9. Climate Neutral and Smart Cities

Scientific leader

Eric Harrison, ESS Head Quarter, City, University of London
Eric.Harrison.2@city.ac.uk

Partners:

ESS ERIC : ESS HQ; Sikt

CESSDA ERIC: CESSDA HQ; SND; ADP

ENVRI Consortium: IAGOS

External contributors

Clusters:

SSHOC social sciences & humanities open cloud

ENVRI FAIR

Do climate and air quality indices affect interview responses?

Objectives

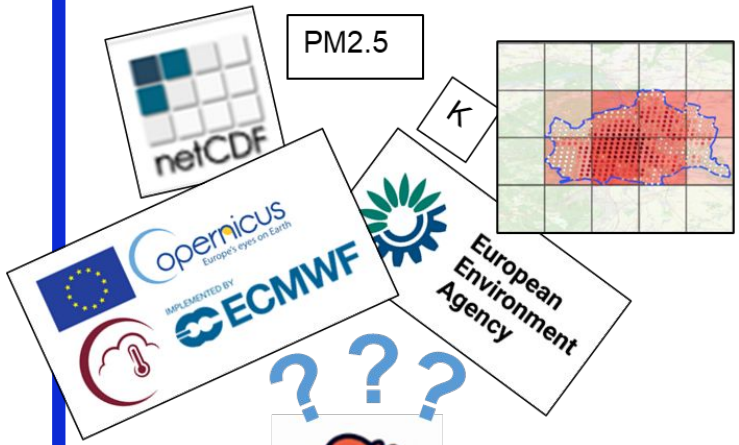
Develop solutions for interdisciplinary research based on a practical example

- Topic: European urban citizens' attitudes and values, in context of the climate and air quality in the cities they live in
- Integration of data from different research domains: Survey data and data on climate and air quality
- Collaboration between professionals from within the social science and environmental science clusters

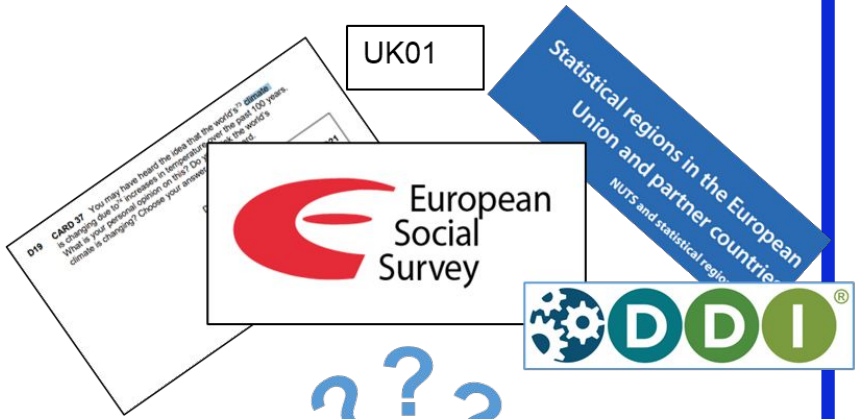
Identify requirements for metadata and systems that support interdisciplinary research

- Necessary to make detailed information about the workflows related to interdisciplinary data production transparent (provenance)
- For this purpose, tools that support human and machine access to such information are needed

Scientific Challenges - Understand data from multiple domains ?



Social scientist



Environmental specialist

Data driven solutions - Integration of multidisciplinary data

Data fra European Social Survey (ESS) as **primary data source**

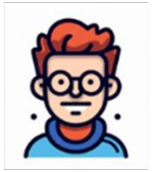
- Data is processed, documented and disseminated by the ESS Data Team at Sikt
- Selection of ESS data from 10 major European cities from 2016 to present
- All ESS variables are kept

Air quality data from the European Environmental Agency (EEA) and climate data from Copernicus ERA5 as **context data**

- Cover the topics, time and geografic coverage needed for integration with the ESS data
- A small selection of variables downloaded
- Used as basis for creating over 50 indikator variables

Data driven solutions - Climate and air quality indicator development

	Long Name	Type
adapto...	adaptor.mars.i...	Local File
fg10	10 metre wind ...	Geo2D
lati...	latitude	—
lon...	longitude	1D
t2m	2 metre temper...	Geo2D
time	time	1D
tp	Total precipitation	Geo2D



Social scientist

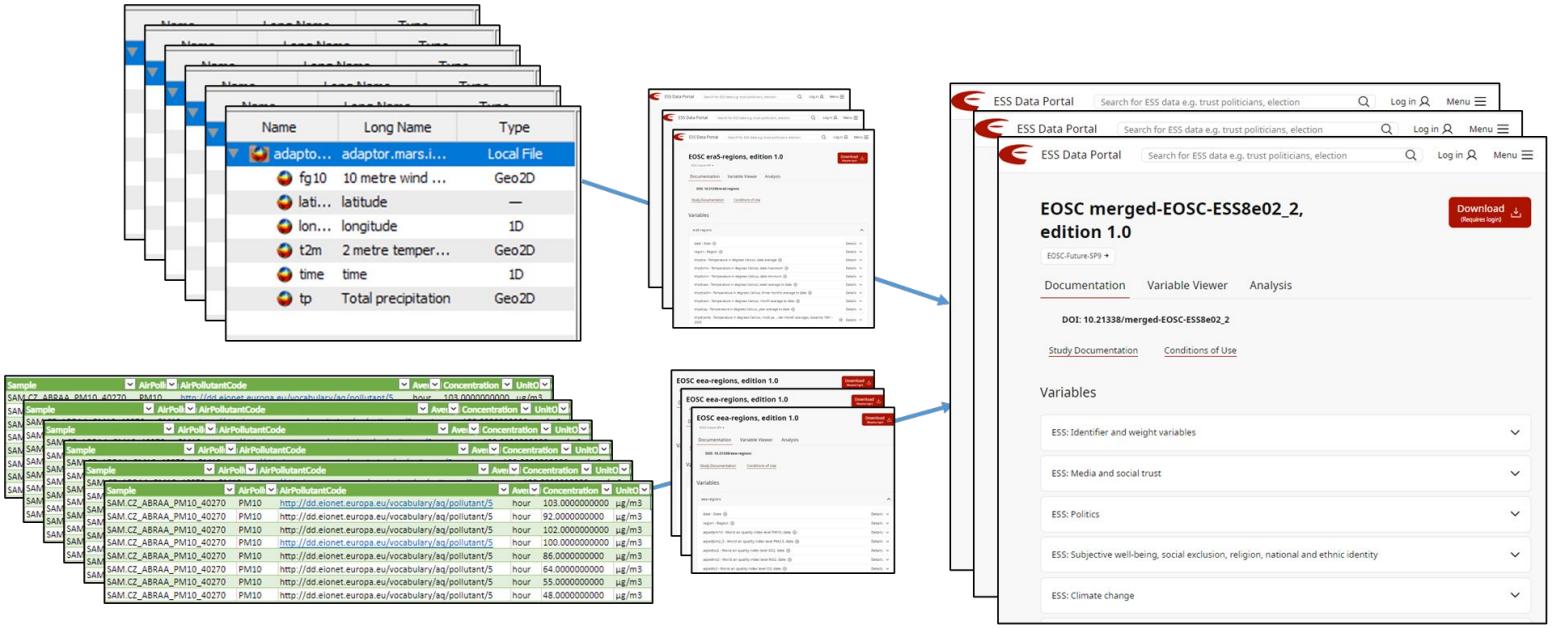
Environmental specialist

Air quality indices	aqiwdpm10	The file eea-stations.pqt contains one observation (row) per hour per pollutant per station. Only background stations are included. Data retreived from https://discomap.eea.europa.eu/map/fme/AirQualityExport.htm.	Compute target variable 'aqiwdpm10' starting from variables 'Concentration' and 'AirPollutant = PM10' for each background station. Compute where 'AirQualityStation' has values for the pollutant. Find max 'Concentration' value for the pollutant for the date with cutoff on the 99th percentil. Create EEA Air Quality Index where PM10: 0 to 20 eq 'Good' represented by value '0'; 20 to 40 eq 'Fair' represented by value '1'; 40 to 50 eq 'Moderate' represented by value '2'; 50 to 100 eq 'Poor' represented by value '3'; 100 to 150 eq 'Very Poor' represented by value '4'; 150 to 1200 eq 'Extremely poor' represented by value '5'. Add missing values

AirPoll	AirPollutantCode	Aver	Concentration	UnitO
PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	103.0000000000	µg/m3
PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	92.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	102.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	100.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	86.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	64.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	55.0000000000	µg/m3
SAM.CZ_ABRAA_PM10_40270	PM10	http://dd.eionet.europa.eu/vocabulary/aq/pollutant/5	hour	48.0000000000	µg/m3

Data driven solutions - Data from three different domains integrated

Tens of thousands of datasets about climate and air quality, are downloaded, reduced, processed, transformed, and finally integrated with the ESS data, based on the interview date and geography



Scientific Challenges - The hunt for metadata

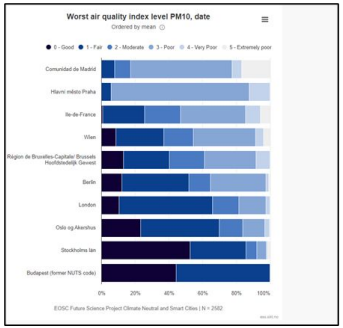
European Social Survey (ESS): Structured in DDI-Lifecycle in the ESS Data Portal. Detailed machine readable study and variable related information covering entities used and their relationships. Methods and processes informations available in documents.

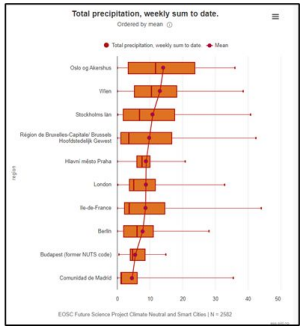
Copernicus ERA5: NetCDF covering minimal structural metadata . Comprehensive variable lists with definition and rich quality assessment documentation (re-analyses methods, validations etc).
Technical documentation about provenance and geospatial aspects of data.

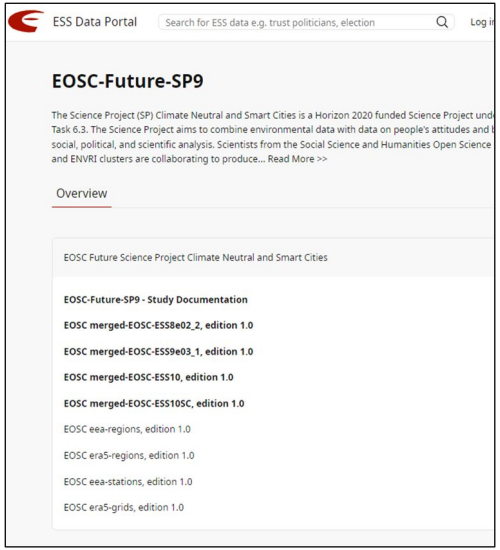
European Environmental Agency (EEA): Metadata csv file with links to vocabularies and related concepts (through EIONET), variable lists and data related documentation. Measurement stations well documented. Lots of links to topic pages and related reports.

Metadata driven solutions - European Social Survey Data Portal

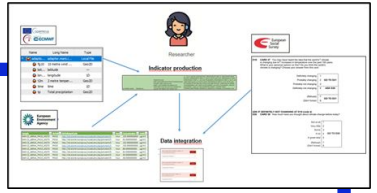
- The existing ESS Data Portal was chosen for publication of data and metadata from the project
- ESS users are already familiar with it
- Metadata at study- or prosjekt level
- Detailed description and visualisation possible at the variable level







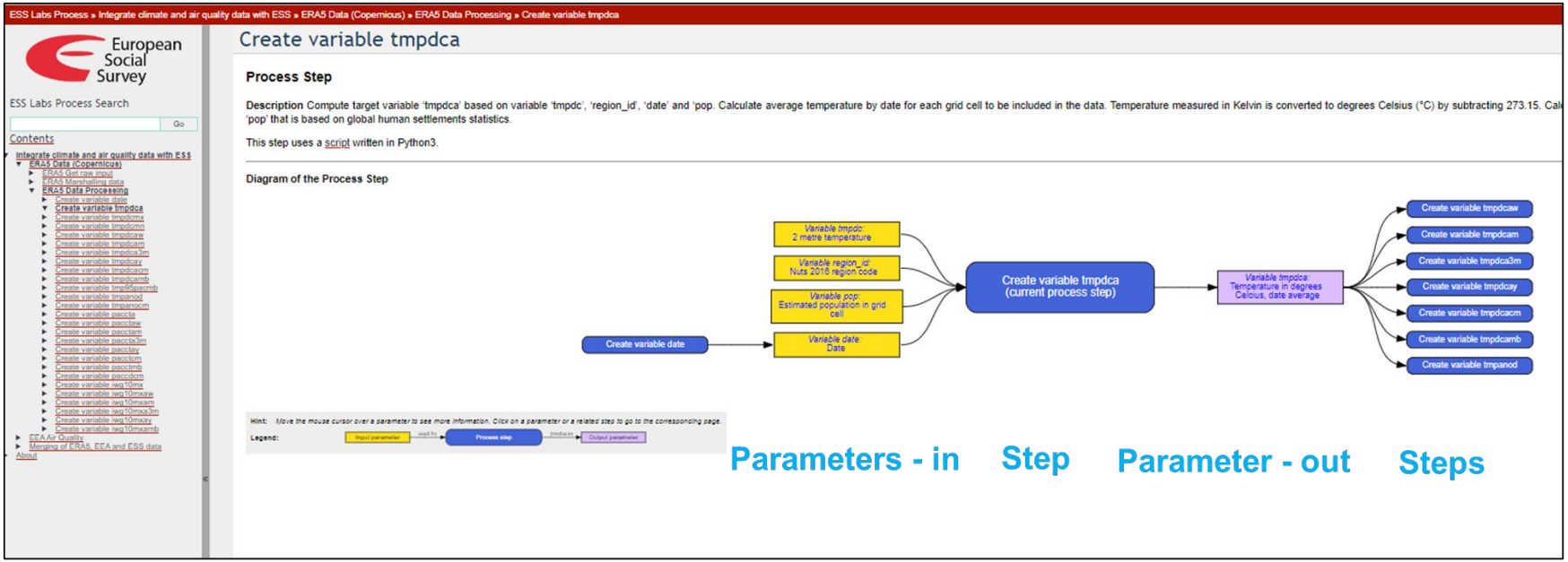
Scientific Challenges - What about the workflows?



- Interdisciplinary research is not the norm
- Researchers from multiple domains are needed to work together to ensure quality
- Granular information about the **provenance** of data is needed – a key indicator for the 'Resuability' pillar in FAIR
- Processes and methods need to be made transparent and machine readable
- Then researchers who are not familiar with one or more of the research domains involved can understand and learn
- Experts in a field can evaluate for the purpose of reuse

Metadata driven solutions - DDI-CDI process2web

- Clickable provenance prototype application developed by the project, covering all steps in our workflow, from data harvesting, data processing and integration
- Based on the 'Provenance' part of the DDI Cross-Domain integration metadata standard



Opportunities for Interdisciplinary Collaboration through EOSC

- EOSC Future provided an arena for cross-domain collaboration
  - Social Scientists and environmental specialists working together providing outputs based on insights from multiple perspectives
  - Establishment of interdisciplinary expert networks that can drive further initiatives
- Further interdisciplinary collaborations:
  - EGU24 Interdiciplinary session, social and environmental sciences together - 37 abstracts received
- Our basis for interdisciplinary components of several HORISON INFRA project proposals

Contributors

- Eric Harrison (ESS HQ City University of London)
- Hilde Orten, Eirik Stavestrand, Hanna Thome Grieg, Benjamin Beuster, Archana Bidargaddi, Carl-Erik Herheim, Bjarne Øymyr, Åse Jorun Holthe-Tveit, Knut Kalgraff Skjåk (Sikt)
- Joachim Wackerow, Arofan Gregory (Consultants for Sikt)
- Iris Alfredsson, David Rayner, Ilse Laze (SND)
- Hannah Clark (IAGOS)
- Irena Brvar Vipavc, Maja Dolinar (ADP)
- Experts from NILU and the Norwegian Meteorological Institute

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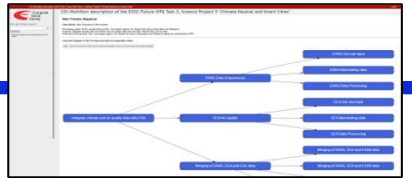
Resources



- EOSC Portal: https://marketplace.eosc-portal.eu/
- ESS Labs page: https://www.europeansocialsurvey.org/esslabs/
- Data from the project in the ESS Data Portal:
- https://ess.sikt.no/en/study/71586b4f-ef66-4b90-aed7-e7e7ad7406ce
- Provenance description application prototype: https://eosc-provenance.sikt.no/