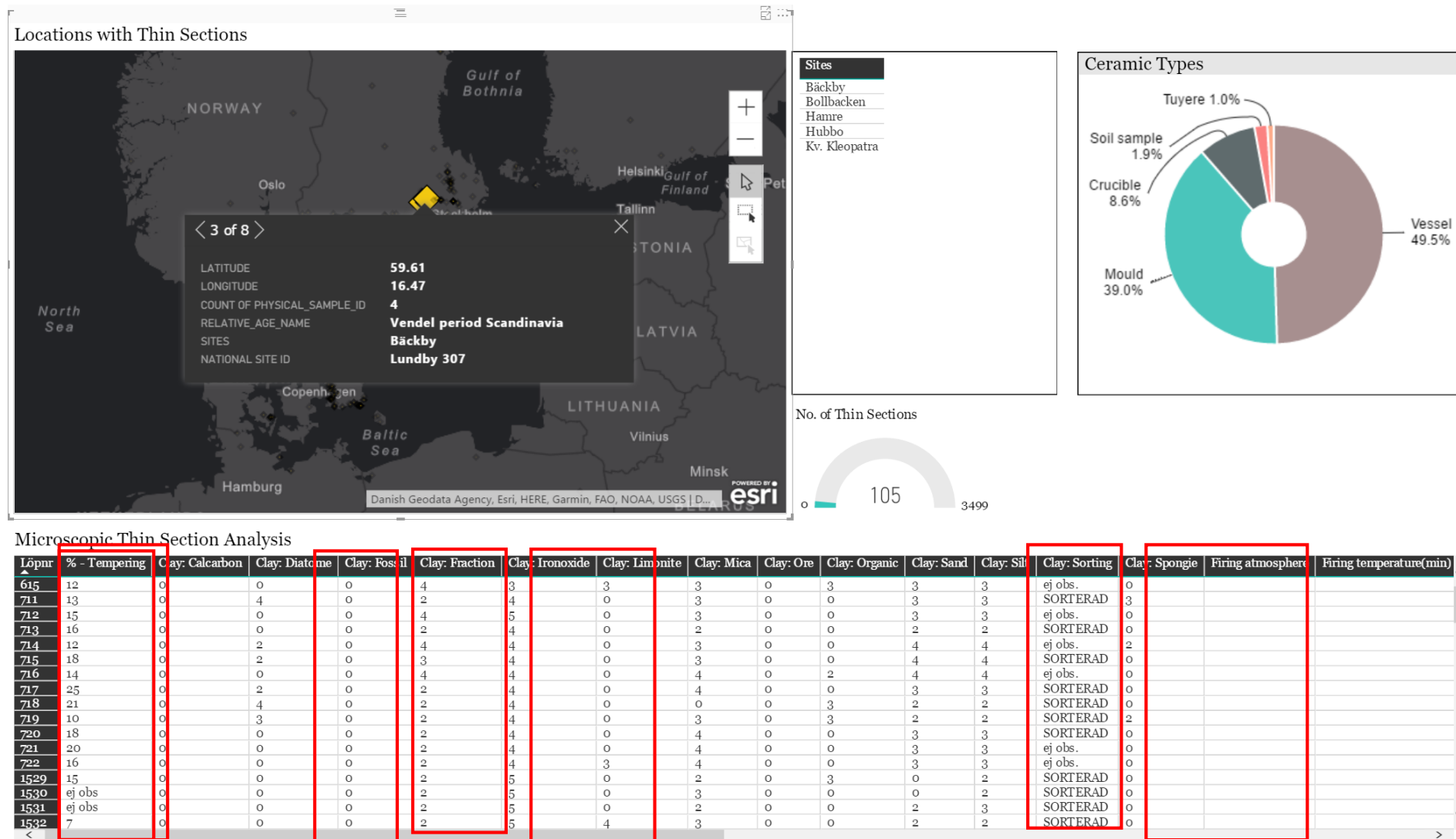
Or interpretation as well?





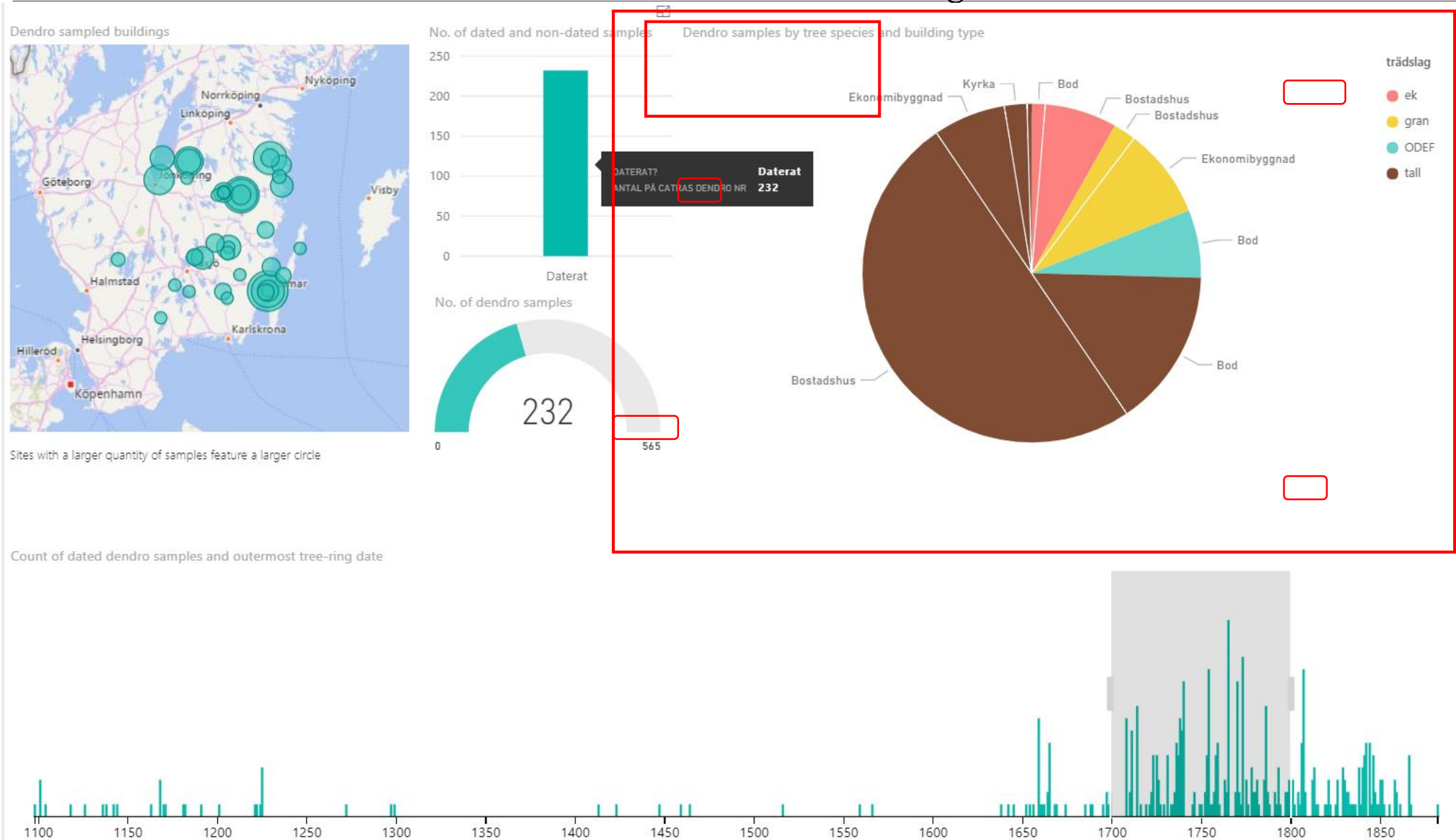
# Analysis & Visualisation

## Power BI for Ceramic Thin Section data



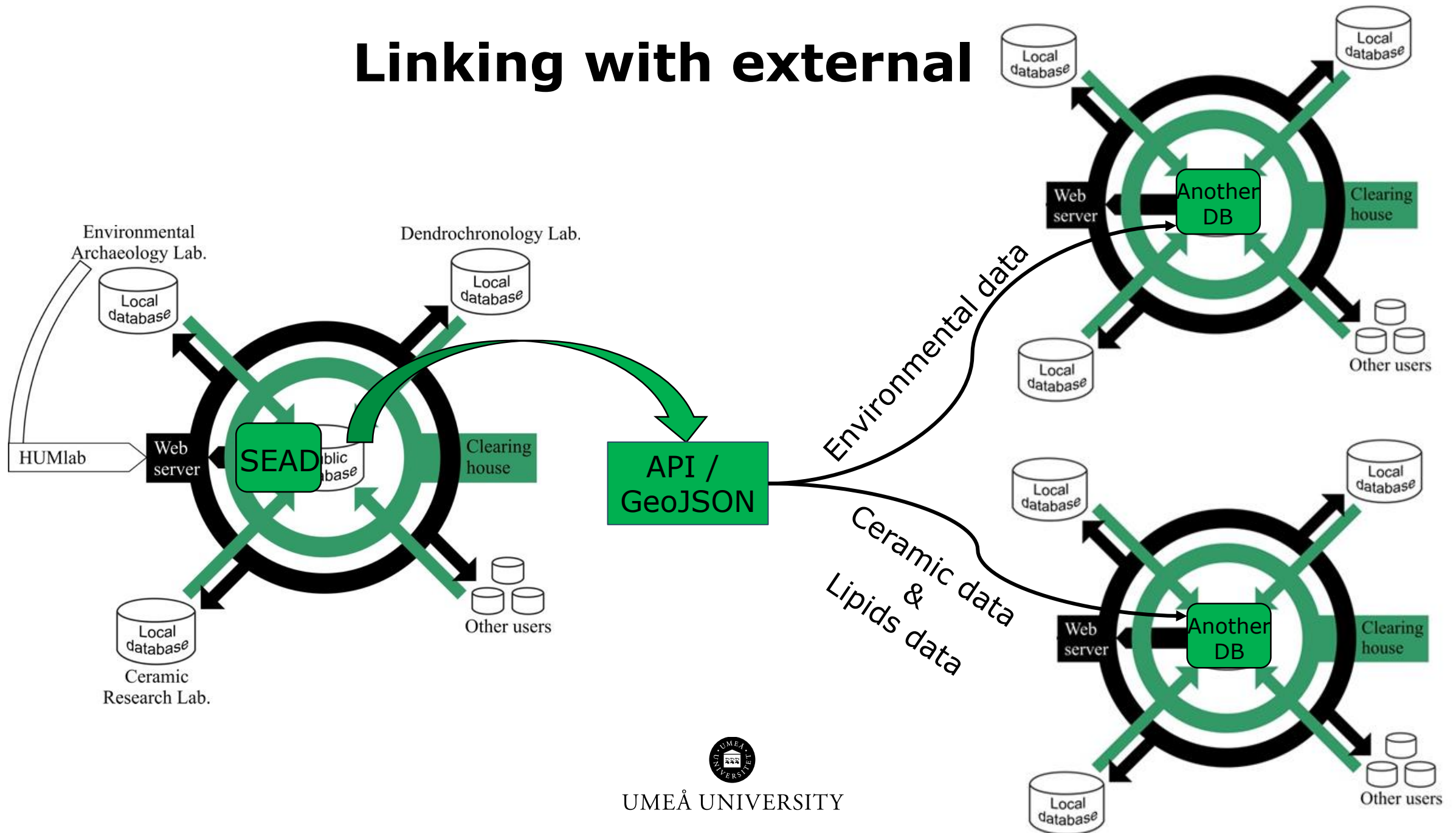
# Visualisation

## Power BI for Dendrochronological





# Linking with external







*www.data-arc.org*

*Colleen Strawhacker, Adam Brin,  
Rachel Opitz, Emily Lethbridge, Phil  
Buckland, Peter Pulsifer, Thomas  
McGovern, Tom Dawson, Ingrid  
Mainland, Gisli Pálsson, Anthony  
Newton, Richard Streeter, Tom  
Ryan*

**National Snow and Ice Data Center, University of Colorado**

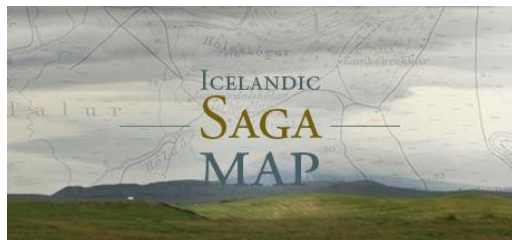


**@archaeohacker**



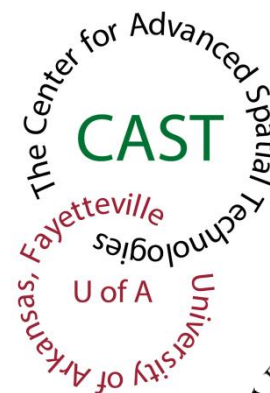
dataARC

# WHO/WHAT ARE WE?



University of Glasgow

TephraBase



Jarðabókin:  
sögulegur landfræðigrunnur um íslenska landnotkun  
the Icelandic historical geographic information system



UMEÅ UNIVERSITY



University of St Andrews

Linking data from archaeology, literature and historic documents (e.g. the Sagas), paleoecology, paleoclimate...

...to enable data discovery for interdisciplinary research on long-term human ecodynamics in the North Atlantic

Exploring new ways of linking and exploring data

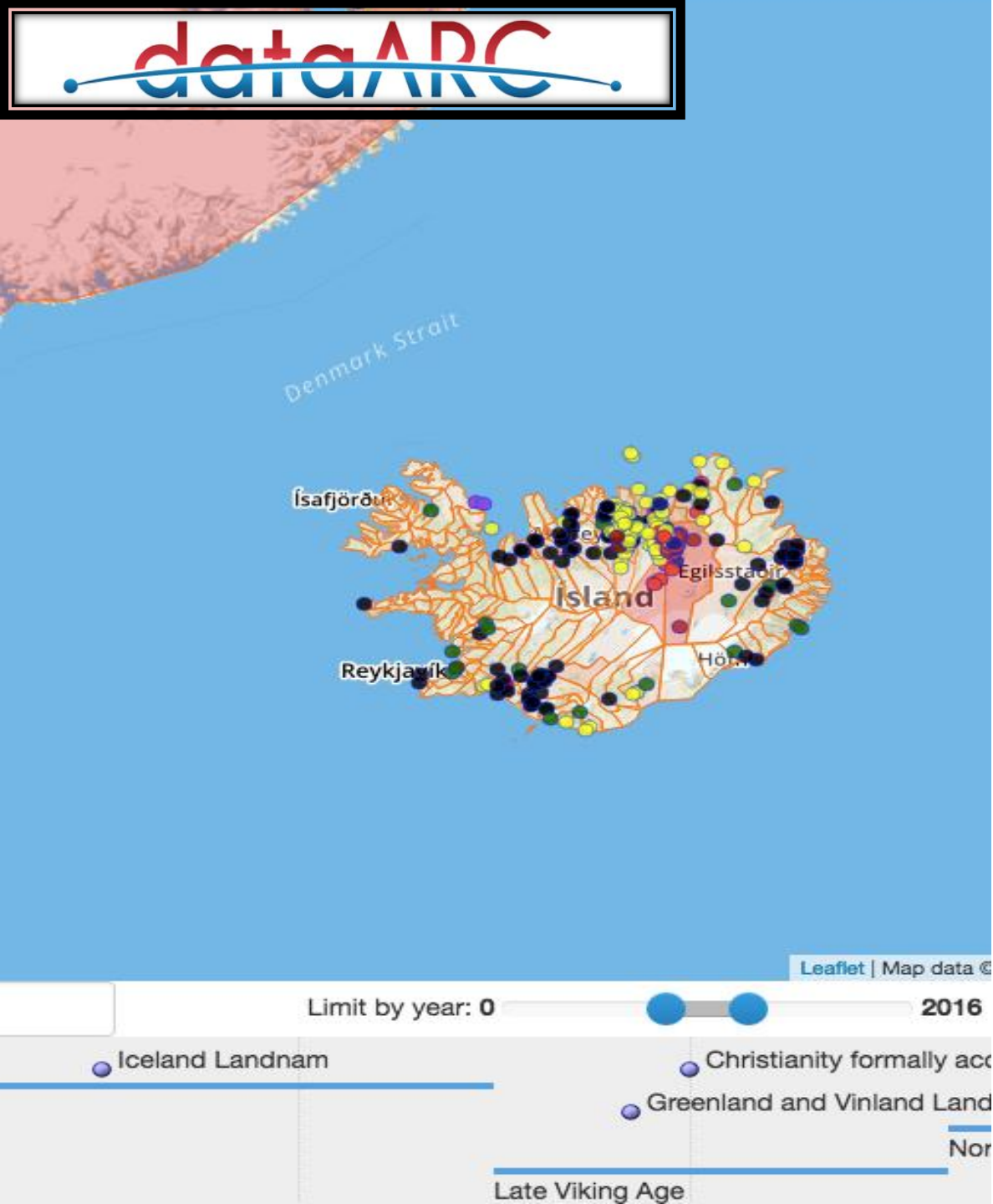




# OVERALL GOAL

Building cyberinfrastructure to enable interdisciplinary synthesis research across islands in the North Atlantic

- Data discovery and visualization tools
- Access to interdisciplinary datasets that can be easily understood by non-specialists
- Whilst maintaining links to raw data



# History, Agency, and Conjuncture in the High Middle Ages

Samalas 1257  
BOOM !

Black Death in  
NW Europe

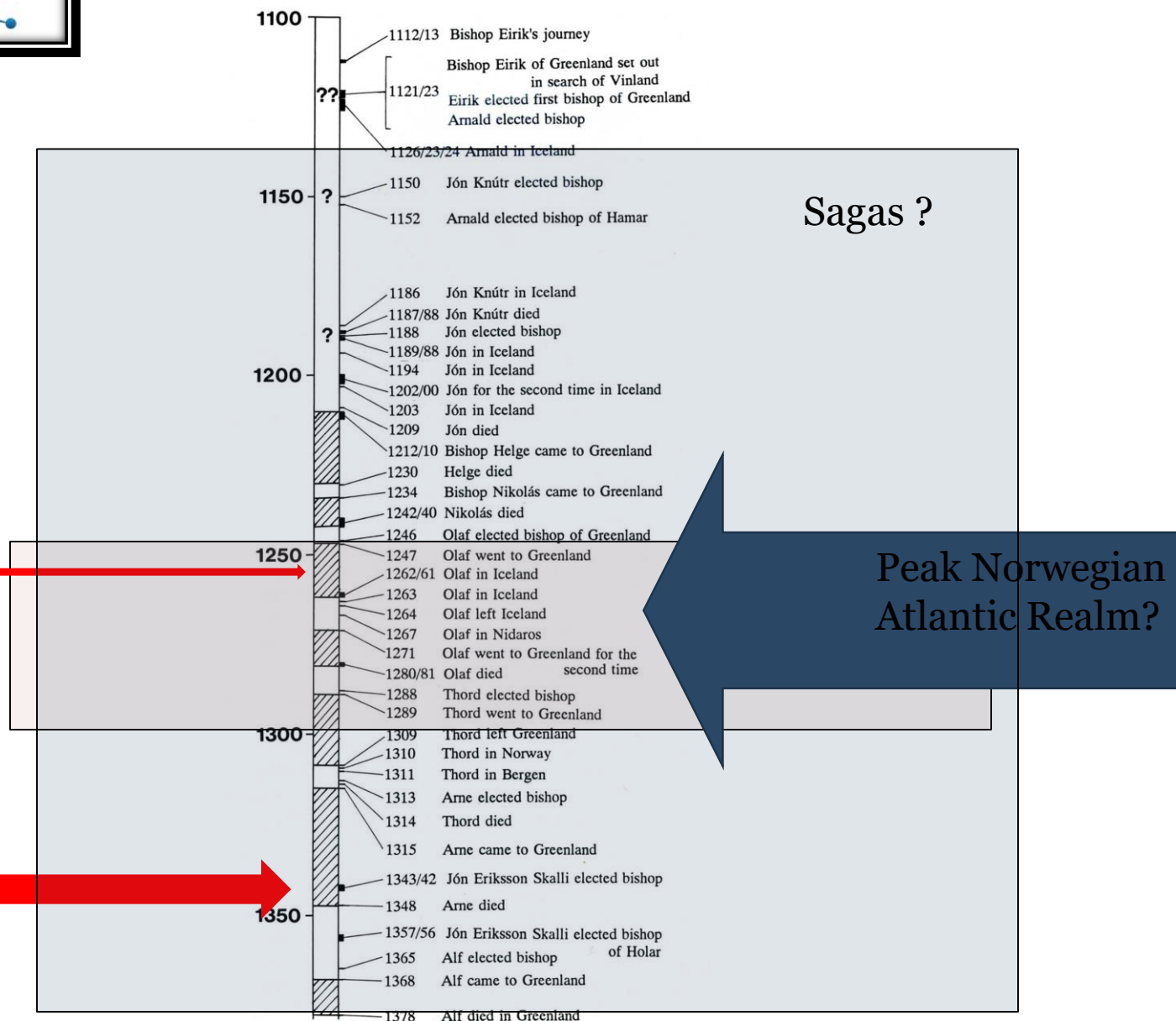
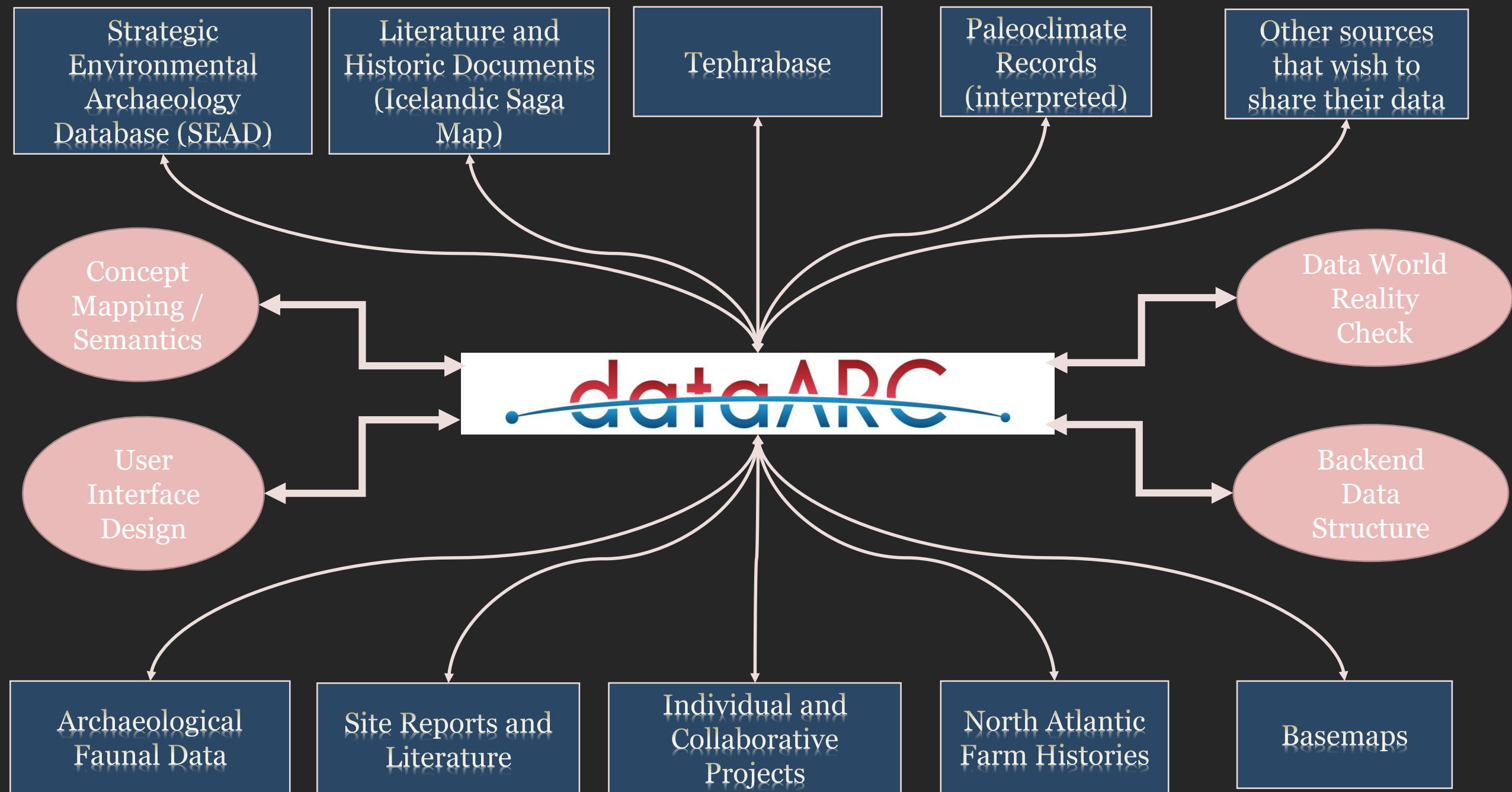


Fig. 2. List of bishops having resided in Greenland according to the Icelandic Annals (GHM III. 6-32). Note: the markings in the column do not indicate how many years the bishops stayed in Greenland.











# CHALLENGES

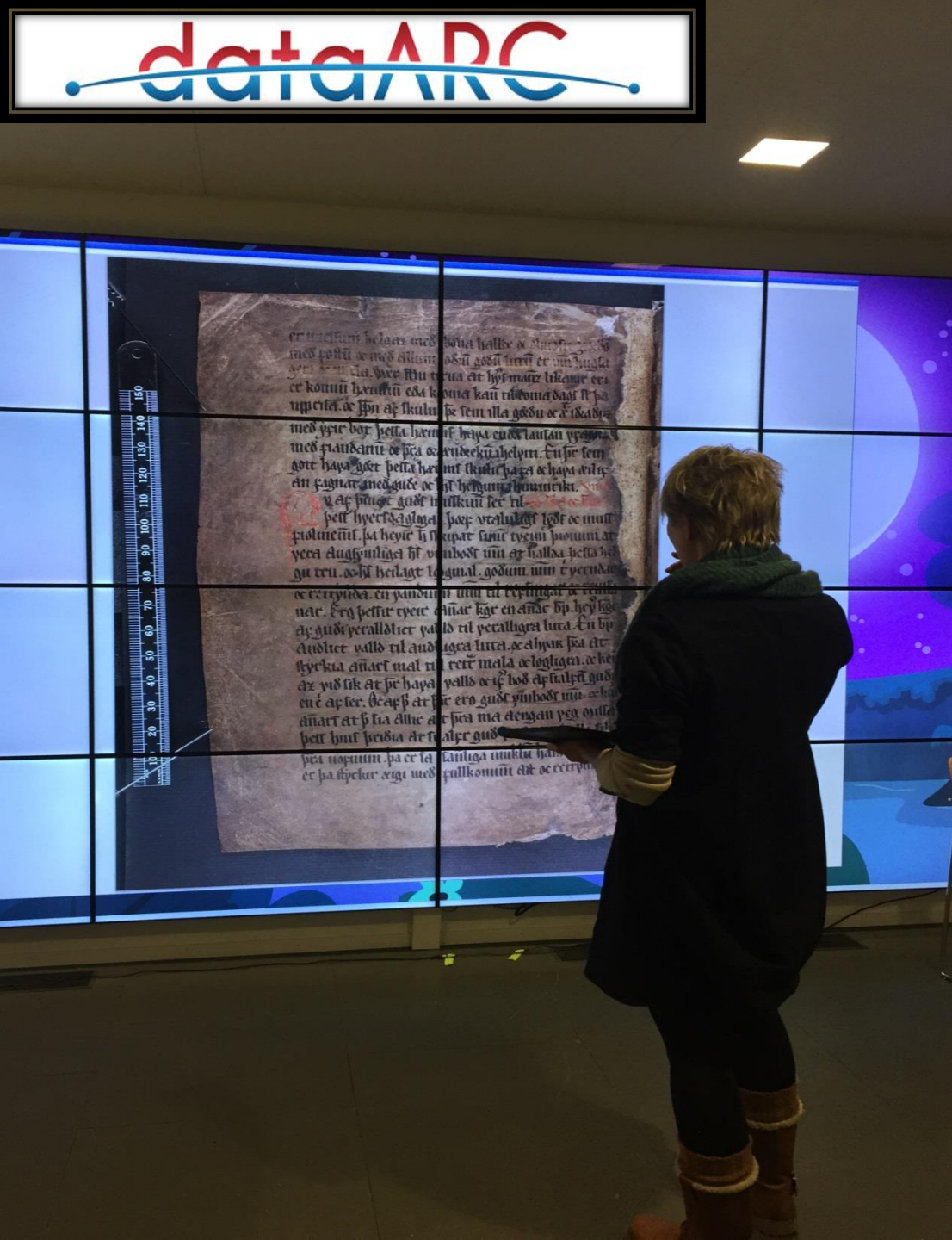
- Diversity of data
- Linking data at multiple spatial and temporal scales
- Diversity of research group / potential user base
- Hesitation to share and/or document data
- Concept mapping linkages and nodes
- How processed / aggregated should the data be?

***Overall: Most challenges are not technical.  
They are social!***



# TO DO LIST

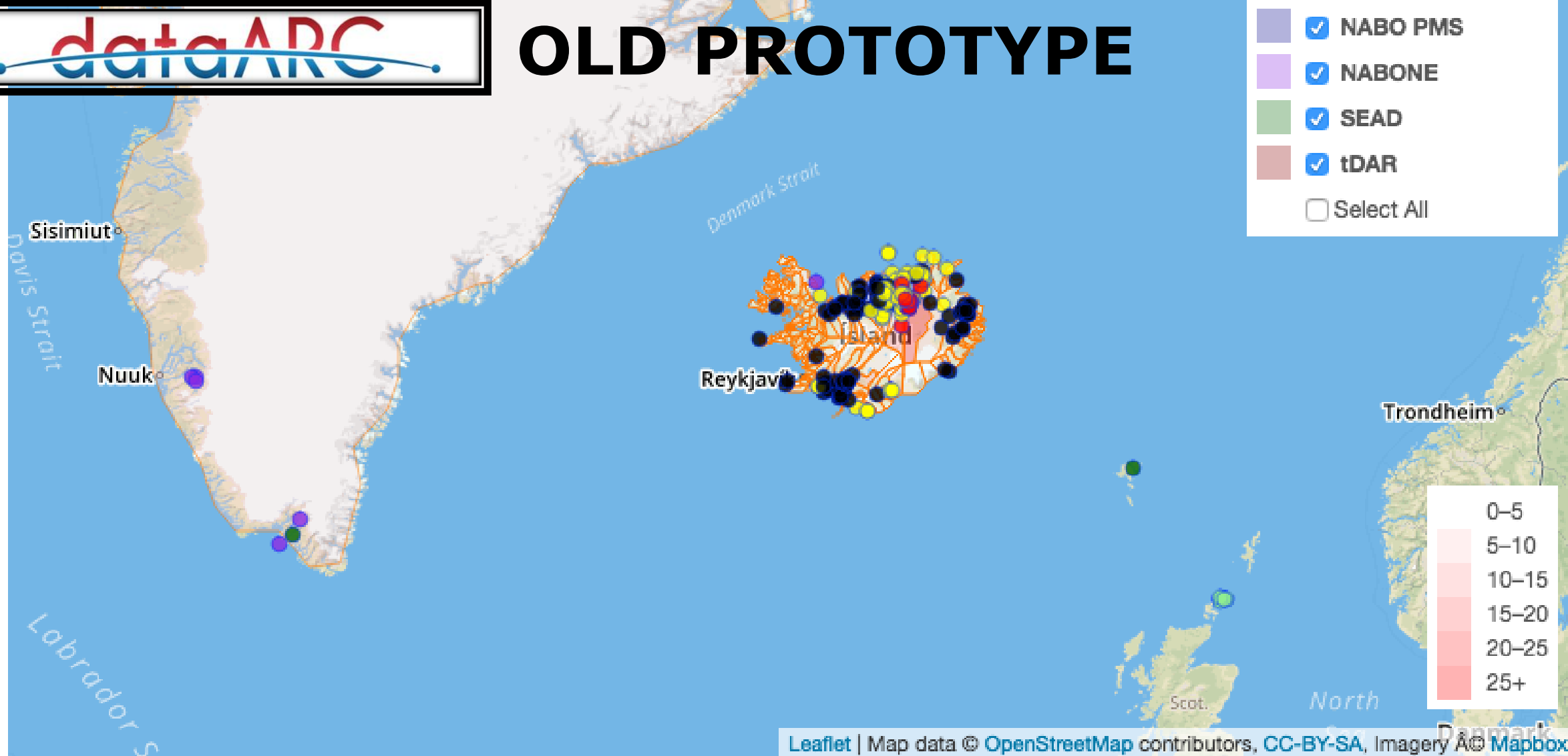
- data cleanup, structuring, service providers
- potential user interfaces for a diverse group
- spatial and temporal search
- conceptual / semantic linkages
- figure out the “aggregated / processed data” that we would like to focus on
- presentation of results...







- ☒ NABO PMS
- ☒ NABONE
- ☒ SEAD
- ☒ tDAR
- ☐ Select All



Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Limit by year: 0  2016 ☐ cluster results?

Iceland Landnam

Christianity formally accepted in Iceland and Greenland

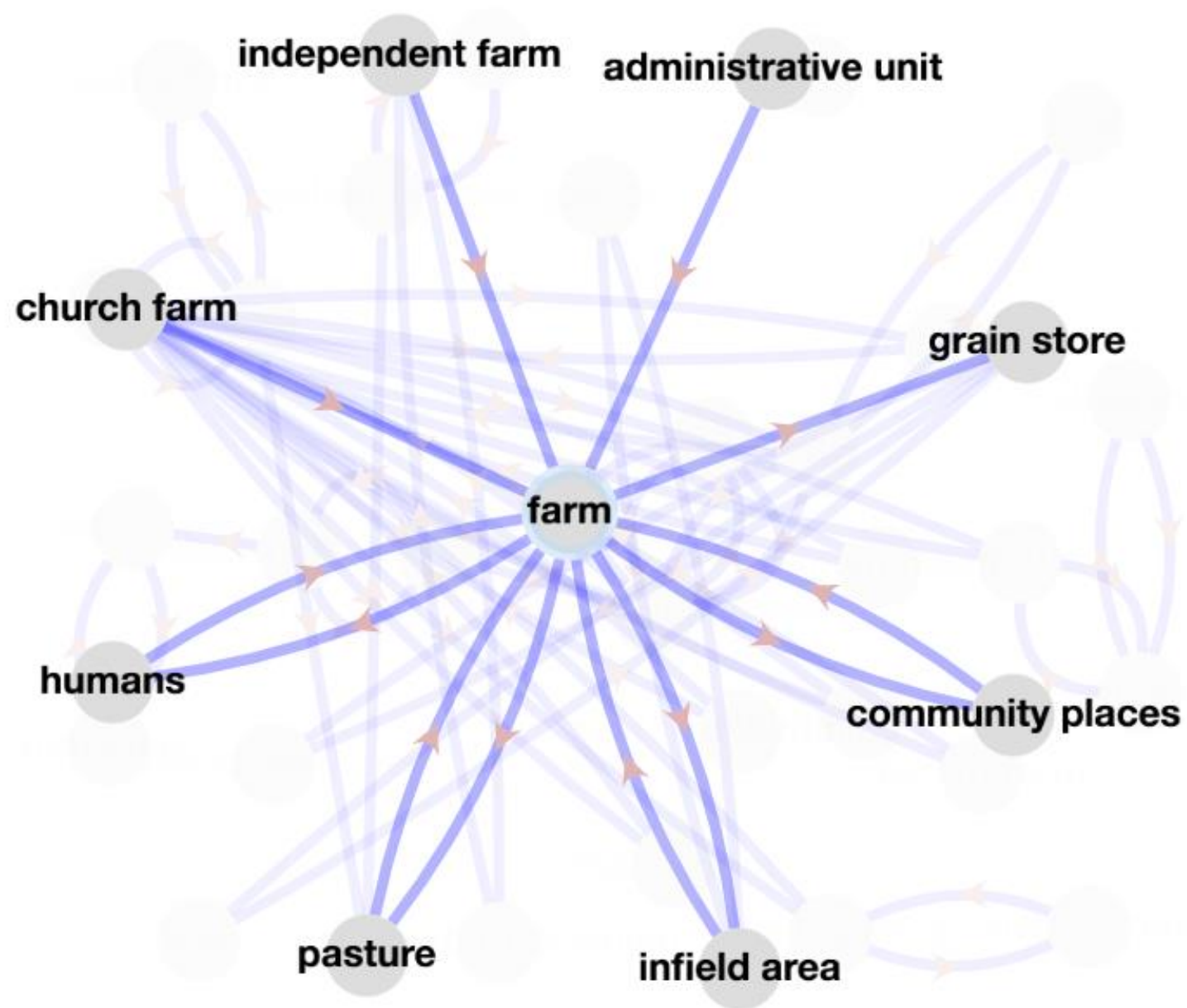
Maximum

Greenland and Vinland Landnam

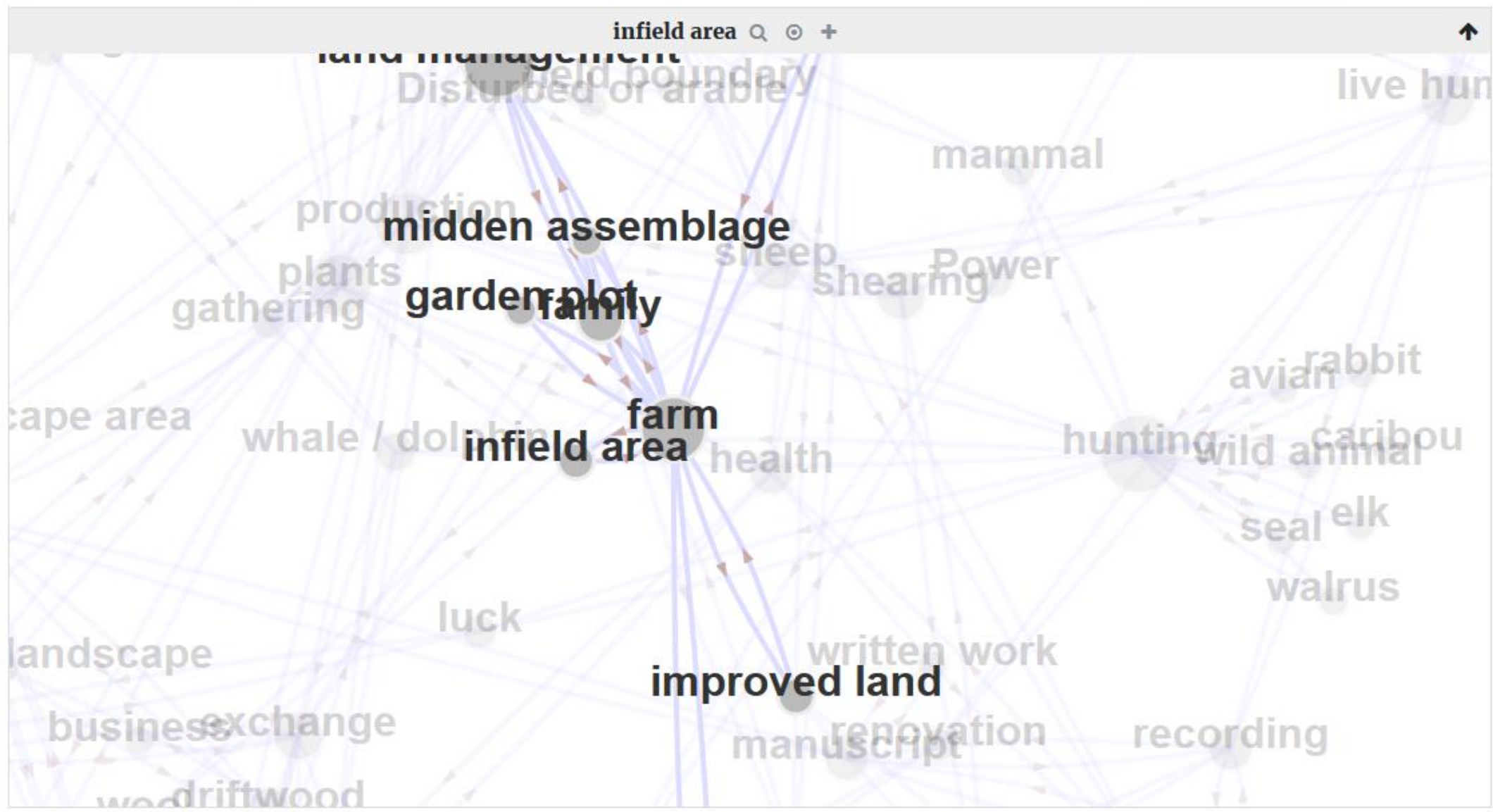
"Viking to Crusader" Period

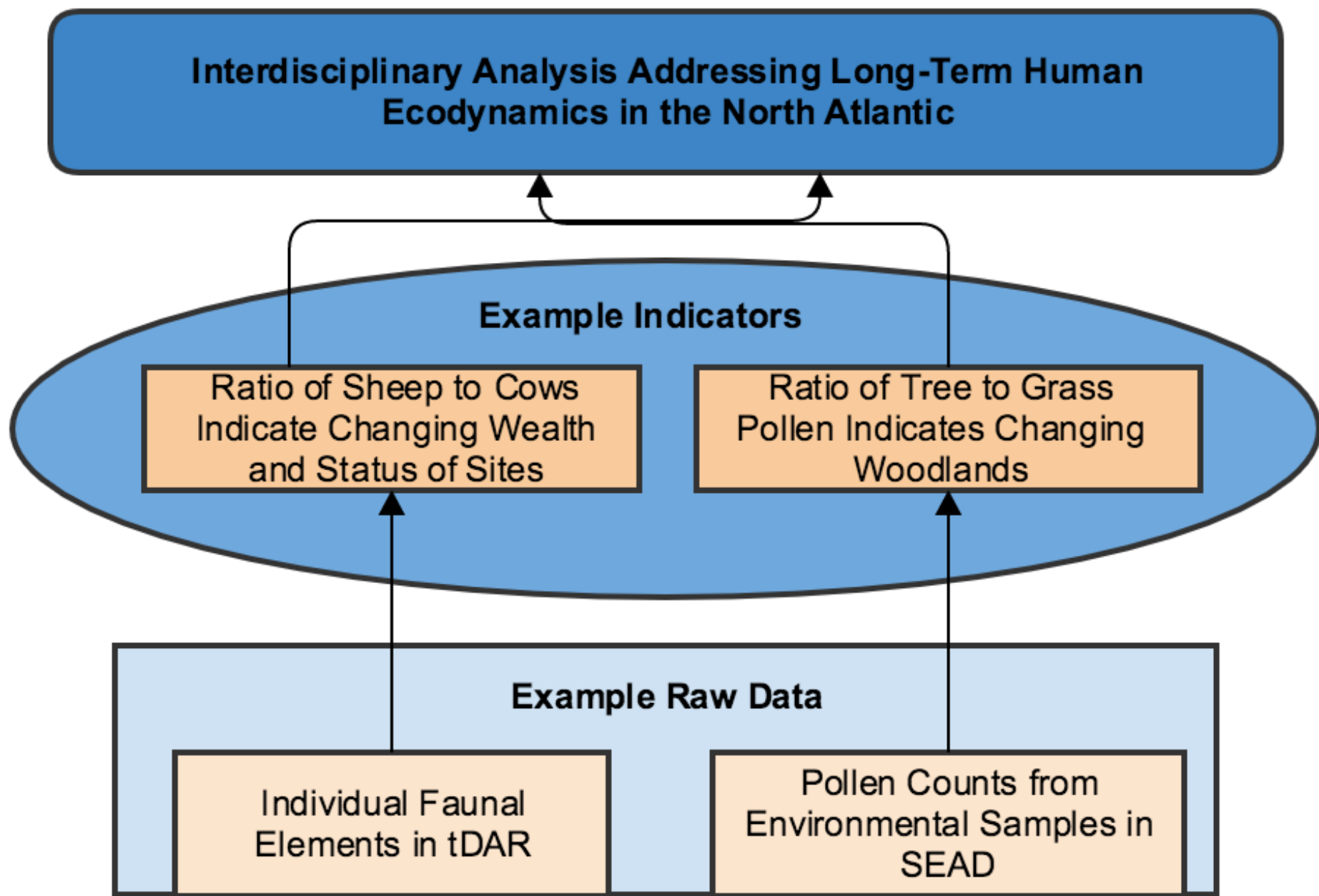
Norman conquest of England constitutes formal end of





100%







# LONG(ER) TERM PLANS

- Move beyond Iceland (Greenland and Faroes in Years 2 and 3)
- Scottish Northern Isles Data (kicking this off Year 1)
- Training and outreach modules
- Sustainability (?)
- Research!

Results



SAVE RESULTS

PRINT RESULTS

# THANK YOU!

[phil.buckland@umu.se](mailto:phil.buckland@umu.se)

[mattias.sjolander@umu.se](mailto:mattias.sjolander@umu.se)

[colleen.strawhacker@colorado.edu](mailto:colleen.strawhacker@colorado.edu)

[sead.se](http://sead.se)

[data-arc.org](http://data-arc.org)

[visead.se](http://visead.se)

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WISEAD is supported by Riksbankens jubileumsfond



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