International Federation of Surveyors
Fédération Internationale des Géomètres
Internationale Vereinigung der Vermessungsingenieure

FIG COMMISSION 3
Spatial Information Management

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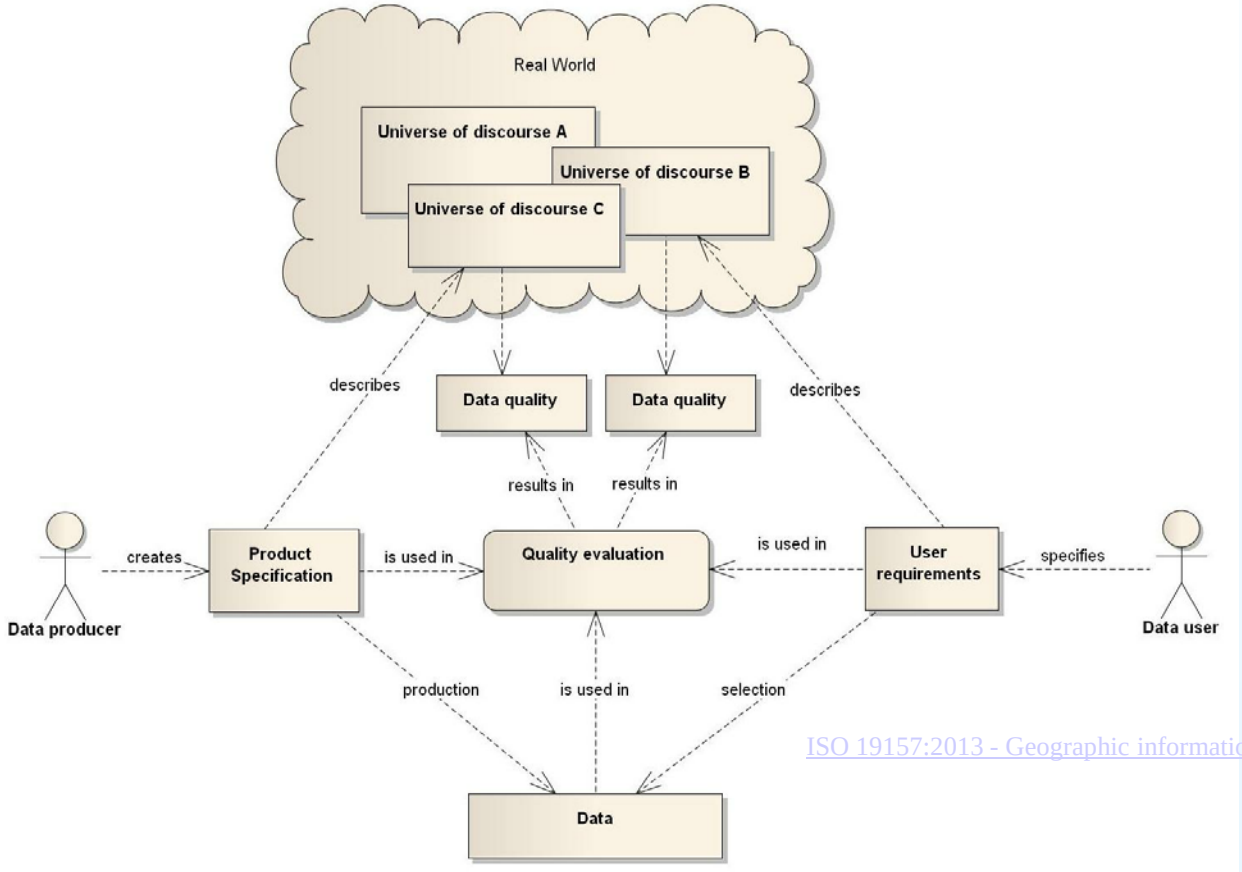
Quality Assurance of Geospatial Information in the Humanities

Nicole Bruhn, Laura Raddatz,
Sebastian Steppan, Hartmut Müller, Germany

Tuesday, Sept 24, 2019, TS 2 – Space in Planning

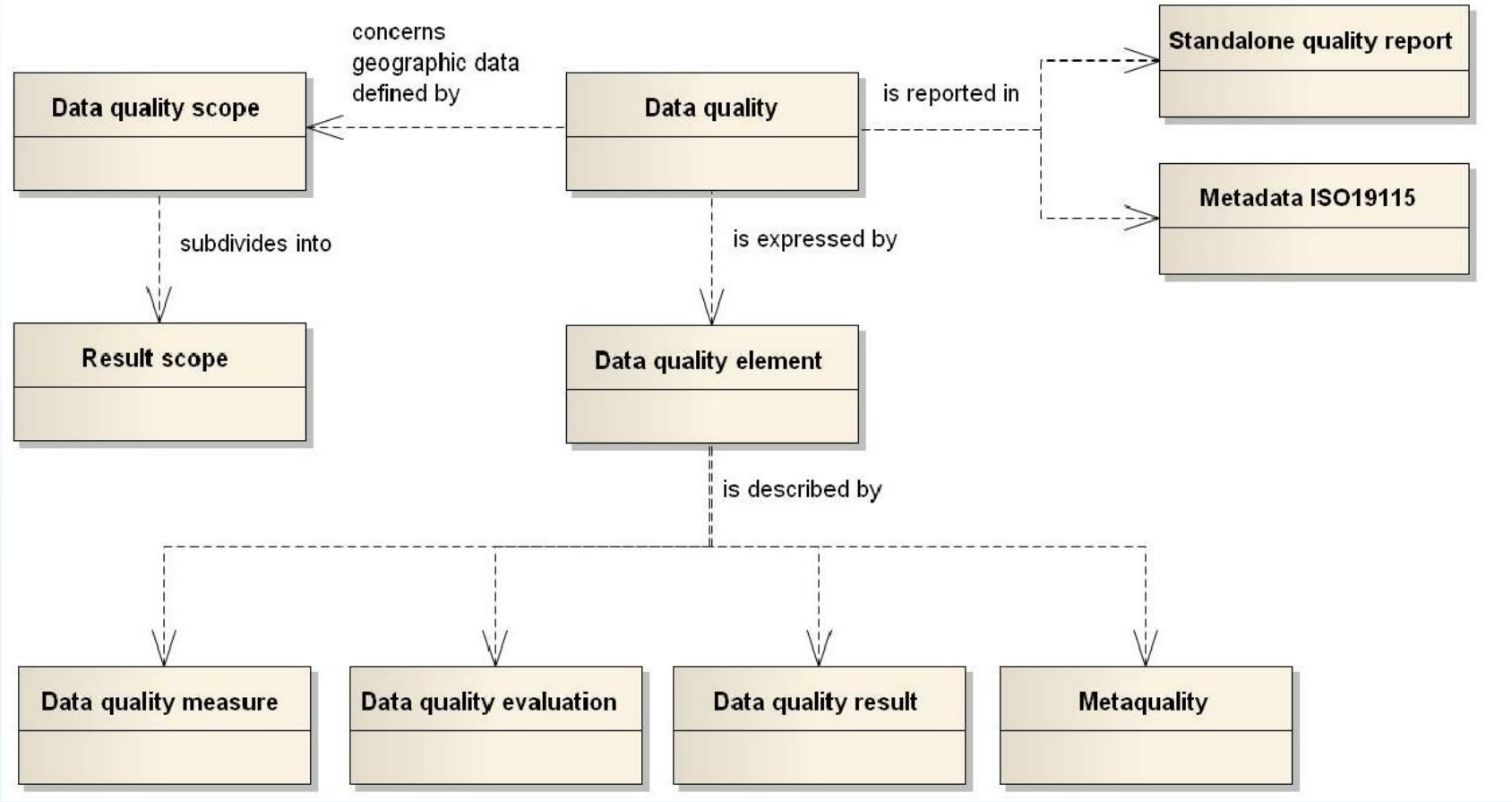
FIG Commission3 Workshop and Annual Meeting
'Advances in Geodata Analytics for Smart Cities and Regions'
University of Agricultural Sciences and Veterinary Medicine
Cluj-Napoca, Romania

Framework of data quality concepts (ISO 19157)



ISO 19157:2013 - Geographic information -- Data quality

Conceptual model on quality for geographic data (ISO 19157)



Metadata ←→ Data Quality

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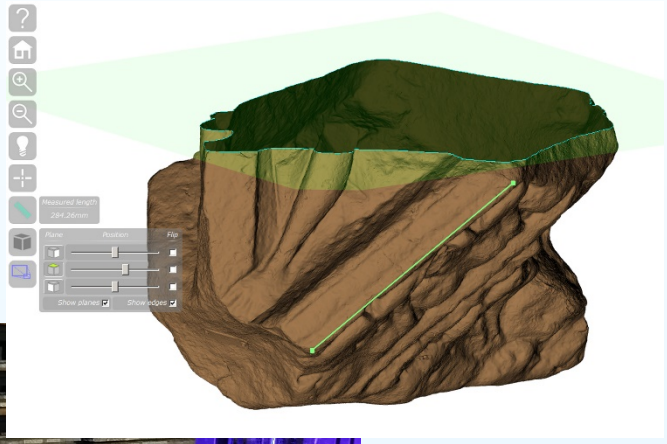
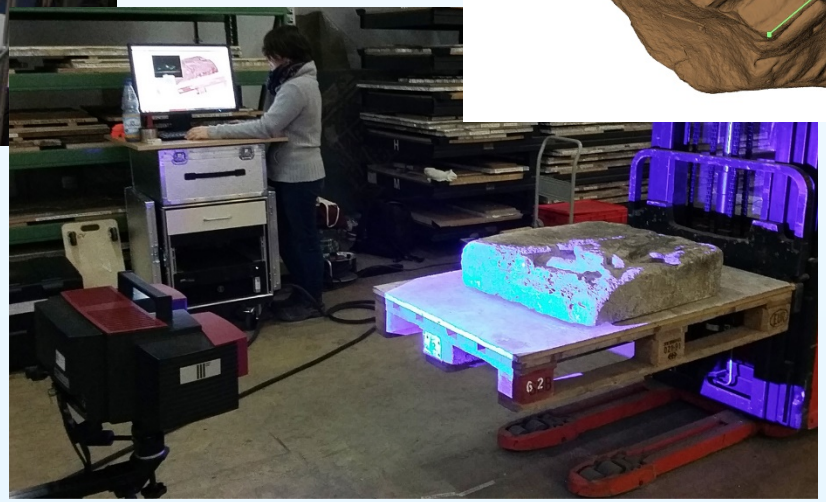
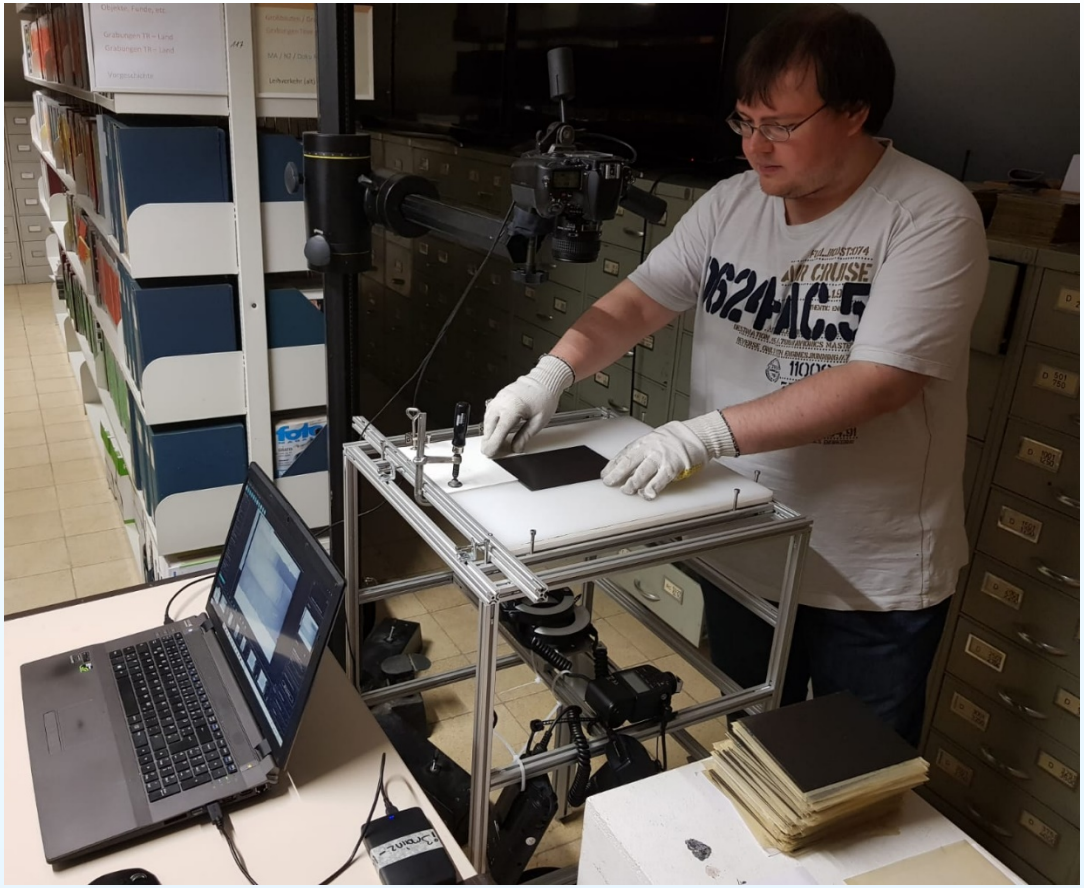
ROMANIAN SURVEYING WEEK

Roman funerary monuments from Augusta Treverorum in an Interregional Context

Founded by German Research Association





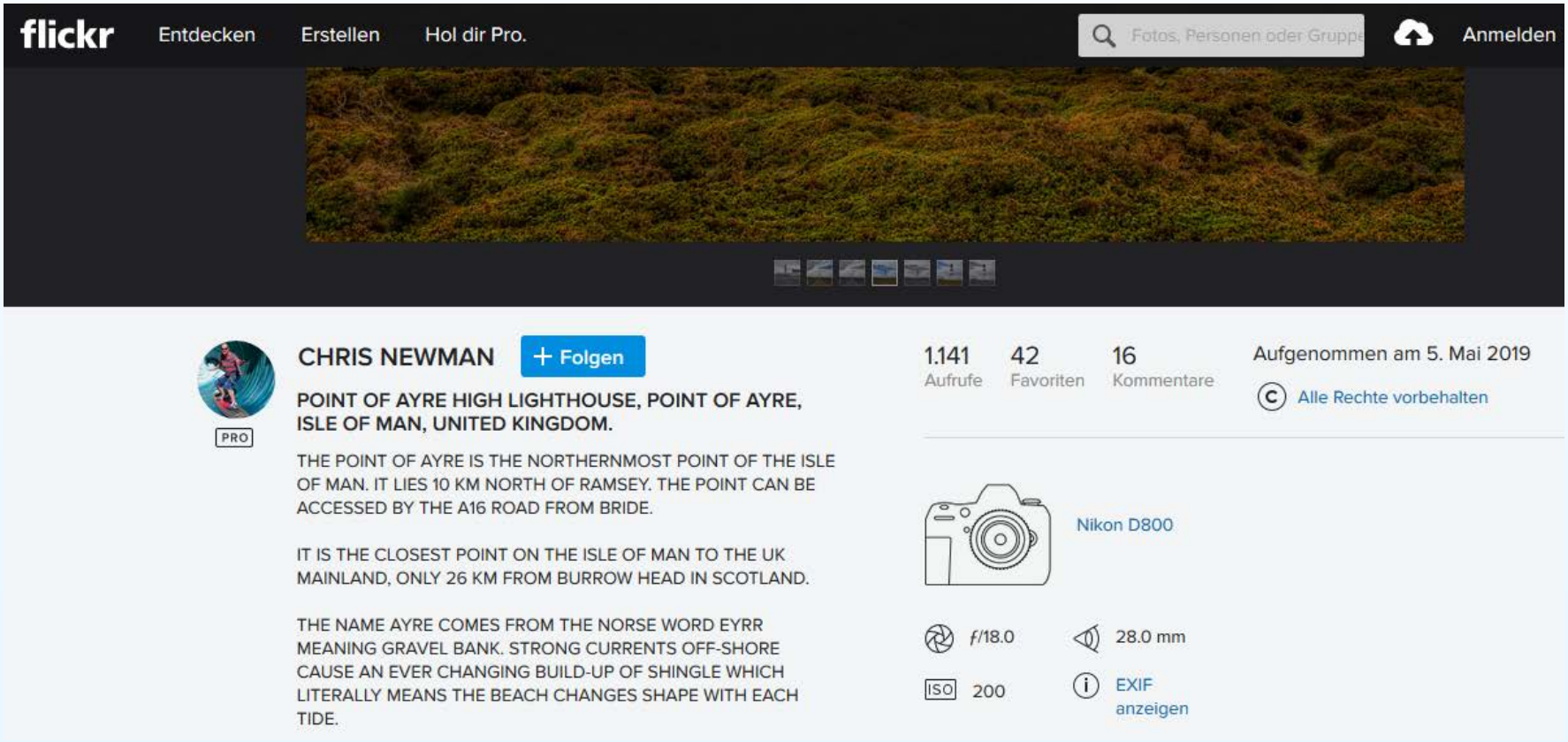


2D Digitization of 22.000 glass plates

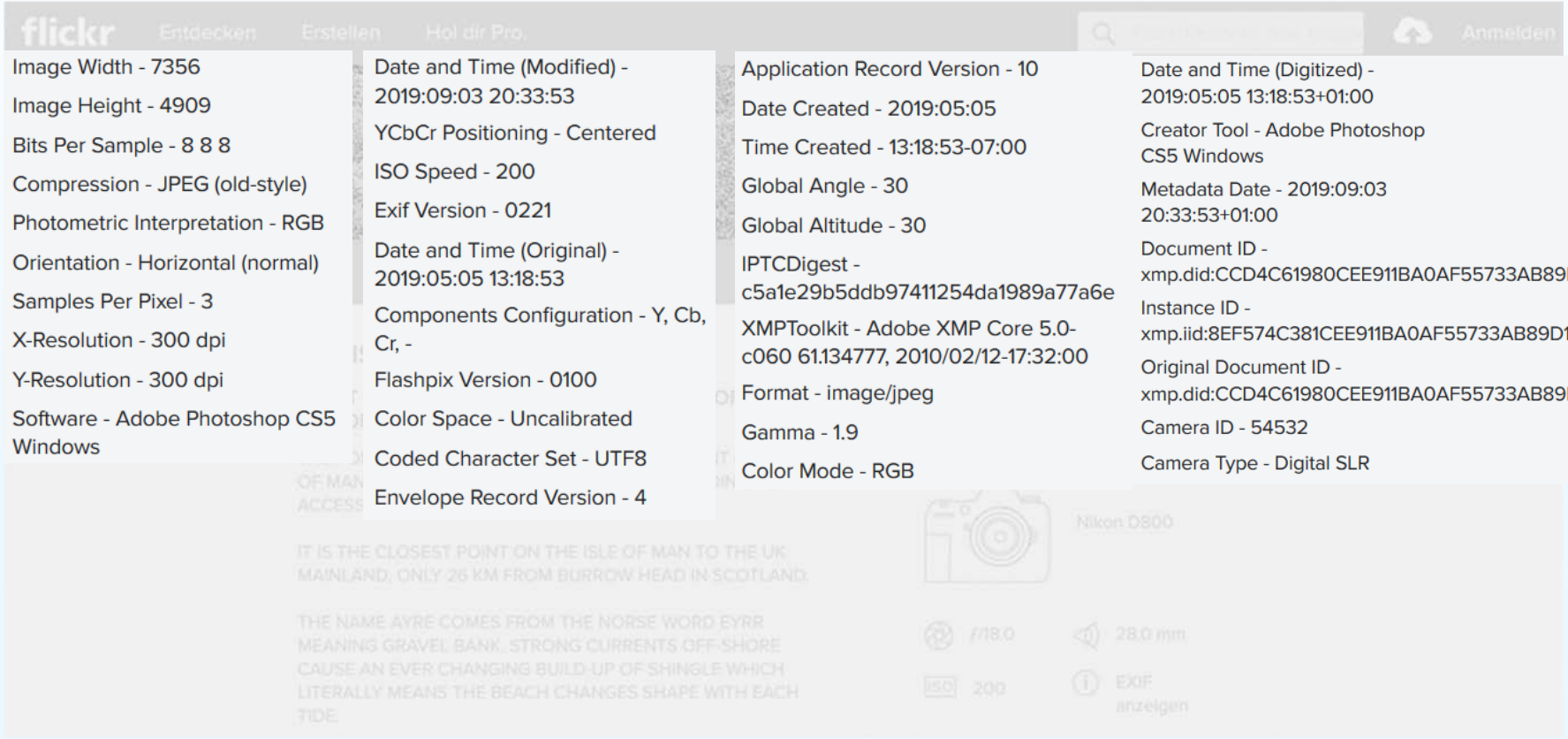
Technical meta data

Object meta data

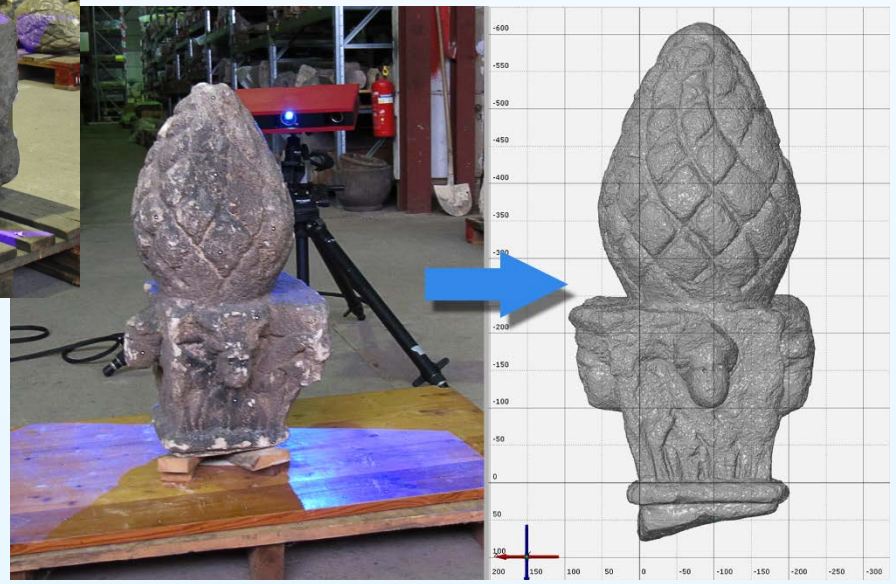
Technical meta data
flickr style, including EXIF



Technical meta data
flickr style, including EXIF



3D Digitization of several hundred funerary fragments



Smithsonian 3D Metadata Model

As there are **no accepted metadata standards for 3D capture and processing information**, the working group opted to designed much of this model from scratch, with the intent of swapping out terms from existing related schemas as the model matures. The current version is an internal draft and it continues to evolve. We need your input to help us identify those existing terms, find areas that need improvement, and extend our work into an adaptable tool that can be used by others working with 3D data. Send us your feedback at OCIO-DPO@si.edu, or on one of our social media platforms.

https://dpo.si.edu/blog/smithsonian-3d-metadata-model

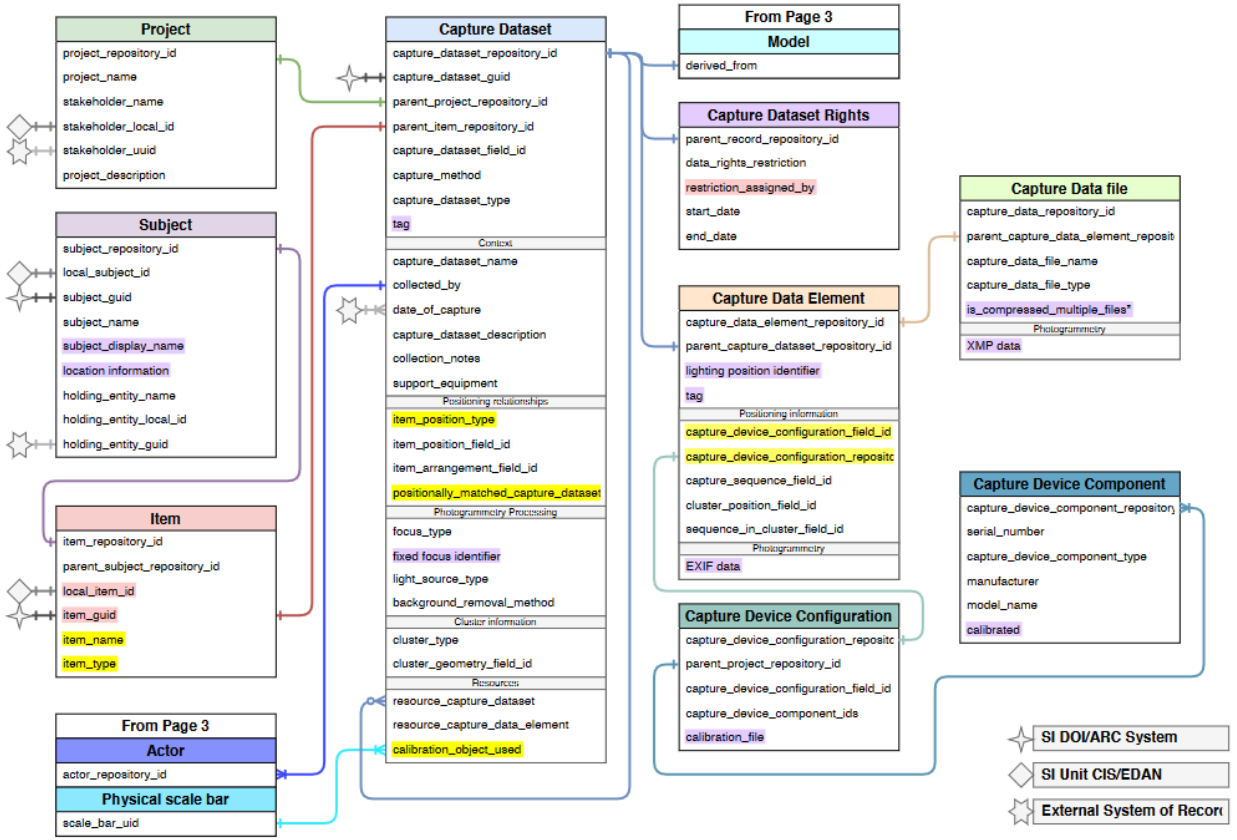
Smithsonian Institution
3D Metadata model, v0.6

A product of...
the Smithsonian's...
Digitization Program Advisory Committee's...
3D Sub-Committee's...
Metadata Working Group

Working group members:

Jon Blundell I Lynda Schmitz Fuhrig I Holly Little
Suzanne Pilsk I Vince Rossi I Rebecca Snyder I Beth Stern
Ben Sullivan I Melinda Jane Tomerlin I Keats Webb

Smithsonian | 3D DIGITIZATION



Smithsonian Institution
3D Metadata model, v0.6

A product of...
the Smithsonian's...
Digitization Program Advisory Committee's...
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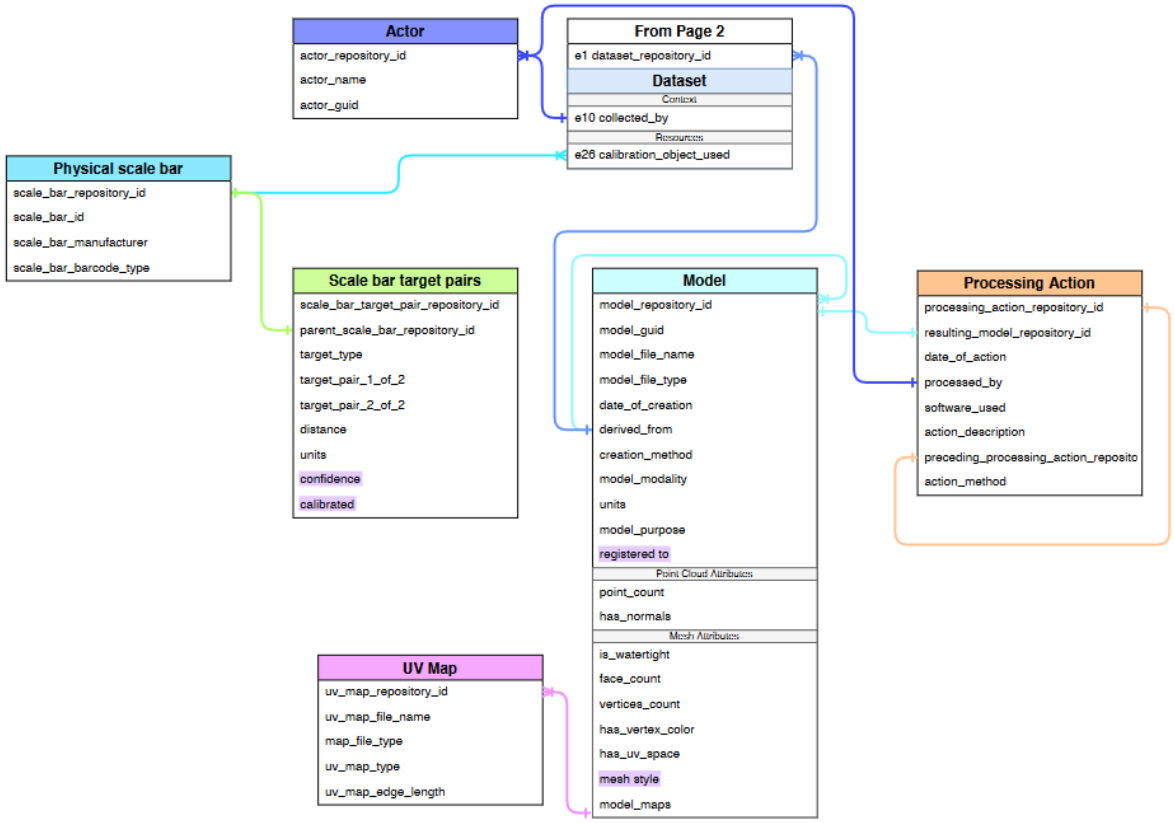
Smithsonian | 3D DIGITIZATION



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HARE – Harbour Research Environment

Data Integration in a Heterogeneous Research Context

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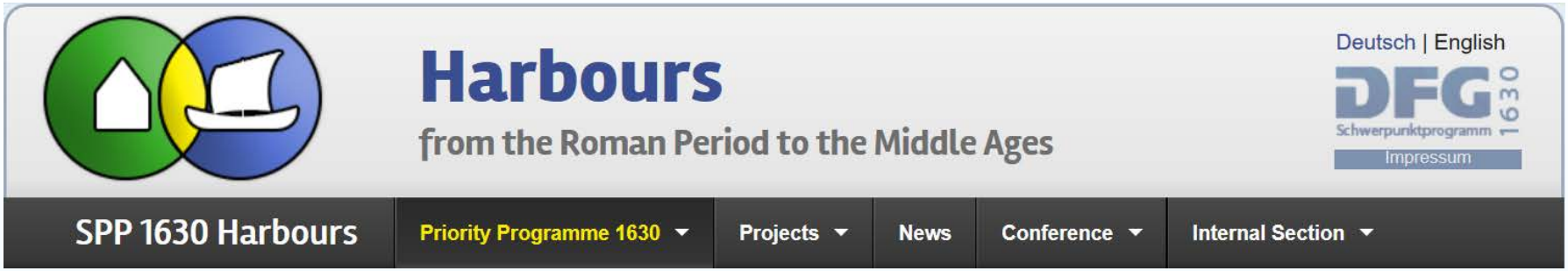

Priority Research Program

of the German Research Association

Harbours are highly complex systems, in which ***ecological, logistical, economic, social, legal, military and religious subsystems*** overlap and influence one another.

For an evaluation of the phenomenon 'harbour‘ these subsystems and their implications for the development of the settlements must be identified. To understand harbours as system-relevant components ***an interdisciplinary, chronological and spatial analysis*** is needed.

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Internationale Vereinigung der Vermessungsingenieure

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ROMANIAN SURVEYING WEEK
23 - 28/09/2019
CLUJ - NAPOCA

Harbours

from the Roman Period to the Middle Ages

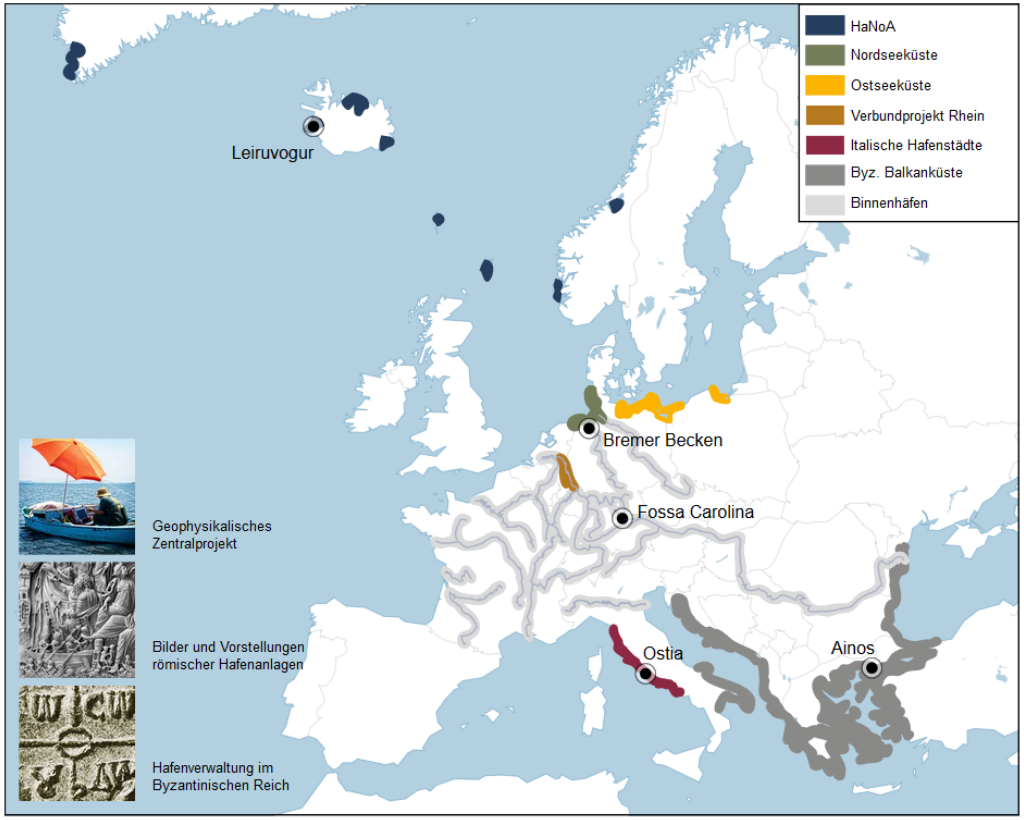
Deutsch | English

DFG Schwerpunktprogramm 1630

Impressum

SPP 1630 Harbours | Priority Programme 1630 | Projects | News | Conference | Internal Section

Area of activity



Participating Institutions

Establishment of a uniform terminology

Almost every assemblage of remains of human activity in coastal areas is interpreted as traces of a landing place or harbour.

De facto, every site near the coast can be seen as a landing place.

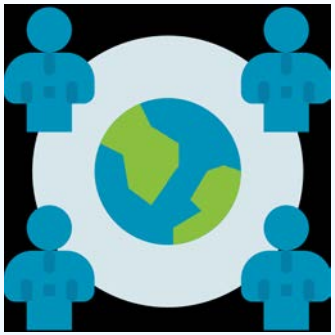
The establishment of a uniform terminology is therefore a fundamental and essential precondition for further studies.

Data Integration

When is a harbour a harbour?

Archaeology

History



Earth Sciences

(Geospatial) Information Science

Term DE	Term EN	Definition SPP 1630	Definition extern
Hafen *[beinhaltet Ankerplatz, Fähranleger, Start-/ Endpunkt eines Transports per Schiff aus hist. Quellen]*	Harbour *[including anchorages, ferry harbours, start and end points of transport by ship in written sources]*	An einem Ufer gelegener Ausgangs- und/ oder Endpunkt für die Schifffahrt. In der Regel handelt es sich um Bereiche, die aufgrund natürlicher und/oder baulicher Anlagen besonderen Schutz bieten. *Starting and/or terminal point of waterways at a shore. Usually areas with natural and/or edificial constructions in terms of protection.*	

Terminology → Thesaurus, Data catalogue

European Harbour Data Reposi

Key words and thesauri
Harbour Terminology for Data Integration in HAR

Fields and Key Codes

A list of key codes has been defined for every column of the
As this list contains information, which is crucial to understan
the full version.

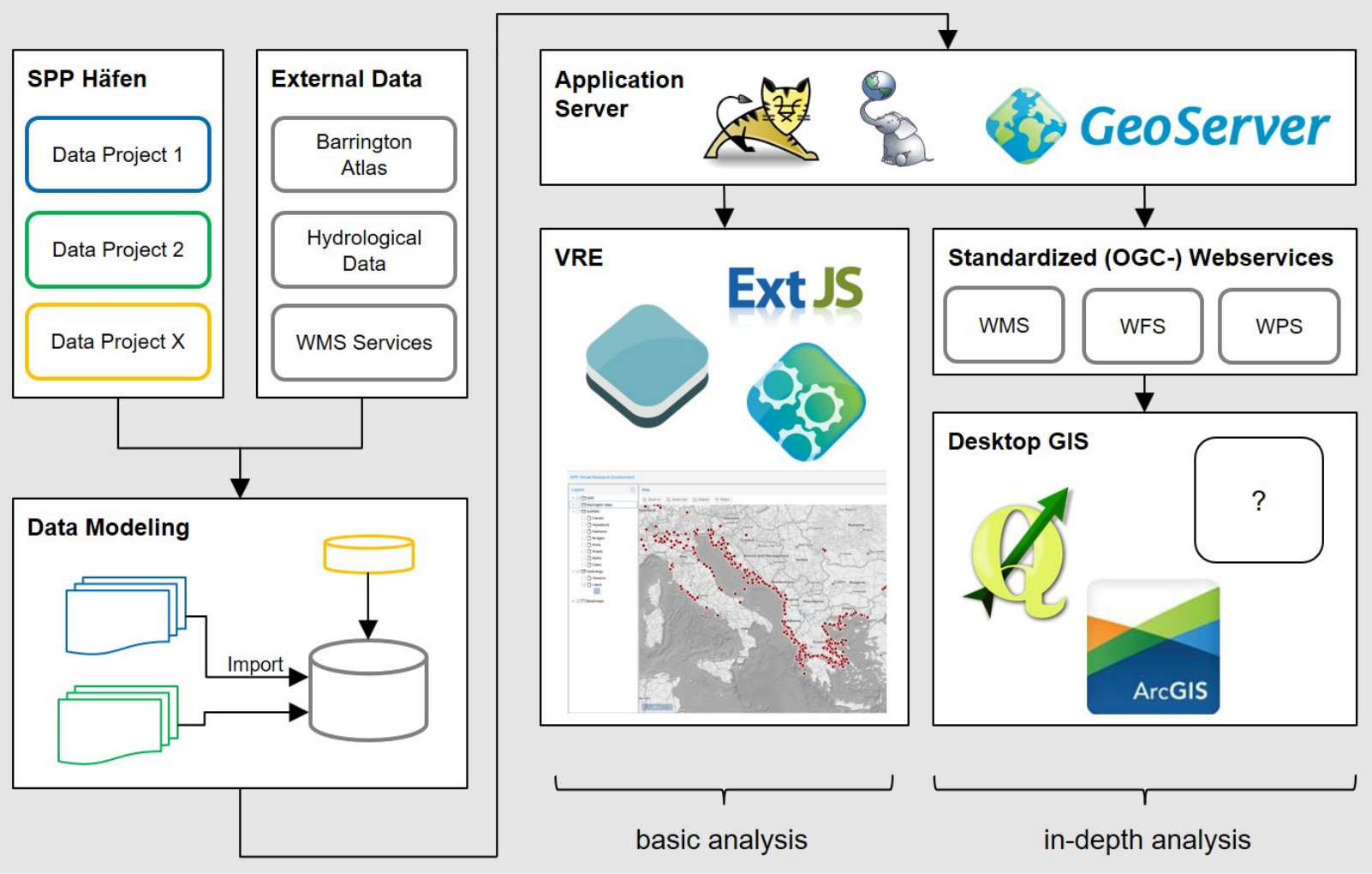
ID_place	Numeric ID of each dataset
Author	Editor/author of the dataset, multiple references
Project	**If you are a member:** project assignment in Pric http://www.spp-haefen.de/en/projects/ [thesauru coherent short title of your project or affiliation
Year	Year of the creation of the data set; You could ac
Status	*1*: Data set completed and confirmed in most ins uncompleted and not confirmed [thesaurus oblig
Public	*internal* (only visible/accessible for registered HA [thesaurus obligatory]
Latitude	Decimal Degrees if possible, minimum two and r values in the South if necessary; Projection WGS Longitude/Latitude - Decimal Degrees
Longitude	Decimal Degrees if possible, minimum two and r values in the West if necessary; Projection WGS Longitude/Latitude - Decimal Degrees
Country	Country (English name)
Name_mod	Modern or common scientific name, usually topo supposed place/locality
Name_hist	Historic name, multiple references possible
Hydro_type	**Hydrological position:** *River*, *Lake*, *Sea*… [the if it is an inland harbour or a maritime harbour; r transition areas

Hydro_name_mod	Modern name of the hydrological unit (River, Lak
Hydro_name_hist	Modern name of the hydrological unit in the spec
Locat_secure	**Reliability of the localisation/spatial reliability** *reliable*, *uncertain*, *very uncertain* [thesaurus obli
Locat_text	**Descriptive text concerning the reliability of t underlying data**, e.g. "Location at river xy", "Loc modern place/town/village"
Locat_precision	**Precision of the localisation** (*1*: meters, *2*: hun place mapped, *5*: modern hydrological unit mapp
Source_hist	**Historic proof for the harbour/locality** (written [thesaurus obligatory]
Source_feature_arch	**Archaeological or geo-archaeological feature** [thesaurus obligatory]
Source_find_arch	**Archaeological finds as an indication for the** of ships...); *yes/no/assumed* [thesaurus obligator
Source_other	Other proof/sources; please use key words (e.g.
Place_type_general	**General definition of the place described:** *har start and end points of transport by ship in writte waterway [especially for written sources, e.g. pro specific information about a harbour locality], ves* thesaurus below for details and definitions]
Place_technique	**Harbour terminology in matters of constructi termini:** *landing [general term for quay, wharf, je mole, breakwater, landing place (hythe, landing revetment Other constructive termini: pontoon, c slipway. Ship-specific termini: raft, planked vesse vessel, keelboat, other water vessel [e.g. with te ropes, sails]* [multiple entries possible; thesaurus details and definitions]
Place_topography	**Topographic position of the harbour. Main to** *harbour, river harbour, lacustrine harbour, river h harbour, tidal harbour, canal harbour, harbour ba [details in comments].* **Other topographic terms** *harbour/dock, harbour basin separated by a mol dead-end harbour canal, Geestrandburg, Gewer* thesaurus obligatory – see the full thesaurus bel
Place_infrastructure	**Infrastructure for harbour operation and addi terms:** *shipyard, dockside crane, boathouse, bo of boatmen/guild [e.g. nautae], river crossing, bri route/road.* **Other infrastructural terms:** *dolphi cairn, Vorr, harbour palisade, barrage, derrick/da* [multiple entries possible; thesaurus obligatory – definitions]
Place_function	**Function and purpose of the harbour. Central** *trade harbour, naval base, origin/destination of t ferry harbour, landing place [synonym hythe, lan harbour, safety harbour, beach market, shipyard,* **specific termini:** *dockland/waterfront, staple po specific termini: inland vessel, seagoing vessel, vessel, rowing facilities, sailing facilities, towing/t staking facilities.* [multiple entries possible; thesa for details and definitions]
Goods_finds	**Proof for specific transported goods and oth** *cargo, passengers/people, food, fish, wine, grain barrels, stone, timber, straw/hay, iron/ore* [Multipl the full thesaurus below for details and definition

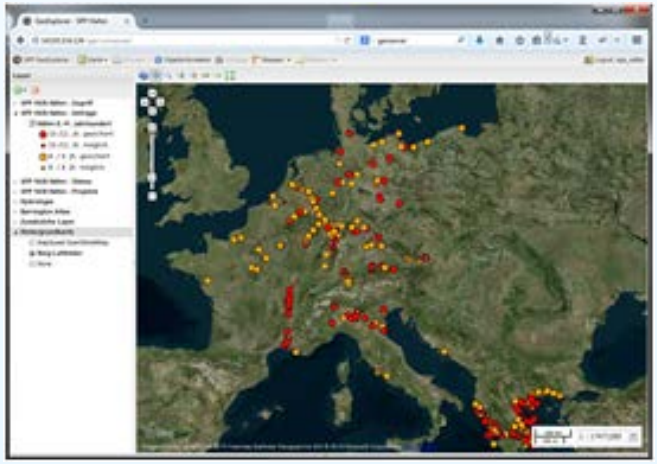
Actors_activity	**Harbour- and n** *upstream naviga punt, shipwreck,* below for details
Place_hierarchy	**Individual expe harbour concer network, the fre spatial connect** *global importanc periodical use, p use, no proof for harbour infrastru important produ center of admini an important mil* thesaurus below
Place_secure_info	**Comments on t (general, techni category):** *expli archaeological fi an unsecure/unc*
Date_min	**Earliest proof i** known: fill in the special characte
Date_max	**Earliest proof i** is known: fill in th special characte
Date_pre_1_cent_BC	Dating before 1s
Date_1_cent_BC	Dating 1st centur
Date_1_cent_AD	Dating 1st centur
Date_2_cent_AD	Dating 2nd centu
Date_3_cent_AD	Dating 3rd centur
Date_4_cent_AD	Dating 4th centur
Date_5_cent_AD	Dating 5th centur
Date_6_cent_AD	Dating 6th centur
Date_7_cent_AD	Dating 7th centur
Date_8_cent_AD	Dating 8th centur
Date_9_cent_AD	Dating 9th centur
Date_10_cent_AD	Dating 10th centu
Date_11_cent_AD	Dating 11th centu
Date_12_cent_AD	Dating 12th centu
Date_13_cent_AD	Dating 13th centu
Date_14_cent_AD	Dating 14th centu
Date_15_cent_AD	Dating 15th centu
Date_16_cent_AD	Dating 16th centu
Date_17_cent_AD	Dating 17th centu
Date_18_cent_AD	Dating 18th centu
Date_19_cent_AD	Dating 19th centu
Date_20_cent_AD	Dating 20th centu
Date_secure	**Dating quality/r** dates in written s

Date_text	**Descriptive text about the dating** (what is dated, how was it dated, how reliable is the date, how reliable is the context...); you can fill in "fuzzy" dating information here, if the dating is very uncertain, for example a roman or early medieval date is assumed without further details
Ref_hist	**Historic/written source, which contains information about the specific harbour**; if possible with information about the author (e.g. Einhard, Vita Caroli Magni/Das Leben Karls des Großen)
Ref_mod	**Modern references/bibliography, which contains crucial information about the specific harbour**; fill in at least a short title/lemma with the authors name and the year of publishing; if possible, please fill in the full title to every short title/lemma in the sub-table "References". For unpublished data/archivalia please add a clear reference such as "unpubl. material/documents from museum XY".
Comments	Comments to the dataset, additional information; free text
Punctation/ Separators	**If multiple entries are necessary in a specific field:** separate alternatives/synonyms with a forward slash "/"; separate rival entries or entries of multiple sources/references with a semicolon ";". The comma "," only divides longer entries and is not allowed to be used as a separator!

Harbour Research Environment HARE



Virtual Research Environment: Analysis functionality



basic analysis

?

ArcGIS

in-depth analysis

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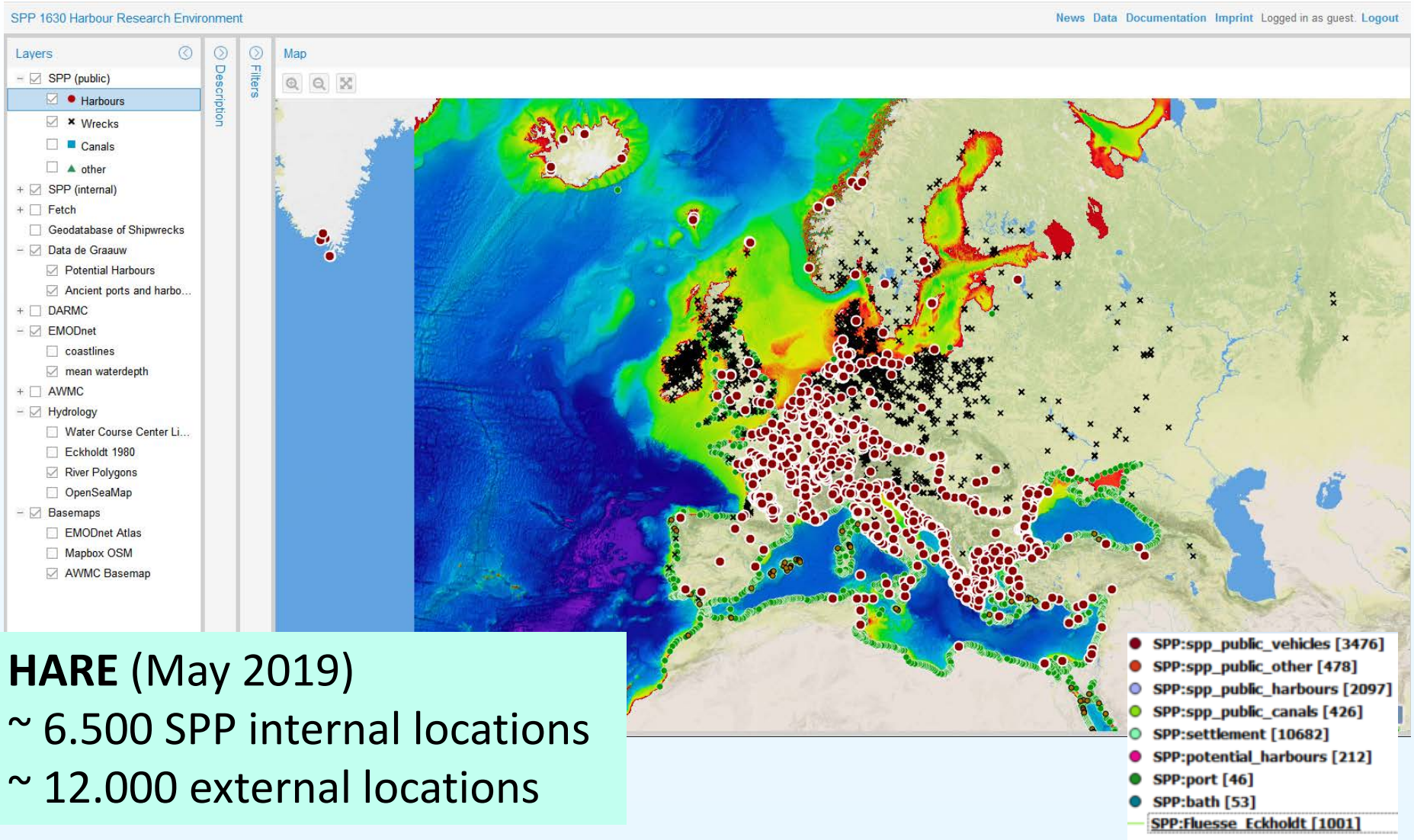
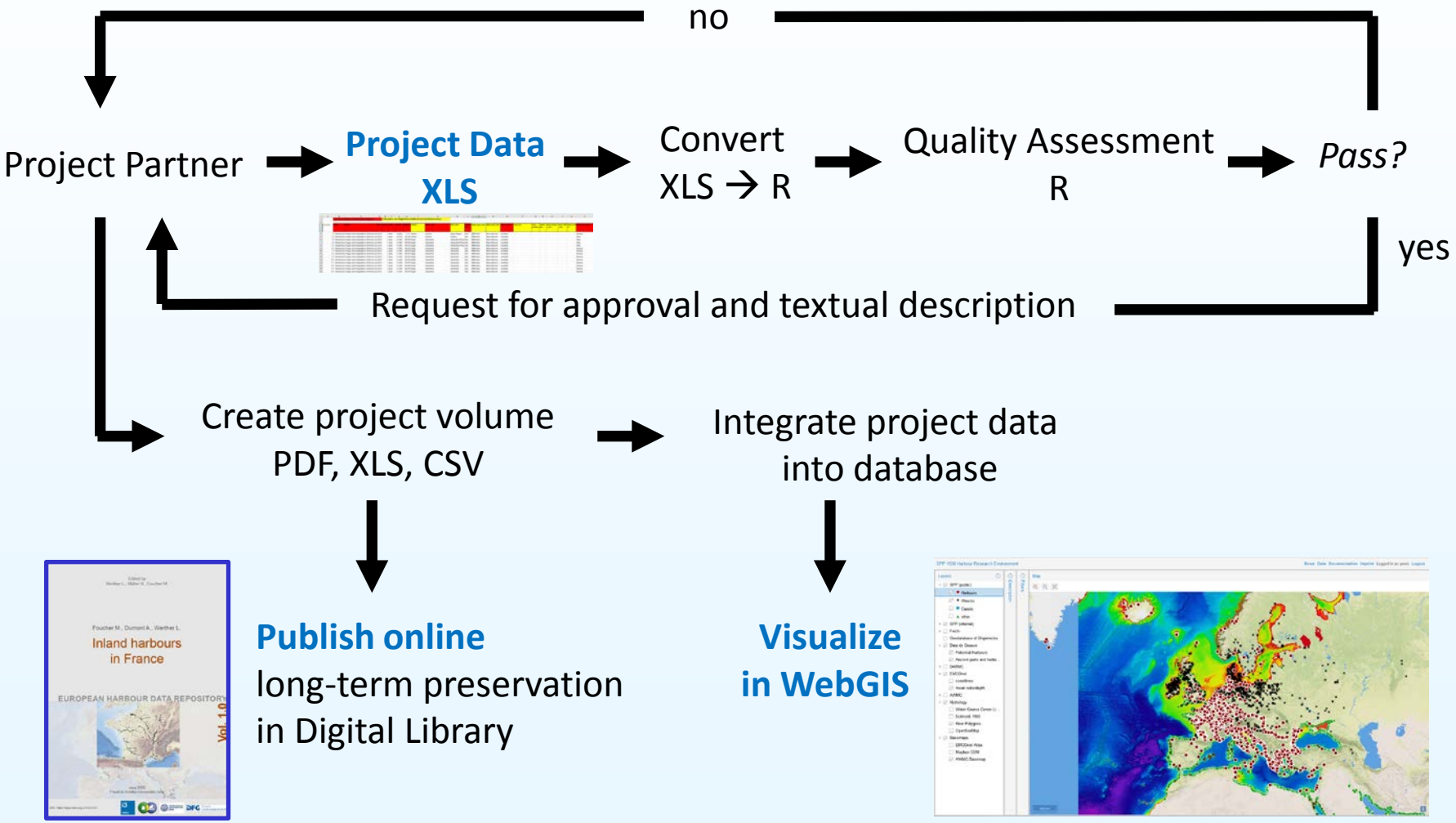


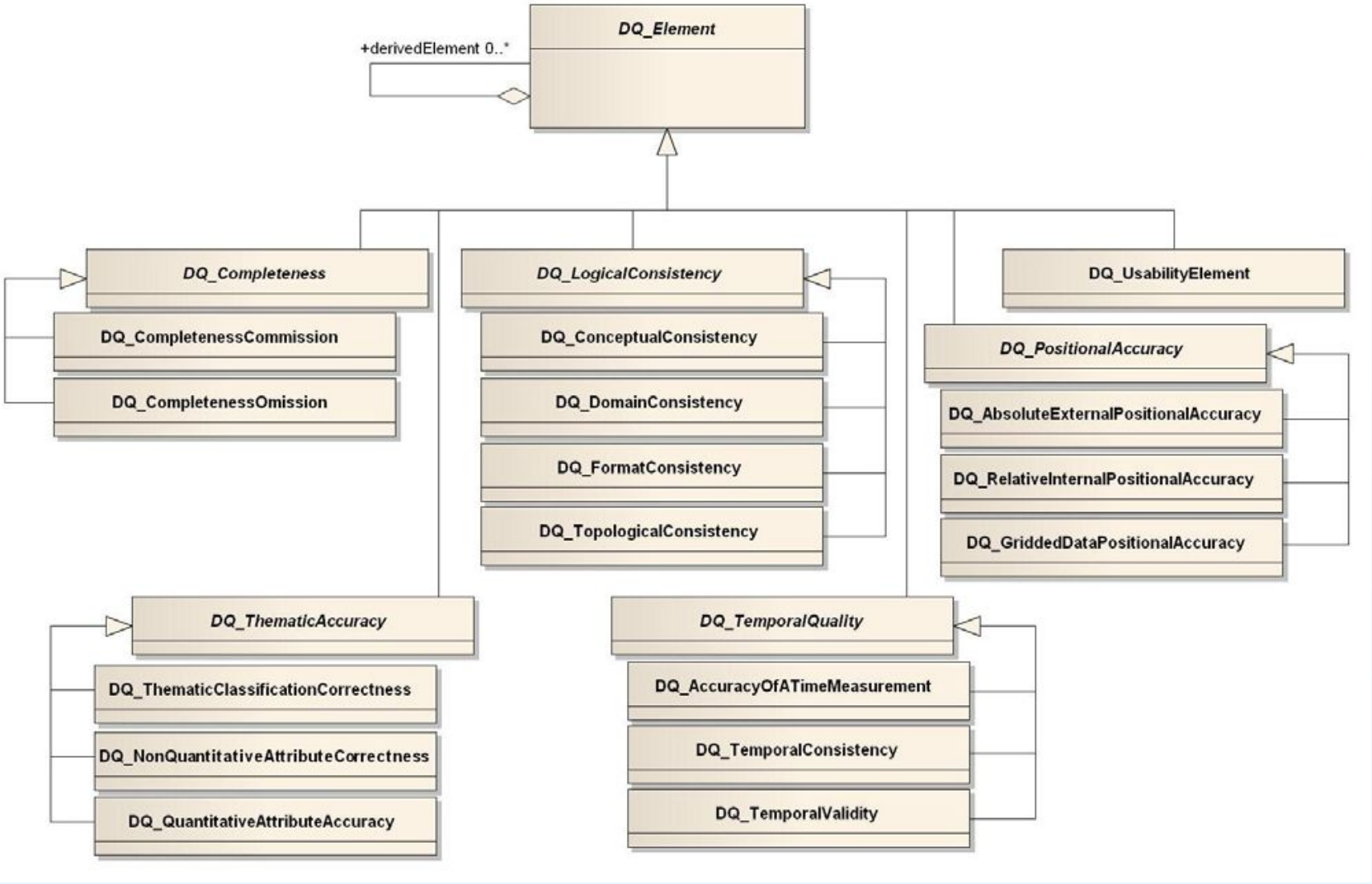
HARE (May 2019)

~ 6.500 SPP internal locations

~ 12.000 external locations

Quality Assurance Workflow in HARE





ISO 19157:2013 - Geographic information -- Data quality

Filled-in Data Table

Rot/red: unbedingt ausfüllen/entry obligatory | Gelb/yellow: nach Möglichkeit ausfüllen/entry if possible/necessary

ID_place	Author	Project	Year	Status	Public	Latitude	Longitude	Country	Name_mod	Name_hist	Hydro_type	Hydro_name_mod	Hydro_name_hist	Locat_secure	Locat_text	Locat_precision	Source_hist	Source_feature_arch	Source_find_arch	Source_other	Place_type_general
1	T. Bendschus	Images and imaginations of Roman por	2014	1	open	36,855	7,771	geria	Annaba	Hippo Regius	Sea	Mittelmeer	Mare Internun	uncertain							harbour
2	T. Bendschus	Images and imaginations of Roman por	2014	1	open	34,774	32,419	yprus	Paphos	Paphos	Sea	Mittelmeer	Mare Internun	uncertain							other
3	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria (Pharc	Sea	Mittelmeer	Mare Internun	uncertain							other
4	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria (Pharc	Sea	Mittelmeer	Mare Internun	uncertain							other
5	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria (Pharc	Sea	Mittelmeer	Mare Internun	uncertain							other
6	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
7	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
8	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
9	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
10	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
11	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
12	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
13	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
14	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
15	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
16	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour
17	T. Bendschus	Images and imaginations of Roman por	2014	1	open	31,206	29,878	gypt	Alexandria	Alexandria	Sea	Mittelmeer	Mare Internun	uncertain							harbour

Position

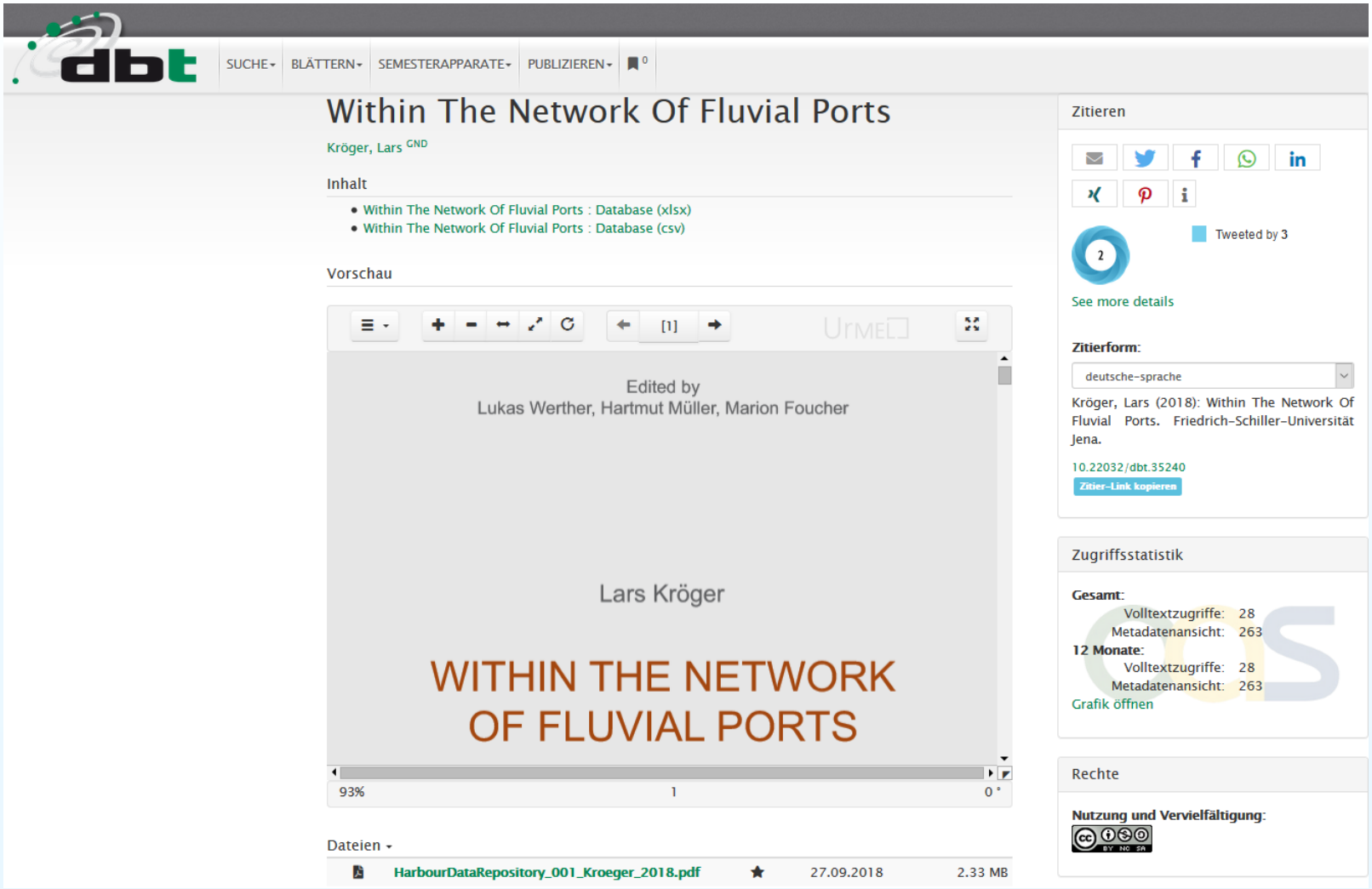
Positional Accuracy

Date_min	Date_max	Date_pre_1_cent_BC	Date_1_cent_BC	Date_1_cent_AD	Date_2_cent_AD	Date_3_cent_AD	Date_4_cent_AD	Date_5_cent_AD	Date_6_cent_AD	Date_7_cent_AD	Date_8_cent_AD	Date_9_cent_AD	Date_10_cent_AD	Date_11_cent_AD	Date_12_cent_AD	Date_13_cent_AD	Date_14_cent_AD	Date_15_cent_AD	Date_16_cent_AD	Date_17_cent_AD	Date_18_cent_AD	Date_19_cent_AD	Date_20_cent_AD	Date_secure	Date_text	Ref_hist	Ref_mod	Comments
					yes	yes																		uncertain			Bendschus - Feuser 2014, 609067, http://arachne.uni-koeln.d	
							yes																	uncertain			Bendschus - Feuser 2014, 608975, http://arachne.uni-koeln.d	
		yes	yes	yes	yes	yes	yes	yes																very uncertain			Bendschus - Feuser 2014, 608577, http://arachne.uni-koeln.d	unsichere Zuordnung
							yes	yes	yes															very uncertain			Bendschus - Feuser 2014, 608678, http://arachne.uni-koeln.d	unsichere Zuordnung
				yes	yes																			very uncertain			Bendschus - Feuser 2014, 608681, http://arachne.uni-koeln.d	unsichere Zuordnung
						yes																		very uncertain			Bendschus - Feuser 2014, 607212, http://arachne.uni-koeln.d	unsichere Zuordnung, vielleicht Karthago
						yes																		very uncertain			Bendschus - Feuser 2014, 607221, http://arachne.uni-koeln.d	unsichere Zuordnung, vielleicht Karthago
						yes																		very uncertain			Bendschus - Feuser 2014, 607223, http://arachne.uni-koeln.d	unsichere Zuordnung, vielleicht Karthago
						yes																		very uncertain			Bendschus - Feuser 2014, 607222, http://arachne.uni-koeln.d	unsichere Zuordnung, vielleicht Karthago
						yes																		very uncertain			Bendschus - Feuser 2014, 607213, http://arachne.uni-koeln.d	unsichere Zuordnung, vielleicht Karthago
				yes	yes	yes																		very uncertain			Bendschus - Feuser 2014, 607225, http://arachne.uni-koeln.d	unsichere Zuordnung
				yes	yes	yes																		very uncertain			Bendschus - Feuser 2014, 607228, http://arachne.uni-koeln.d	unsichere Zuordnung
				yes	yes	yes																		very uncertain			Bendschus - Feuser 2014, 607229, http://arachne.uni-koeln.d	unsichere Zuordnung
				yes	yes	yes																		very uncertain			Bendschus - Feuser 2014, 607230, http://arachne.uni-koeln.d	unsichere Zuordnung

Time

Temporal Accuracy

Long-term Archiving



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ROMANIAN SURVEYING

European Harbour Data Repository, the Digital Catalogue

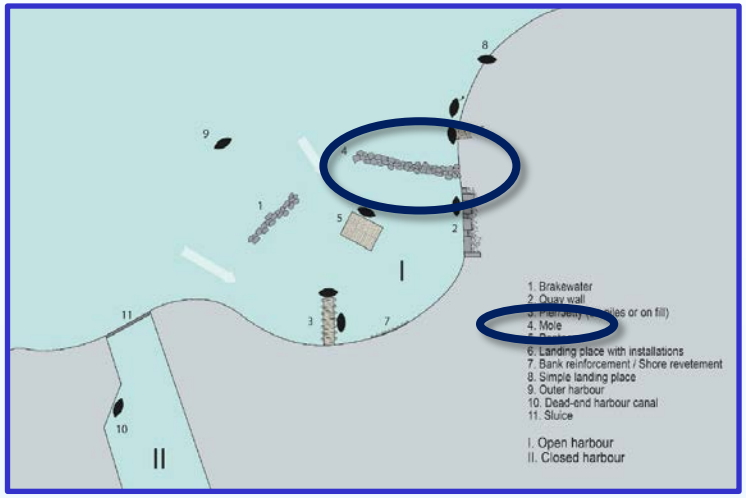
dbt

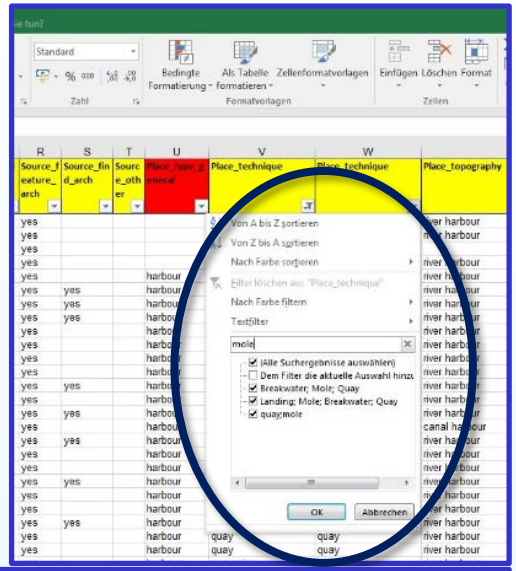
doi

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Author	Project	Year	Status	Public	Latitude	Longitude	Country	Name_mod	Name_hist	Hydro_type	Hydro_name_mod	Hydro_name_hist	Locat_secure
2	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	63,4307	10,4011	Norway	Trondheim	Niðarós	River	Nidelva		highly reliable
3	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	63,6460	9,7366	Norway	Kong Øysteins havn		Sea	Trondheimsfjorden		highly reliable
4	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	62,4664	6,2358	Norway	Borgund på Sunnmøre		Sea	Borgundfjorden		highly reliable
5	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	55,7276	12,9946	Sweden	Lödde Kar	Lyddekar	Sea; Riv	Lödde å		highly reliable
6	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	58,5018	13,1589	Sweden	Lidköping		River	Nidan		highly reliable
7	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	56,4212	10,2297	Denmark	Stavnsager		Sea	Oxenbæk		reliable
8	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	57,4575	18,1473	Sweden	Paviken		Lake	Paviken		reliable
9	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	57,4485	18,1436	Sweden	Västergarn		River	Pavikeån		reliable
10	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	57,4486	18,1275	Sweden	Kronholmen		Sea			reliable
11	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	57,9733	12,1558	Sweden	Skepplanda		River	Grönån		highly reliable
12	M. Blobel	Viking Age Scandinavian Harbours	2017	1	open	59,7410	17,2220	Sweden	Garn		River	Örsundaån		highly reliable

Querying the Database

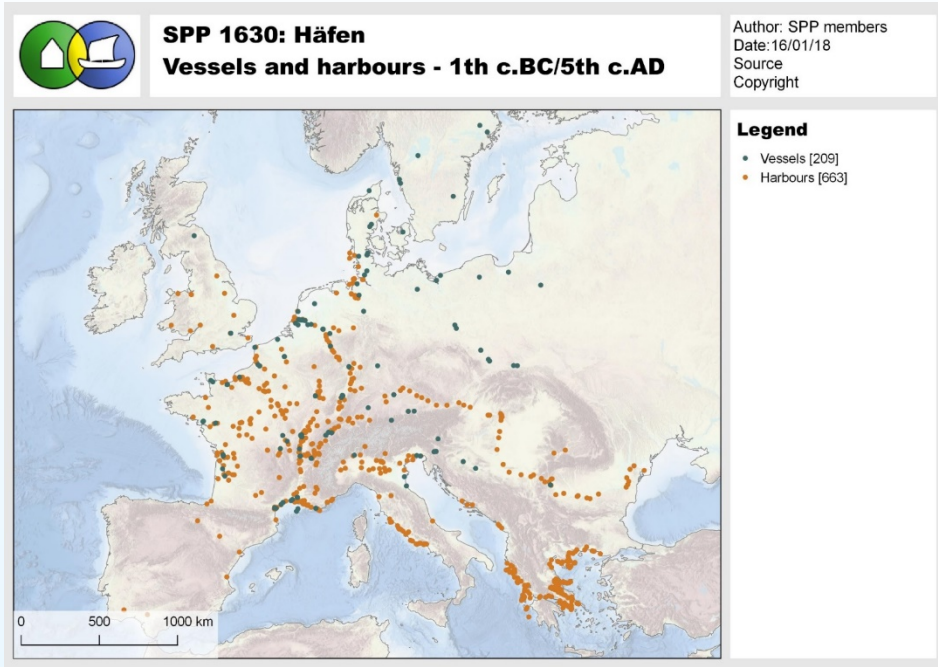
Looking for Comparisons, Literature etc.

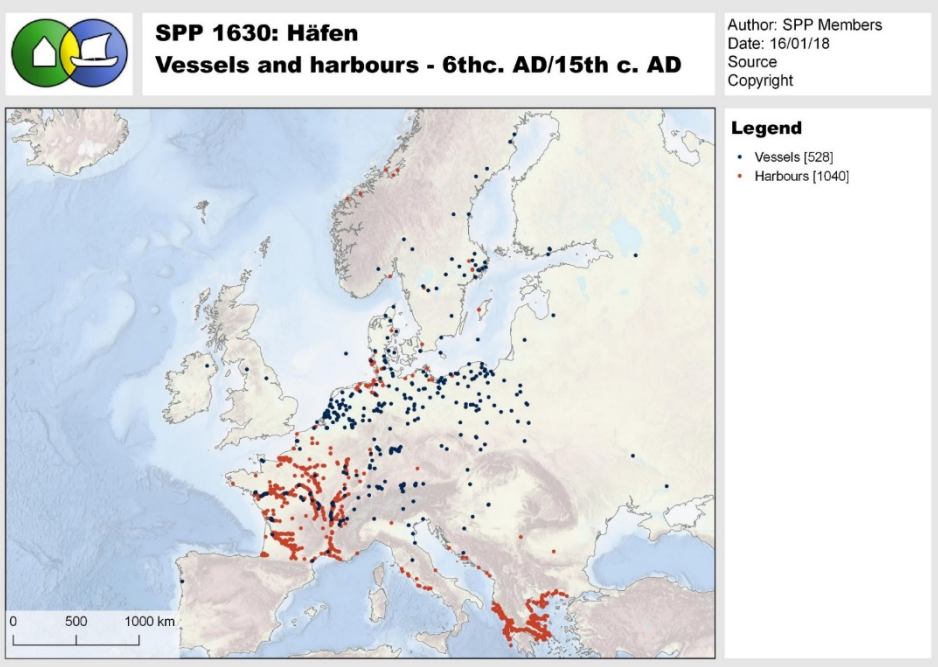




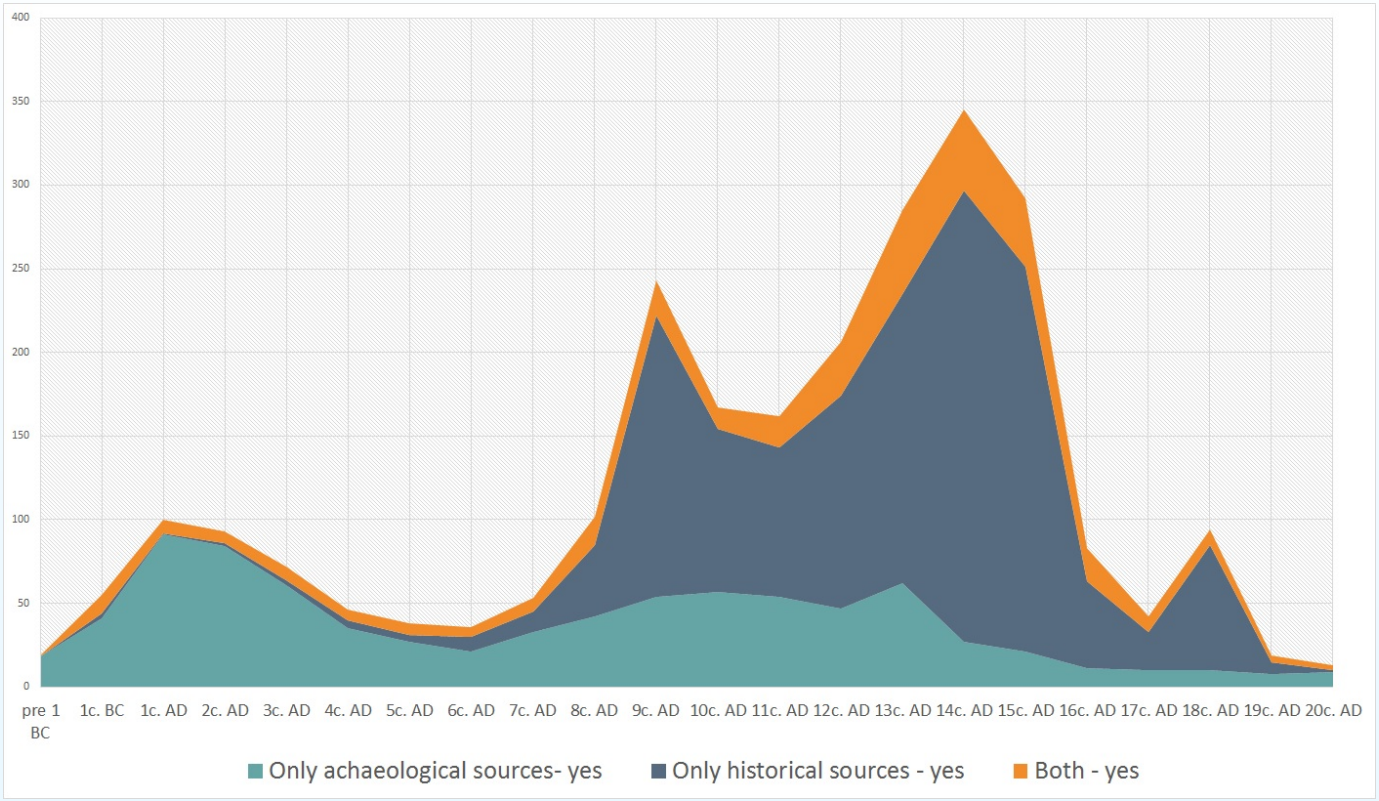
Country	Name_mod	Name_hist	Hydro_type	Hydro_name_mod	Hydro_name_hist	Locat_precision	Source_hist	Source_feature_arch	Source_find_arch	Source_other	Place_type_general	Place_technique	Place_technique
Rumänien	Capidava		Fluss	Donau		1		yes			harbour	quay;mole	quay;mole
Syrien	Derkush El-H		Fluss	Orontes				yes			harbour	quay;mole	quay;mole
Schweiz	Genf	Genava	Fluss	Rhône		4		yes			harbour	Pier; Mole	Pier; Mole
Deutschland	Moers-Asberg		Fluss	Rhein		4		yes			harbour	Mole	Mole
Italien	Rom		Fluss	Tiber		4	yes	yes	yes		harbour	quay;mole	quay;mole
Niederlande	Velsen		Fluss	Oer-IJ		4		yes			harbour	Pier; Mole	Pier; Mole
Deutschland	Zullestein		Fluss	Weschnitz; R				yes			harbour	Mole	Mole
Italy	Santa Severa	Pyrgi	Sea	Tyrrhenisches	Mare Tyrrhen	highly reliable	Archäologisch	1	yes	yes	yes	Harbour	Landing ; Canal; Breakw	Landing ; Ca
Italy	Ladispoli/Pal	Alsium	Sea	Tyrrhenisches	Mare Tyrrhen	highly reliable	Archäologisch	1	yes	yes	yes	Harbour	Mole	Mole
Italy	Civitavecchia	Centumcellae	Sea	Tyrrhenisches	Mare Tyrrhen	highly reliable	Archäologisch	1	yes	yes	yes	Harbour	Landing; Mole; Breakwa	Landing; Mo
Italy	Anzio	Antium	Sea	Tyrrhenisches	Mare Tyrrhen	highly reliable	Archäologisch	1	yes	yes	yes	Harbour	Breakwater; Mole; Quay	Breakwater
Italy	Torre Astura	Astura	Sea	Tyrrhenisches	Mare Tyrrhen	highly reliable	Archäologisch	1	yes	yes	yes	Harbour	Breakwater; Mole; Quay	Breakwater
France	Cannes (Bateguier 3)		Sea	the Mediterranean Sea		highly reliable	because of th	1		yes	yes	harbour	mole	mole

Cross-Project Analysis: Chronology





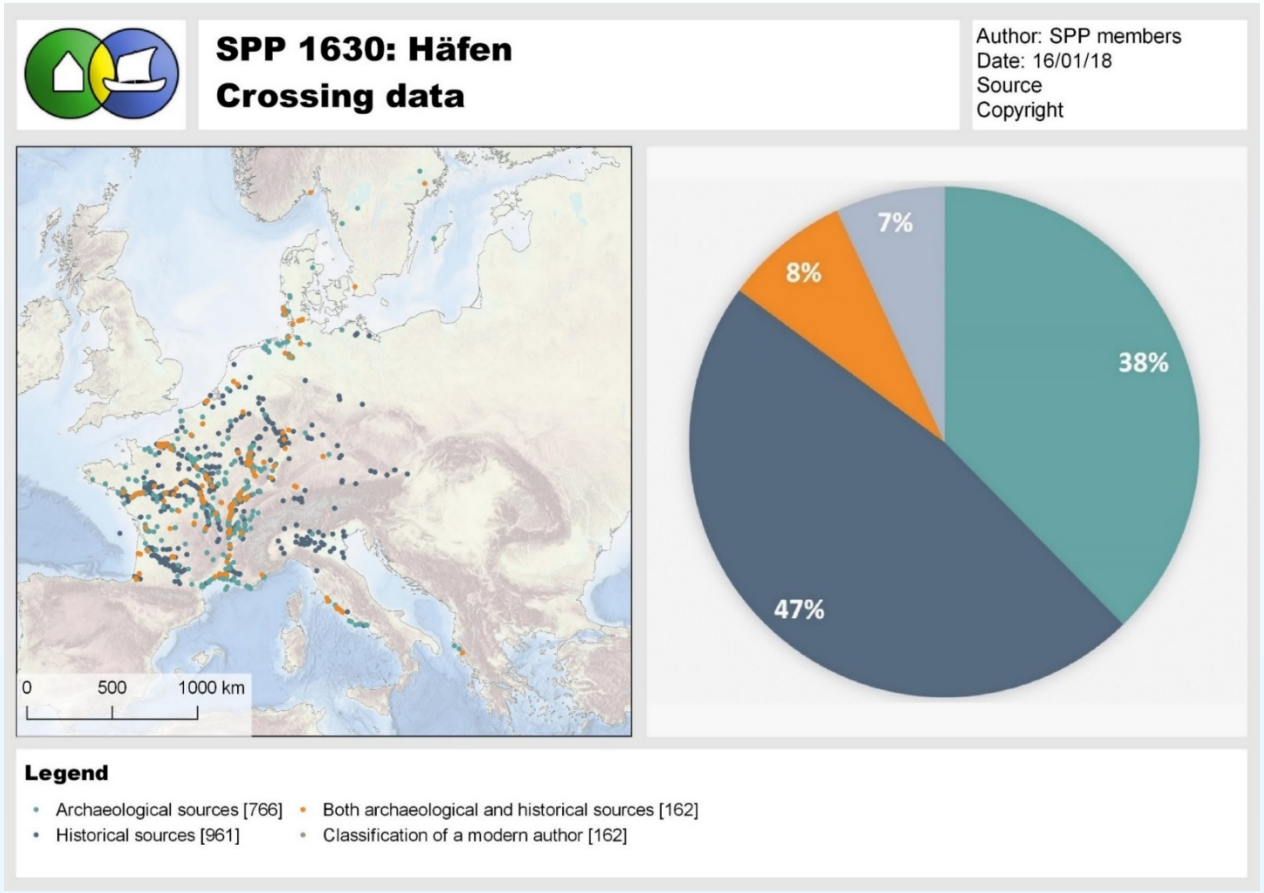
Simple Statistics: Archaeology, History, or Both?



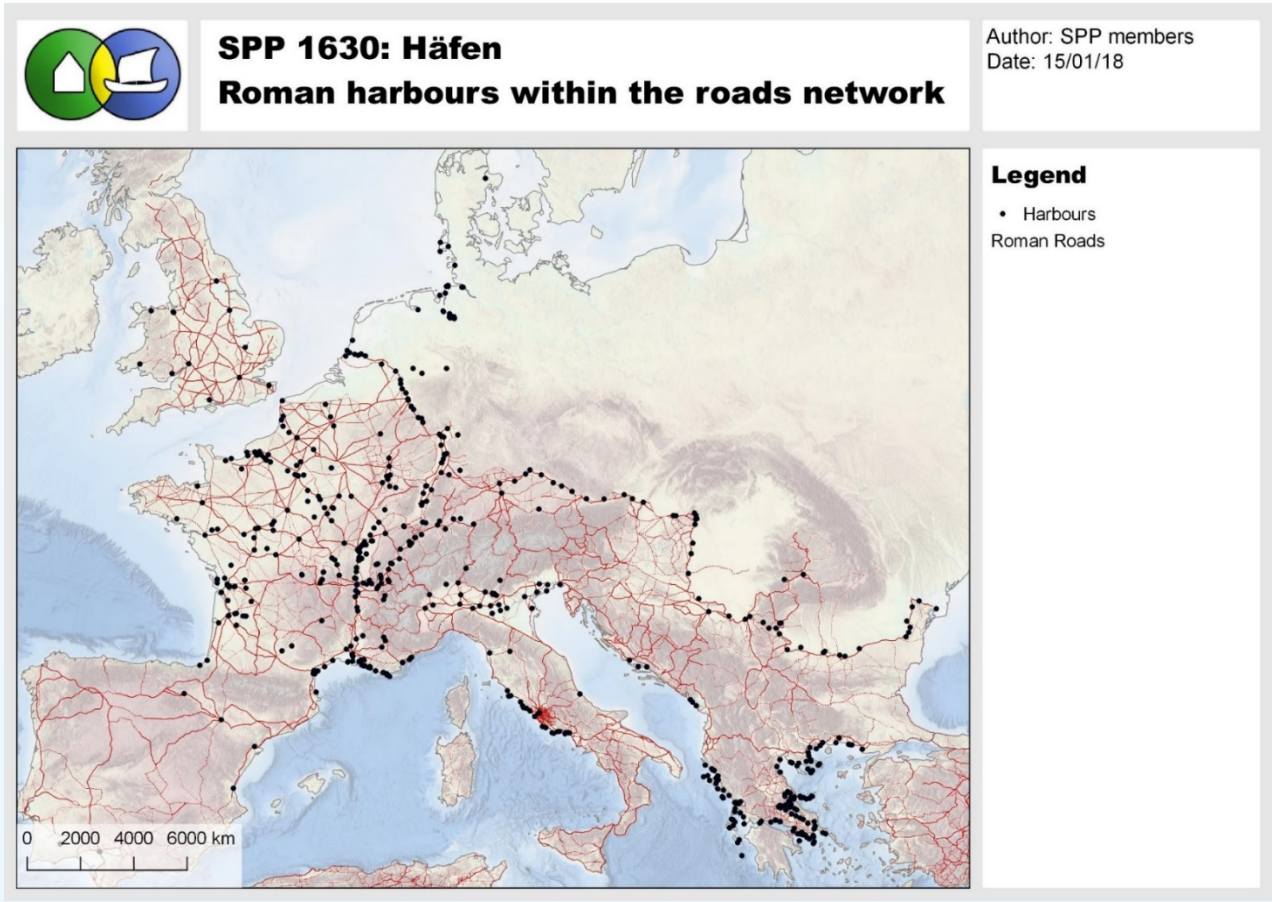
Sources by century

Data : status january 2018

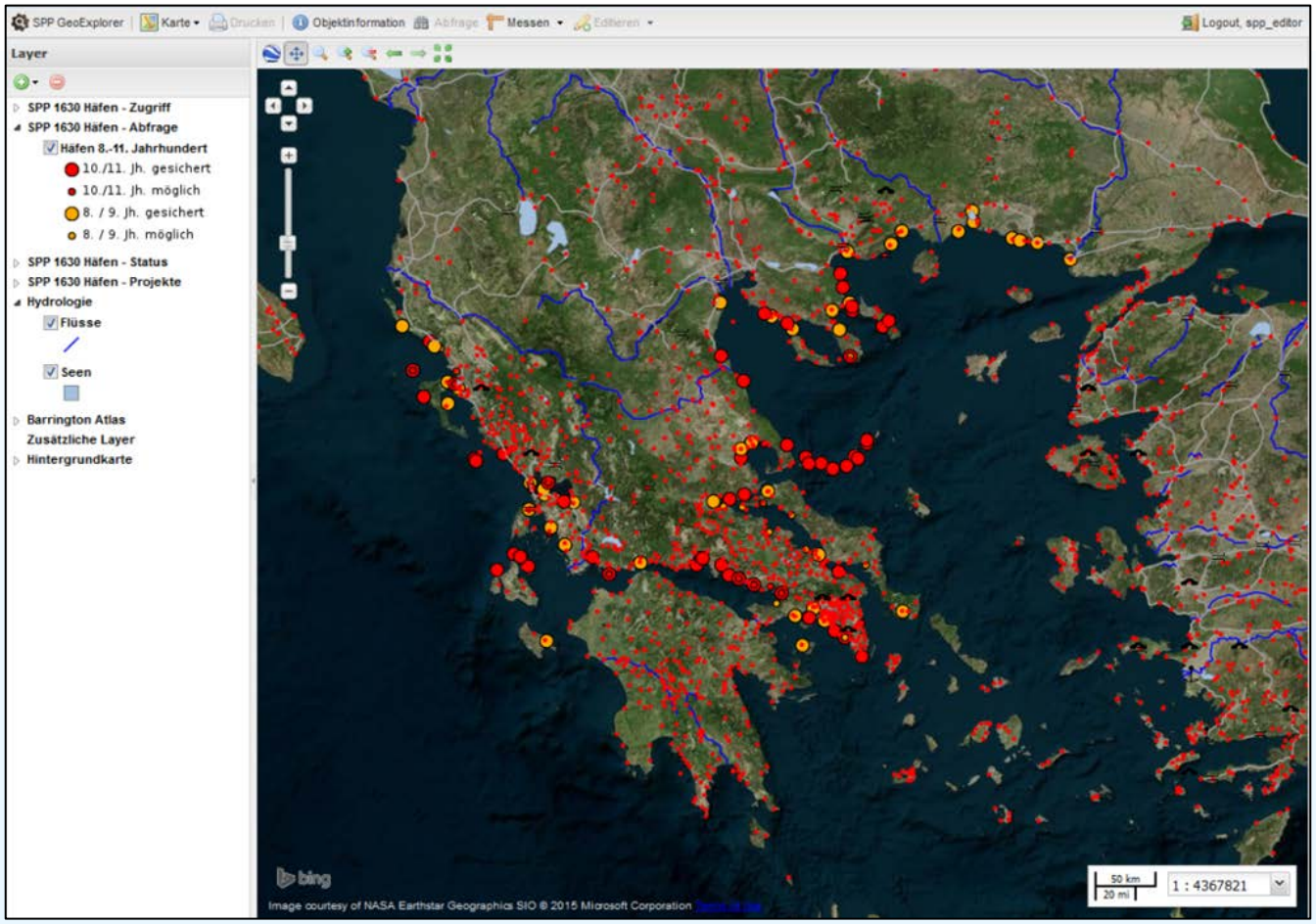
Cross-Project Analysis: Combining Maps and Graphs



Combining Cross-Project Data with Background Data



Visualiation of spatiotemporal accuracy (Data 2014)



Selected Harbour Data: J. Preiser-Kapeller 2014

url: http://haefen.i3mainz.hs-mainz.de/spp

Conclusions

Interdisciplinary research objectives require intensive cooperation between the project partners

In a multidisciplinary research environment, adapted data acquisition procedures are necessary

Quality assured data is an indispensable prerequiste for any meaningful analysis

Thank you!

https://haefen.i3mainz.hs-mainz.de/

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