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LANDESHAUPTSTADT KIEL	BEN - KIEL		
OPEN & AGILE SMART CITIES	BEN - OASC		
MOBILITY AS A SERVICE ALLIANCE	BEN - MAAS		
UNIVERSITY OF GALWAY	BEN - GALW		
KIEL-MARKETING EV	BEN - KIELM		
DUNAVNET LIMITED	BEN - DNET		
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D2.3: Data source catalogue and integration requirements

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0.7	26/05/2025	Alex Gluhak	Updated version based on reviews by DDAO and OASC
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Quality Control

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List of Acronyms

Abbreviation / acronym	Description
API	Application Programming Interface
AQI	Air Quality Index
AVI	Audio Video Interleave
CO	Carbon Monoxide
CSV	Comma-Separated Values
EQI	Environmental Quality Index
EV	Electric vehicle
GIS	Geographic information system
GML	Geography Markup Language
JPG	Joint Photographic Experts Group (image file format)
JSON	JavaScript Object Notation
LEZ	Low Emission Zone
LRT	Light Rail Transit
MIM	Minimum Interoperability Mechanism
NGSI-LD	Next Generation Service Interfaces Linked Data
OASC	Open and Agile Smart Cities
OGC	Open Geospatial Consortium
PDF	Portable Document Format
POI	Points of Interest
REST	Representational State Transfer
SHP	shape file format
SVG	Scalable Vector Graphics
TIFF	Tagged Image File Format
TXT	Plain Text File
VRML	Virtual Reality Modeling Language
WFS	Web Feature Service
WMS	Web Map Service
WMTS	Web Map Tile Service
XLS	Excel Spreadsheet
XML	Extensible Markup Language

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Executive Summary

The SENSE project aims to enhance citizen engagement and urban experiences in Kiel (Germany) and Cartagena (Spain) by building an immersive, interoperable digital environment—referred to as the *CityVerse*. This deliverable, D2.3, serves as a foundational step by cataloguing available urban data sources and specifying requirements for their integration into a unified data space.

The document begins by presenting an extensive register of data sources across both cities, structured around thematic use cases including environmental monitoring, transportation, urban planning, and cultural heritage. Over 90 data sources have been identified and analysed in detail, covering metadata such as data format, update frequency, licensing, ownership, and access mechanisms. Sources range from municipal datasets and sensor streams to historical archives and satellite imagery.

WP2, responsible for creating interoperable data foundations, developed a methodology to cluster these sources and evaluated them for compatibility with open standards—particularly the Open and Agile Smart Cities (OASC) Minimum Interoperability Mechanisms (MIMs). This standards-driven approach facilitates streamlined data integration, reuse, and future scalability.

The integration strategy emphasizes adherence to FAIR data principles and supports automated discovery and access through common data models and APIs. Specific focus is placed on data dynamics (real-time vs. static), legal constraints, and the technical readiness of sources.

This deliverable sets the stage for the integration of these data sources into the SENSE data space, enabling agile application development and interoperability across European urban environments. Future work will build on this catalogue to implement integration pipelines for harmonised data access, enabling the realisation of data-driven *CityVerse* applications in other work packages of the project.

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1 Introduction

Kiel (Germany) and Cartagena (Spain) have embarked on an exciting journey to empower their citizens and local decision makers with new tools to enhance quality of life and the way they experience their cities. Together with their project partners in the SENSE project, these front-runner cities are reimagining city experiences by creating a CityVerse, which will be exemplified in six different use cases/applications.

Data plays a crucial role in enabling the diverse CityVerse applications. Tapping into a pool of diverse historic and current data sources about the cities, SENSE aims to create a rich data space to bring the city into life to enable novel immersive experiences that seamlessly blend the virtual with the real world.

WP2 – creating interoperable data foundations - is tasked with the creation of an interoperable data space that meshes a rich tapestry of city information and urban data. This deliverable represents a first step towards this goal and captured outcomes of task T2.2 performed in the project over the first six months.

Driven by six identified CityVerse use case ideas, the document performs an extensive mapping of available data sources across the two cities that can be useful for the realisation of these. It serves as a repository of identified data sources required to realise the desired use cases, analyses existing data formats, APIs and terms of condition for data sharing. This provides the basis to generate further relevant metadata about these data sources so they can be effectively discovered and shared in the SENSE data space. A total of 90 data sources have been identified and captured with relevant metadata as part of tables in section 2.

Section 3 systematically analyses these data sources and clusters them according to common properties relevant for their integration. It proposes an approach for the integration aligned with Open and Agile Smart Cities Minimum Interoperability mechanism and other widely used data standards. This approach not only minimises the overall integration effort but also makes the SENSE data space and developed CityVerse applications more interoperable, easing their replication and scaling to other city environments.

Finally, section 4 provides concluding remarks that explain how these foundations will aid further development in the project to create the envisioned interoperable SENSE data space.

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2 Data source register

This section presents the outcomes of extensive data source analysis and mapping work carried out by WP2 over the first six months of the project. In collaboration with the different use case owners in the cities of Kiel and Cartagena and their data teams, an extensive collection of data sources has been identified in different IT systems that the city operates, including those of partner organisations.

The data source register captured a lot of detailed information about the data sources, that can be later used to generate relevant metadata. This will enable efficient data reuse by the developers of the envisioned CityVerse use cases and applications. Section 2.1 presents the template used to describe each data source in the register. Section 2.2 covers all relevant data sources that have been identified in the city of Cartagena for all locally envisioned city verse use cases. Due to the complex data environment required for the use cases of the city of Kiel, the identified data sources have been presented in separate subsections 2.3-2.5 respectively.

2.1 Introduction to data source descriptions

Data source table	
Name	Descriptive name for data source
Description	textual description of the data source
General information	
Type	data source type, e.g. file, stream
Data format	format of data source e.g.xls, smart data model etc
Data nature	static or dynamic
Update frequency	How often data item is updated
Data structure	how a data set / item is structured
Use case information	
UC reference	what use case the data source relates to
Purpose	how that data will be used in the use case
Legal information	
Owner	owner and/or publisher of the data source
Sharing terms	terms and conditions / license for data source
Restrictions	sensitive nature (e.g. personal or commercially sensitive)
Data access information	
Access portal	name of system/portal that hosts data source
URL	direct URL to data source
Access keys, token	credentials for data source access

2.2 Data sources in Cartagena

2.2.1 Geodata of Cartagena

Data source table	
Name	Overview and Geodata of the City of Cartagena
Description	Spatial Data Infrastructure (in Spanish, Infraestructura de Datos Espaciales) is a portal that displays different city viewers (mainly cartographic and urban planning) and provides insight into its structure and development over time in

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	UTM-ETRS 89 coordinates. Both viewers provide access to orthophotos, the base image being from 2019. A flight was conducted in 2022 with an accuracy of less than 7 cm and high image quality.
General information	
Type	link
Data format	PDF, DWG
Data nature	static
Update frequency	Not defined
Data structure	Not defined
Use case information	
UC reference	All UC
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, depending on the selected license
Restrictions	Open data, depending on the selected license
Data access information	
Access portal	Infraestructura de Datos Espaciales - Ayuntamiento de Cartagena
URL	https://geoportal.cartagena.es/gvsigonline/core/load_public_project/basecartografica/
Access keys, token	unknown

2.2.2 National Geographic Institute Download Center

Data source table	
Name	National Geographic Institute Download Center
Description	The Download Center is a platform of the National Geographic Institute and the National Geographic Information Center that makes maps and cartography, aerial and satellite photography, orthophotos, digital terrain models, databases, LiDAR point clouds, etc., available to the public. It offers services to integrate query and download into third-party applications.
General information	
Type	link
Data format	Vectorial
Data nature	static
Update frequency	Not defined.
Data structure	Not defined
Use case information	
UC reference	All UC
Purpose	TBC
Legal information	
Owner	Government of Spain
Sharing terms	Free and open to the public, provided the source and ownership of the data is mentioned (CC-BY 4.0 license)
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Centro de Descargas del Instituto Geográfico Nacional
URL	https://centrodedescargas.cnig.es/CentroDescargas/home
Access keys, token	unknown

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2.2.3 ESRI GIS platform

Data source table	
Name	GIS Platform of ESRI
Description	A 3D survey of the city of Cartagena is expected soon, probably after the end of year.
General information	
Type	probably link
Data format	Various, based on service such WMS, WFS, etc
Data nature	static
Update frequency	Not defined.
Data structure	Not defined
Use case information	
UC reference	All UC
Purpose	TBC
Legal information	
Owner	unknown
Sharing terms	unknown
Restrictions	unknown
Data access information	
Access portal	unknown
URL	unknown
Access keys, token	unknown

2.2.4 LEZ Air quality index (AQI)

Data source table	
Name	LEZ Air quality index (AQI)
Description	This is a municipal application that shows different measures taken by meteorological sensors in real time.
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 6 columns (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/public-smartcity-aqica/indice-de-calidad-del-aire-ica?orgId=1&kiosk&var-device_name=AQ1%20-%20
Access keys, token	unknown

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2.2.5 LEZ Air quality – Gases (CO, NO2, O3, SO2)

Data source table	
Name	LEZ Air quality - Gases (CO, NO2, O3, SO2)
Description	This is a municipal application that shows different measures taken by meteorological sensors in real time.
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 7 columns (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/public-smartcity-po/calidad-del-aire-gases?orgId=1&kiosk&var-device_name=Aquatec%20-%20C%2F
Access keys, token	unknown

2.2.6 LEZ Air quality - Gases (EQI, O3, NO2, SO2)

Data source table	
Name	LEZ Air quality - Gases (EQI, O3, NO2, SO2)
Description	This is a public application that shows that we use both the European Union methodology and that of the United States Environmental Protection Agency (EPA) with modeled data on air quality from the European Union Copernicus Atmospheric Monitoring Service (CAMS) for the city of Cartagena.
General information	
Type	data
Data format	TBC
Data nature	dynamic (forecast)
Update frequency	every day
Data structure	TBC
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Pelmorex Corp. 2025
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms

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Data access information	
Access portal	El tiempo.es
URL	https://www.eltiempo.es/calidad-aire/murcia
Access keys, token	unknown

2.2.7 LEZ Air quality - Particulate matter (PM10, PM2.5, PM1)

Data source table	
Name	LEZ Air quality - Particulate matter (PM10, PM2.5, PM1)
Description	This is a municipal application that shows different measures taken by environmental sensors in real time
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 4 columns (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/public-smartcity-pm/calidad-del-aire-materia-particulada?orgId=1&kiosk&var-device_name=Aquatec%20-%20C%2F
Access keys, token	unknown

2.2.8 LEZ Air quality - Particulate matter (PM10, PM2.5)

Data source table	
Name	LEZ Air quality - Particulate matter (PM10, PM2.5)
Description	This is a public application that shows that we use both the European Union methodology and that of the United States Environmental Protection Agency (EPA) with modeled data on air quality from the European Union Copernicus Atmospheric Monitoring Service (CAMS) for the city of Cartagena
General information	
Type	data
Data format	TBC
Data nature	static (forecast)
Update frequency	every day
Data structure	TBC
Use case information	
UC reference	UC6

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Purpose	TBC
Legal information	
Owner	Pelmorex Corp. 2025
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	El tiempo.es
URL	https://www.eltiempo.es/calidad-aire/murcia
Access keys, token	unknown

2.2.9 Weather stations (temperature, humidity)

Data source table	
Name	Weather stations (temperature, humidity)
Description	This is a municipal application that shows different measures taken by environmental sensors in real time
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 4 columns each (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/public-smartcity-weather/estaciones-meteorologicas?orgId=1&kiosk&var-resource=temperature&var-service=WeatherStation&var-servicepath=%2Faytocartagena&var-type=WeatherObserved&var-table=mtweatherstation.etweatherobserved&var-device_name=
Access keys, token	unknown

2.2.10 Weather information

Data source table	
Name	Weather information (temperature, humidity, atmospheric pressure, wind and precipitation parameters, UV radiation index)
Description	This is a municipal application that shows different measures taken by environmental sensors in real time
General information	
Type	file

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		Status:	Draft

This document translates some of the obligations from the grant agreement and in case of discrepancies, it is the grant agreement which prevails over this deliverable.

Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 4 columns each (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/public-smartcity-weatherdynamic/informacion-meteorologica?orgId=1&kiosk&var-device_name=Aquatec%20-%20
Access keys, token	unknown

2.2.11 LEZ Parking space monitoring

Data source table	
Name	LEZ Parking space monitoring
Description	This is a municipal application that displays occupancy data collected by presence sensors in real time
General information	
Type	time data
Data format	TBC
Data nature	dynamic
Update frequency	every 1 second (presence sensor)
Data structure	Time-bar under the map
Use case information	
UC reference	UC6
Purpose	Displays street parking for people with disabilities or reduced mobility
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/Lo24VXdNk/monitorizacion-de-plazas-de-parking?orgId=1&kiosk&var-resource=status&var-service=Parking&var-servicepath=All&var-type=ParkingSpot&var-table=mtparking.etparkingspot&var-device_name=C%2F
Access keys, token	unknown

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		Status:	Draft

This document translates some of the obligations from the grant agreement and in case of discrepancies, it is the grant agreement which prevails over this deliverable.

2.2.12 People counting

Data source table	
Name	People counting
Description	This is a municipal application that displays various data collected by sensors in real time
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 4 columns each (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data (Password)
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/private-smartcity-crowd/conteode-personas?orgId=1&kiosk&var-device_name=AQ1%20-%20
Access keys, token	unknown

2.2.13 LEZ Vehicle traffic information

Data source table	
Name	LEZ Vehicle traffic information (vehicle count, speed, environmental label)
Description	This is a municipal application that displays various data collected by sensors and cameras in real time
General information	
Type	file
Data format	CSV, JSON, TXT
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data in 2, 4 and 6 columns respectively (CSV)
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Cartagena City Council
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data (Password)
Data access information	
Access portal	Cuadro de mando tecnico - Grafana
URL	https://pma.ayto-cartagena.es/visualizador/d/Xyac_MGsk/camaras-de-traffic?orgId=1
Access keys, token	unknown

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2.2.14 Pollen level in LEZ

Data source table	
Name	Pollen level in LEZ
Description	This is a public application that shows that we use both the European Union methodology and that of the United States Environmental Protection Agency (EPA) with modeled data on air quality from the European Union Copernicus Atmospheric Monitoring Service (CAMS) for the city of Cartagena
General information	
Type	data
Data format	TBC
Data nature	static (forecast)
Update frequency	every day
Data structure	TBC
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Pelmorex Corp. 2025
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	El tiempo.es
URL	https://www.eltiempo.es/murcia/polen
Access keys, token	unknown

2.2.15 LEZ Air quality index - Mompean station

Data source table	
Name	LEZ Air quality index - Mompean station
Description	This is a Autonomous Community of the Region of Murcia application that shows different measures taken by environmental sensors in real time in a specific area of the LEZ in the city of Cartagena.
General information	
Type	file
Data format	XLS
Data nature	dynamic
Update frequency	every 1 hour
Data structure	Hourly data (Mompean column) Allows you to obtain historical data with daily average values
Use case information	
UC reference	UC6
Purpose	TBC
Legal information	
Owner	Autonomous Community of the Region of Murcia
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	

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Access portal	Calidad del Aire - Region de Murcia
URL	https://sinqlair.carm.es/calidadaire/Default.aspx
Access keys, token	unknown

2.2.16 Copernicus

Data source table	
Name	Copernicus
Description	unknown
General information	
Type	unknown
Data format	Various in Copernicus Atmospheric Monitoring Service
Data nature	unknown
Update frequency	unknown
Data structure	unknown
Use case information	
UC reference	UC6
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	Copernicus Programme of the European Union
Sharing terms	Open data, so no restrictions beyond license terms
Restrictions	Open data, so no restrictions beyond license terms
Data access information	
Access portal	Copernicus Monitoring Service - Atmosphere
URL	https://atmosphere.copernicus.eu/charts/packages/cams_air_quality/?facets=%7B%22Parameter%22%3A%5B%22PM10%22%2C%22PM2.5%22%2C%22nitrogen%20dioxide%22%2C%22sulphur%20dioxide%22%2C%22ozone%22%5D%7D
Access keys, token	unknown

2.3 Data sources in Kiel (SeaLevel)

2.3.1 Coastline Baltic Sea Germany

Data source table	
Name	Coastline Baltic Sea Germany
Description	Coastline based on shapefiles
General information	
Type	file
Data format	zip, geojson, xml
Data nature	static
Update frequency	publisjhed 23.04.21, not updates since
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord

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		Status:	Draft

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Legal information	
Owner	Landesamt für Landwirtschaft, Umwelt und ländliche Räume (LLUR) von Schleswig Holstein
Sharing terms	open data licesce, CC BY4.0
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/kustenlinie-deutsche-ostsee
Access keys, token	unknown

2.3.2 Rating Baltic Sea Grid

Rating Baltic Sea Grid	
Data source table	
Name	Rating Baltic Sea Grid
Description	Overall and individual assessment of the Baltic Sea coastal waters of Germany according to the Water Framework Directive. Quality components phytoplankton (QE1_1), large algae and angiosperms (QE1_2) and macroinvertebrates (QE1_3) as well as the overall ecological and chemical status of the coastal waters up to the sovereign border are presented.
General information	
Type	file
Data format	zip, geojson, xml
Data nature	static
Update frequency	published 14.01.24, updated 23.01.24
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU), stefan.krause@lfu.landsh.de
Sharing terms	Open data, Datenlizenz Deutschland Namensnennung 2.0 (LLUR SH)
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/wrrl-bewertung-ostsee-de-grid
Access keys, token	unknown

2.3.3 Coastal protection structures in Schleswig-Holstein

Data source table	
Name	Coastal protection structures in Schleswig-Holstein
Description	Coastal protection structures on the Baltic coast of Schleswig-Holstein, such as groynes, dolphins and dikes, ditches, embankments, tidal channels or paths. This includes data from terrestrial and photogrammetric surveys as well as digitization using digital orthophotos.

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General information	
Type	file
Data format	wfs, wms, shp
Data nature	static
Update frequency	published 16.02.18, last updated 24.02.25
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein poststelle.husum@lkn.landsh.de
Sharing terms	Open data, Datenlizenz Deutschland Namensnennung 2.0 (LKN SH Nationalparkverwaltung)
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/kustenschutzbauwerke-in-schleswig-holstein-ostsee-stand-2017
Access keys, token	unknown

2.3.4 Findings of ammunition in the sea

Data source table	
Name	Findings of ammunition in the sea
Description	Overview of the ammunition finds reported to the Central Reporting Office for Munitions in the Sea of the Coastal States in Schleswig-Holstein in the period 2015 to 2019
General information	
Type	file
Data format	csv
Data nature	static
Update frequency	published 21.02.20, last updated 13.04.25
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Ministerium für Energiewende, Landwirtschaft, Umwelt, Natur und Digitalisierung
Sharing terms	Open data, Datenlizenz Deutschland Namensnennung 2.0 (MELUND Schleswig-Holstein)
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/fundereignisse-munition-im-meer
Access keys, token	unknown

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2.3.5 Bathing water measurements

Data source table	
Name	Swim water measurements
Description	Hintergrundinformationen zum Thema Badegewässerqualität im Landesportal (various parameter)
General information	
Type	file
Data format	csv
Data nature	static
Update frequency	published 06.01.25, last updated 24.04.25
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Ministerium für Justiz und Gesundheit
Sharing terms	Open data licence, Creative Commons Namensnennung – 4.0 International (CC BY 4.0) (Sozialministerium S-H)
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/badegewasser-messungen
Access keys, token	unknown

2.3.6 Water Salinity

Data source table	
Name	Water Salinity
Description	Salinities (surface) of the Schleswig-Holstein coastal waters of the LLUR (01.01.1980 - 31.12.2014)
General information	
Type	service
Data format	WMS
Data nature	dynamic
Update frequency	annual
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU)
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein

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URL	https://umweltportal.schleswig-holstein.de/trefferanzeige?docuuid=7edae88c-603a-4a16-aad8-7963334c6331
Access keys, token	requires access credentials to WMS service

2.3.7 Water temperature

Data source table	
Name	Water temperature
Description	Water temperature of the Schleswig-Holstein coastal waters of the LLUR from 2005 (01.01.2005 - 31.12.2014)
General information	
Type	service
Data format	vector map
Data nature	dynamic
Update frequency	annual
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU)
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://umweltportal.schleswig-holstein.de/trefferanzeige?docuuid=f92dd075-461e-450b-8ab3-a4e4d65efca9
Access keys, token	unknown

2.3.8 Maritime Data Baltic Sea LRT 1110 and 1170

Data source table	
Name	Maritime Data Baltic Sea LRT 1110 and 1170
Description	Habitat types
General information	
Type	unknown
Data format	Projection: ETRS89, GRS80 ellipsoid, UTM zone 32, with leading 32 in easting (EPSG code: 4647)
Data nature	unknown
Update frequency	unknown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Landwirtschaft, Umwelt und ländliche Räume; poststelle@llur.landsh.de
Sharing terms	https://opendata.zitsh.de/data/llur51/allgemeine_Nutzungsbedingungen_Naturschutzfachdaten.pdf

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Restrictions	see license
Data access information	
Access portal	unknown
URL	unknown
Access keys, token	unknown

2.3.9 Visibility through waterbody

Data source table	
Name	Visibility through waterbody
Description	Average summer visibility for the years 2005 to 2010 from the State Office for Agriculture, Environment and Rural Areas Schleswig-Holstein. Status: December 13, 2011. Values from database up to December 31, 2010.
General information	
Type	file
Data format	WMS
Data nature	static
Update frequency	last updated 07.07.2023
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Landwirtschaft, Umwelt und ländliche Räume; poststelle@llur.landsh.de-mail.de
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Schleswig-Holstein Umwelt Portal
URL	https://umweltportal.schleswig-holstein.de/trefferanzeige?docuuid=0803b733-059c-4627-b084-2113a71ebc8d
Access keys, token	unknown

2.3.10 Bathing water master data

Data source table	
Name	Bathing water master data
Description	Master data of bathing waters in Schleswig-Holstein (19.06.2020 - 07.07.2020)
General information	
Type	service
Data format	WCS, WFS and WMS
Data nature	static
Update frequency	published: 19.06.2020, last updated 27.11.2020
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord

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This document translates some of the obligations from the grant agreement and in case of discrepancies, it is the grant agreement which prevails over this deliverable.

Legal information	
Owner	Ministerium für Soziales, Gesundheit, Jugend, Familie und Senioren
Sharing terms	Open data licence, Creative Commons Namensnennung – 4.0 International (CC BY 4.0) (Sozialministerium S-H)
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	https://opendata.schleswig-holstein.de/dataset/badegewasser-stammdaten3
Access keys, token	unknown

2.3.11 Pollutants/heavy metals

Data source table	
Name	Pollutants/heavy metals
Description	These are verified pollutant data (heavy metals) in water from 2003 to 2011.
General information	
Type	service
Data format	WCS, WFS and WMS
Data nature	dynamic
Update frequency	published: 18.07.2013, last updated: 24.02.2025
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU); christoph.heinrich@lfu.landsh.de
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	Deskriptor 8 - Schadstoffe - Daten - Datensätze - Open-Data Schleswig-Holstein
Access keys, token	unknown

2.3.12 Eutrication

Data source table	
Name	Eutrication
Description	These are verified eutrophication-relevant data from 2003 to 2010.
General information	
Type	service
Data format	WFS, WMS
Data nature	dynamic
Update frequency	published 18.07.2013, last updated: 24.02.2025
Data structure	unknown
Use case information	
UC reference	Sealevel use case

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Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU); christoph.heinrich@lfu.landsh.de
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Open-Data Schleswig-Holstein
URL	Deskriptor 5 - Eutrophierung - Daten - Datensätze - Open-Data Schleswig-Holstein
Access keys, token	unknown

2.3.13 Average share of plastic waste on beaches

Data source table	
Name	Average share of plastic waste on beaches (01.01.2011 - 31.12.2018)
Description	Plastic content detected during beach waste monitoring on the Schleswig-Holstein Baltic Sea coast.
General information	
Type	file
Data format	WFS, WMS
Data nature	static
Update frequency	published: 04.03.2019
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Umwelt des Landes Schleswig-Holstein (LfU); christoph.heinrich@lfu.landsh.de
Sharing terms	Open data license, DL-DE->BY-2.0
Restrictions	see license
Data access information	
Access portal	Schleswig-Holstein Umwelt Portal
URL	https://umweltportal.schleswig-holstein.de/trefferanzeige?docuuid=81994d88-f973-44e6-a8fd-245875998a4e
Access keys, token	unknown

2.3.14 Marine Data infrastructure

Data source table	
Name	Marine Data infrastructure
Description	Official marine and coastal data for the North Sea and Baltic Sea. MDI-DE provides free data and services from the relevant authorities.
General information	
Type	data set, downloads, services and links
Data format	varies

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Data nature	Static
Update frequency	unknown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Different providers
Sharing terms	open data, varies based on data sets
Restrictions	see license
Data access information	
Access portal	Marine Data Infrastructure Germany
URL	https://mdi-de.org/mdi-de/#/search
Access keys, token	unknown

2.3.15 Geo Sea Portal

Data source table	
Name	Geo Sea Portal
Description	Map Portal with geographical information on various types of information of coastal and marine areas in Germany
General information	
Type	map layers
Data format	unclear
Data nature	static
Update frequency	unknown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	BSH (Federal Maritime and Hydrological Agency)
Sharing terms	unclear
Restrictions	see license
Data access information	
Access portal	GeoSeaPortal
URL	https://gdi.bsh.de/mapapps/?lang=de
Access keys, token	unknown

2.3.16 Bathymetrie Kiel Fjord

Data source table	
Name	Bathymetrie Kiel Fjord
Description	1m resolution of the Kiel Fjord bathymetry from the BSH
General information	
Type	file
Data format	PDF

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Data nature	static
Update frequency	unkown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	BSH (Federal Maritime and Hydrological Agency)
Sharing terms	unclear
Restrictions	see license
Data access information	
Access portal	BSH (Federal Maritime and Hydrological Agency)
URL	https://www.bsh.de/SiteGlobals/Forms/Suche/EN/Servicesuche_Formular.html?nn=288542&resourceId=300564&input_=288542&pageLocale=en&templateQueryString=bathymetry&submit.x=0&submit.y=0
Access keys, token	unknown

2.3.17 Water level Kiel Fjord

Data source table	
Name	Water level Kiel Fjord
Description	Hydrographs of water levels in Kiel Holtenau
General information	
Type	service
Data format	REST API, XML or WMS
Data nature	dynamic
Update frequency	unknown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	WSH (Wasser- und Schifffahrtsverwaltung des Bundes)
Sharing terms	Open data license, DL-DE->Zero-2.0
Restrictions	see license
Data access information	
Access portal	WSH (Wasser- und Schifffahrtsverwaltung des Bundes)
URL	https://www.pegelonline.wsv.de/gast/stammdaten?pegelnr=9610066
Access keys, token	unknown

2.3.18 Management plan according to the Water Framework Directive

Data source table	
Name	Management plan according to the Water Framework Directive
Description	Thematic maps /Layers about various parameters with regard to water framework directive
General information	

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Type	map layers
Data format	unclear
Data nature	static
Update frequency	published 14.02.2022
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Federal Institute of Hydrology (BfG)
Sharing terms	unclear
Restrictions	see license
Data access information	
Access portal	Federal Institute of Hydrology (BfG)
URL	https://geoportal.bafg.de/karten/wfdmaps2022/
Access keys, token	unknown

2.3.19 Digital Atlas North

Data source table	
Name	Digital Atlas North
Description	Leisure, environment, planning, administration, infrastructure and aerial photography
General information	
Type	map layers
Data format	unclear
Data nature	static
Update frequency	unclear
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	Landesamt für Vermessung und Geoinformation Schleswig-Holstein
Sharing terms	Different T&C for business and personal use (impressum)
Restrictions	see license
Data access information	
Access portal	Landesamt für Vermessung und Geoinformation Schleswig-Holstein
URL	https://danord.gdi-sh.de/viewer/resources/apps/Anonym/index.html?lang=de#/
Access keys, token	unknown

2.3.20 EMODNet Map Viewer

Data source table	
Name	EMODNet Map Viewer
Description	Various data, e.g. with geographical focus Baltic Sea
General information	

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Type	map layers
Data format	unclear
Data nature	static
Update frequency	unclear
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Model / digital twin of Kiel Fjord
Legal information	
Owner	European Marine Observation and Data Network (EMODnet) European Marine Observation and Data Network (EMODnet)
Sharing terms	unclear
Restrictions	see license
Data access information	
Access portal	European Marine Observation and Data Network (EMODnet) European Marine Observation and Data Network (EMODnet)
URL	https://emodnet.ec.europa.eu/geoviewer/#!/
Access keys, token	unknown

2.3.21 Copernicus service

Data source table	
Name	Copernicus service
Description	Marine global data (extent 1 Oct 2021 to 16 May 2025)
General information	
Type	map layers
Data format	WMTS
Data nature	dynamic
Update frequency	regular
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	Copernicus Programme of the European Union
Sharing terms	mix, depends on what data source considered
Restrictions	see license
Data access information	
Access portal	My Ocean Pro
URL	https://data.marine.copernicus.eu/viewer/expert?view=viewer&crs=epsg:4326&t=1672747200000&z=0&center=0,5.000000000000001&zoom=9.55&base map=dark&objv2=H4sIAIkYwGcAA1WNPwvCMBDFv8vNobTFRJrNxdldSgn21AzNhfMciuS7e1EodHzv9.5cPxBn8DBRCwbuGOTN_AKvvqwZlZz.ntIH0oLCK.gNXigmUXQj4jmmIL9u1zeDc8fOWNscetcOdiwGMINGllgju9cUlr o1naCUUW845GfNqPoCnTt1558AAA-
Access keys, token	login needed

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2.3.22 HELCOM Map and data service

Data source table	
Name	HELCOM Map and data service
Description	Baltic Sea data
General information	
Type	map layers
Data format	ArcGIS Rest, OGC WMS, WFS
Data nature	dynamic
Update frequency	unclear
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	HELCOM partners
Sharing terms	mix, depends on what map layer
Restrictions	see license
Data access information	
Access portal	HELCOM Map and data service
URL	https://maps.helcom.fi/website/mapservice/
Access keys, token	unknown

2.3.23 Marine Data Portal

Data source table	
Name	Marine Data Portal
Description	Central access point to research data from the German marine research community
General information	
Type	service
Data format	various
Data nature	dynamic
Update frequency	unclear
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	Alfred-Wegener-Institute
Sharing terms	https://marine-data.de/termsfuse
Restrictions	see license
Data access information	
Access portal	Marine Data Portal
URL	https://www.marine-data.de/data
Access keys, token	unknown

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2.3.24 Weather station from GEOMAR

Data source table	
Name	Weather station from GEOMAR
Description	The department of Marine Meteorology currently receives data from two measurement sites: (1) Campus (Wischhofstr. 1-3), referred to as “Centre” (2) Kiel Lighthouse (located approximately 8km offshore in the Kiel Bight), referred to as “Leuchtturm”. All data is available as 8 min averages (8 min maximum in case of wind gusts). All times are local times.
General information	
Type	service
Data format	unclear, currently only displayed on website
Data nature	dynamic
Update frequency	every 8 mins
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	GEOMAR Helmholtz Centre for Ocean Research Kiel
Sharing terms	unclear
Restrictions	see license
Data access information	
Access portal	GEOMAR Helmholtz Centre for Ocean Research Kiel
URL	https://www.geomar.de/en/service/weather
Access keys, token	unknown

2.3.25 Baltic Sea Water Level Data

Data source table	
Name	Baltic Sea Water Level Data
Description	Water level data for Baltic Sea
General information	
Type	website, file
Data format	table/graph on website, PDF for monthly report
Data nature	dynamic
Update frequency	several times a day
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	BSH (Federal Maritime and Hydrological Agency)
Sharing terms	unclear

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Restrictions	see license
Data access information	
Access portal	Water level forecast for the Baltic Sea coast
URL	https://www.bsh.de/DE/DATEN/Vorhersagen/Wasserstand_Ostsee/wasserstand_ostsee_node.html
Access keys, token	unknown

2.3.26 Local weather data for Kiel fjord region

Data source table	
Name	Local weather data for Kiel fjord region
Description	Weather service for water sports such as kite and windsurfers or sailors from Kiel
General information	
Type	service
Data format	REST API, json for Forecast, Superforecast, Tides, Reports, Search, Nearby Spots
Data nature	dynamic
Update frequency	unkown
Data structure	unknown
Use case information	
UC reference	Sealevel use case
Purpose	Could be used in digital part of exhibition
Legal information	
Owner	Windfinder
Sharing terms	requires business subscription for API access
Restrictions	see license
Data access information	
Access portal	Weather data and forecast on local level
URL	https://de.windfinder.com/forecast/innenfoerde_kiel
Access keys, token	business account needed

2.4 Data sources in Kiel (HiddenHistory)

2.4.1 City map of Kiel

Data source table	
Name	City Map of Kiel
Description	Overview and Geodata of the city (with districts) and possibility to cluster; Update of the aerial view expected in summer 2025
General information	
Type	map viewer
Data format	screenshots / map prints?
Data nature	static
Update frequency	aerial views is updatet every two years
Data structure	unknown
Use case information	

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UC reference	Kiel Hidden History UC
Purpose	Present data source, Data can be used to provide an overview of Kiel; focus on project-related districts Innenstadt (city centre) and Wik (maritime quarter)
Legal information	
Owner	City of Kiel; Amt für Bauordnung, Vermessung und Geoinformation
Sharing terms	open but license unclear
Restrictions	unclear
Data access information	
Access portal	City of Kiel Map Portal
URL	https://ims.kiel.de/extern/kielmaps/
Access keys, token	unknown

2.4.2 City base map of Kiel

Data source table	
Name	City base map of Kiel
Description	The city base map contains information on parcels of land, buldings and street names
General information	
Type	map viewer
Data format	screenshots / map prints?
Data nature	static
Update frequency	unclear
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source, Main information about Kiel
Legal information	
Owner	City of Kiel; Amt für Bauordnung, Vermessung und Geoinformation
Sharing terms	open but license unclear
Restrictions	unclear
Data access information	
Access portal	City of Kiel Map Portal
URL	https://ims.kiel.de/extern/kielmaps/?view=STGK&
Access keys, token	unknown

2.4.3 3D-Mesh of Kiel

Data source table	
Name	3D-Mesh of Kiel
Description	The city of Kiel is working in a 3D-model (Mesh) of the city; is expected probably for summer 2025
General information	
Type	3D mesh
Data format	CityGML (TBC)
Data nature	static
Update frequency	once

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Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	
Owner	City of Kiel
Sharing terms	TBC
Restrictions	TBC
Data access information	
Access portal	Unclear
URL	unknown
Access keys, token	unknown

2.4.4 Video recordings of Kiel

Data source table	
Name	Video recordings of Kiel
Description	The city of Kiel seems to own video recordings of the city from a car travelling through the city
General information	
Type	file
Data format	unclear
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	
Owner	City of Kiel
Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	Unclear
URL	unknown
Access keys, token	unknown

2.4.5 3D building models in LoD1 and LoD2

Data source table	
Name	3D building models in LoD1 and LoD2
Description	The 3D models shows buildings and selected structure of the city centre; system of ALKIS object identification number
General information	
Type	file
Data format	SHP GML (Shape)

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Data nature	static
Update frequency	last updated: 09.05.2022
Data structure	In Level of Detail 1 (LoD1) and Level of Detail 2 (LoD2)
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	
Owner	Landesregierung Schleswig-Holstein: Landesamt für Vermessung und Geoinformation Schleswig-Holstein
Sharing terms	Test data is open, license unclear
Restrictions	unclear
Data access information	
Access portal	ALKIS (Amtliches Liegenschaftskatasterinformationssystem)
URL	https://www.schleswig-holstein.de/DE/landesregierung/ministerien-behoerden/LVERMGEOH/Downloads/DownloadTestdaten/downloadsTestdaten3d?nn=b7e3eb10-4e7a-4dd0-8caf-a8911c06430a
Access keys, token	unknown

2.4.6 3D Video building model

Data source table	
Name	3D Video building model
Description	Animated video flight over Kiel City hall and the neighbourhood;
General information	
Type	file
Data format	AVI
Data nature	static
Update frequency	last updated: 09.05.2022
Data structure	integration of following data: Digital terrain model (DTM), digital orthophotos (DOP, colour-adjusted 3D building model (LoD2)
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	
Owner	Landesregierung Schleswig-Holstein: Landesamt für Vermessung und Geoinformation Schleswig-Holstein
Sharing terms	open, license unclear
Restrictions	unclear
Data access information	
Access portal	ALKIS (Amtliches Liegenschaftskatasterinformationssystem)
URL	https://www.schleswig-holstein.de/DE/landesregierung/ministerien-behoerden/LVERMGEOH/Downloads/DownloadTestdaten/downloadsTestdaten3d?nn=b7e3eb10-4e7a-4dd0-8caf-a8911c06430a
Access keys, token	unknown

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2.4.7 Image-based digital surface model (bDOM) of Kiel

Data source table	
Name	Image-based digital surface model (bDOM) of Kiel
Description	Visualises the surface of an required section, including the objects on it, like buildings and vegetation with a mesh size of 20cm; contains moving objects
General information	
Type	mapviewer, file
Data format	TIFF PP TFW geoJson
Data nature	static
Update frequency	every few years (last update in may 2023)
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	
Owner	Landesregierung Landesamt für Vermessung Geoinformation Schleswig-Holstein
Sharing terms	open, license unclear
Restrictions	unclear
Data access information	
Access portal	Downloadclient image-based surface (bDOM)
URL	https://geodaten.schleswig-holstein.de/gaialight-sh/_apps/dl/download/dl-bdom.html
Access keys, token	unknown

2.4.8 Copernicus satellite data of Schleswig-Holstein /Kiel

Data source table	
Name	Copernicus satellite data of Schleswig-Holstein/Kiel
Description	Provides current data from Copernicus Sentinel-2; orbit the earth at an altitude of 786 kilometres
General information	
Type	service
Data format	maps tiles
Data nature	static
Update frequency	every five days
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source
Legal information	

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Owner	Landesamt für Vermessung und Geoinformation Schleswig-Holstein
Sharing terms	T&C defined by Geoservers Schleswig-Holstein (Geoserver)
Restrictions	unclear
Data access information	
Access portal	DigitalerAtlasNord: Copernicus Sentinel Data
URL	Copernicus
Access keys, token	unknown

2.4.9 Destination.One

Data source table	
Name	Destination.one
Description	CMS of events and point's of interests
General information	
Type	service
Data format	XML, JSON, GeoJSON
Data nature	dynamic
Update frequency	frequently
Data structure	https://developer.et4.de/explorer/?samples=true#http%3A%2F%2Fmeta.et4.de%2Frest.ashx%2Fsearch%2F%3Fexperience%3Dkiel-sailing-city%26licensekey%3Denter_your_licensekey%26type%3DEvent%26template%3DET2014A.xml
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Present data source, POI and events
Legal information	
Owner	Kiel-Marketing, events: external
Sharing terms	unclear
Restrictions	commercial license
Data access information	
Access portal	destination.one
URL	https://www.destination.one/
Access keys, token	unknown

2.4.10 Historical Map of Kiel 1588

Data source table	
Name	Historical Map of Kiel from around 1588
Description	Map of the city of Kiel around 1588 in aquarell oblique view; Marime quarter is not presented
General information	
Type	Print
Data format	image file, around 42 x 59,4 cm
Data nature	static
Update frequency	once

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Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. Data can be used to map the user the city in this time; must be digitalised for UC
Legal information	
Owner	City of Kiel; Amt für Bauordnung, Vermessung und Geoinformation
Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	unknown
URL	Historische Karten von Kiel
Access keys, token	unknown

2.4.11 Historical map of Kiel around 1853

Data source table	
Name	Historical map of Kiel around 1853
Description	Map of the city around 1853; it contains street names, altitude information, water depth; buildings are accurately represented on a cadastral plan; maritime quarter is not presented
General information	
Type	Print
Data format	image file, around 65 x 75 cm
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. The detailed information of the city can support the process of digitalisation the map and create a 3D model in this way
Legal information	
Owner	City of Kiel; Amt für Bauordnung, Vermessung und Geoinformation
Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	unknown
URL	Historische Karten von Kiel
Access keys, token	unknown

2.4.12 Development map of Kiel City region (1879-1979)

Data source table	
Name	Kiel 1879 - 1979: Development of the city and surroundings

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	(Title in German: Kiel 1879 - 1979: Entwicklung von Stadt und Umland im Bild der Topographischen Karte 1:25000)
Description	Map of the development of the city Kiel and its surroundings in topographical maps
General information	
Type	Print/Book
Data format	image files
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. The changes within 100 years (including the first and second world wars) can clearly show the changes
Legal information	
Owner	Jürgen Bähr Geographisches Institut der Universität Kiel
Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	unknown
URL	unknown
Access keys, token	unknown

2.4.13 Kiel City Archive

Data source table	
Name	Stadtarchiv Kiel
Description	Digital platform for an information database to show various sources from the historical period
General information	
Type	images with description
Data format	PDF
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. The large variety of data can be used to present the history part of Kiel; how did the city look like
Legal information	
Owner	City of Kiel
Sharing terms	open; License: CC BY-3.0 SA DE
Restrictions	unclear
Data access information	
Access portal	unknown
URL	https://fotoarchiv-stadtarchiv.kiel.de/
Access keys, token	unknown

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2.4.14 Archiv.SH

Data source table	
Name	Archiv.SH
Description	Historical Collection of buildings, constructions in Kiel on a map
General information	
Type	mapviewer, file
Data format	POI data
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. The map and the pictured provides an overview for the user; supports the development of the application
Legal information	
Owner	Archiv.sh (Dennis Rindermann)
Sharing terms	open, licence unclear
Restrictions	unclear
Data access information	
Access portal	Archiv.sh
URL	https://archiv.sh/karte?search_order=idlisting%20DESC&search_view=grid&offset=0&search_what=Kiel&map_num_listings=10000
Access keys, token	unknown

2.4.15 Archivportal-D

Data source table	
Name	Archivportal-D (part of Deutsche Digitale Bibliothek)
Description	Digital archival material an information on archives from all over Germany
General information	
Type	data catalogue
Data format	pointers to diverse archives
Data nature	static
Update frequency	once
Data structure	unknown
Use case information	
UC reference	Kiel Hidden History UC
Purpose	Past data source. Large selection of different data
Legal information	
Owner	Deutsche Digitale Bibliothek, Landesarchiv Baden-Württemberg
Sharing terms	open data license,CC BY-4.0 if not stated otherwise
Restrictions	see license terms
Data access information	

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Access portal	ARCHIVEPORTAL-D
URL	Startseite - Archivportal-D
Access keys, token	unknown

2.5 Data sources in Kiel (Other)

2.5.1 Kiel Ferry position

Data source table	
Name	Kiel Ferry position
Description	Position of Ferries operating in Kiel harbour derived from an filtered AIS (automatic identification signal) system sent by boats. See more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/ais
General information	
Type	data stream (NGSI-LD)
Data format	smart data model: type "Vehicle"
Data nature	dynamic
Update frequency	every 10-30 sec
Data structure	https://github.com/smart-data-models/dataModel.ERA/tree/master/Vehicle
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	KielRegion
Sharing terms	unclear
Restrictions	AIS data API commercially sensitive
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.2 Vistor numbers Kiellinie

Data source table	
Name	Vistor numbers Kiellinie
Description	Number of visitors on Kiel's main promenade Kiel Linie, derived from a radar based people and bike counter sensor. See more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/besucherz%C3%A4hlung_kiellinie
General information	
Type	data stream (NGSI-LD)
Data format	smart data model: "CrowdFlowObserved" smart data model: "TrafficFlowObserved"

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Data nature	dynamic
Update frequency	can be defined based on use case
Data structure	https://github.com/smart-data-models/dataModel.Transportation/tree/master/TrafficFlowObserved , https://github.com/smart-data-models/dataModel.Transportation/tree/master/TrafficFlowObserved
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	KielRegion
Sharing terms	CC-BY-4.0
Restrictions	at the moment offline
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.3 Traffic counters

Data source table	
Name	Traffic counters
Description	Traffic loop counters across 87 road segments in Kiel See more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/dauerz%C3%A4hlstellen
General information	
Type	data stream (NGSI-LD)
Data format	smart data model: "TrafficDataShortTermInterval" smart data model: "TrafficDataLongTermInterval"
Data nature	dynamic
Update frequency	short term: every 1 min long term: every 1hr
Data structure	https://addix.io/modelle/addix-smart-cities/Traffic/TrafficDataShortTermInterval.html https://addix.io/modelle/addix-smart-cities/Traffic/TrafficDataLongTermInterval.html
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion
Sharing terms	CC-BY-4.0
Restrictions	no restrictions
Data access information	

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Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.4 Traffic height measurements

Data source table	
Name	Traffic height measurements
Description	Height sensor deployed at the old railway bridge Alte Lübecker Chaussee issues an alarm if vehicle height exceed 3.6m and actuates a traffic light see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/h%C3%B6henkontrolle
General information	
Type	data stream (NGSI-LD)
Data format	smartDataModel: "Binary switch"
Data nature	dynamic
Update frequency	event based
Data structure	https://github.com/smart-data-models/dataModel.OCF/tree/master/BinarySwitch
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion
Sharing terms	unclear (possibly CC-BY-4.0)
Restrictions	unclear
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.5 EV charge point locations and availability

Data source table	
Name	EV charge point locations and availability
Description	Location and availability data of EV chargepoints across Kiel region see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/lades%C3%A4ulen
General information	
Type	data stream (NGSI-LD)
Data format	smartdataModel: "EVChargingStation"

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This document translates some of the obligations from the grant agreement and in case of discrepancies, it is the grant agreement which prevails over this deliverable.

Data nature	dynamic
Update frequency	event based (change of status)
Data structure	https://github.com/smart-data-models/dataModel.Transportation/tree/master/EVChargingStation https://addix.io/modelle/addix-smart-cities/Transportation/EVChargingPoint.html
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	KielRegion
Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.6 Parking availability data

Data source table	
Name	Parking availability data
Description	<p>On and off street parking availability in Kiel, integrated from diverse supplier systems and parking locations. Includes parking lots for cars and bikes.</p> <p>see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/parken </p>
General information	
Type	data stream (NGSI-LD)
Data format	smartdataModel: "OffStreetParking" smartdataModel: "OnStreetParking"
Data nature	dynamic (live) and historic data
Update frequency	event based (change of status)
Data structure	https://github.com/smart-data-models/dataModel.Parking/tree/master/OffStreetParking https://github.com/smart-data-models/dataModel.Parking/tree/master/OnStreetParking
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	Kiel region
Sharing terms	unclear
Restrictions	unclear
Data access information	

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Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.7 Water level sensor for fire ponds and storm water catchment

Data source table	
Name	Water level sensor for fire ponds and storm water catchment
Description	Water level in water reservoirs across Kiel area, used to generate alarms for drought or flooding see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/pegelstandssensoren
General information	
Type	data stream (NGSI-LD)
Data format	smartDataModel: "FloodMonitoring"
Data nature	dynamic
Update frequency	event based (change of status)
Data structure	https://github.com/smart-data-models/dataModel.Environment/tree/master/FloodMonitoring
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion
Sharing terms	unclear (possibly CC-BY-4.0)
Restrictions	possibly sensitive
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.8 Bicycle traffic

Data source table	
Name	Bicycle traffic
Description	Bicycle traffic across Kiel across 16 different measurement locations see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/radverkehrs%C3%A4hlung
General information	
Type	data stream (NGSI-LD)
Data format	smart data model: "TrafficFlowObserved"
Data nature	dynamic
Update frequency	once a day

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Data structure	https://github.com/smart-data-models/dataModel.Transportation/tree/master/TrafficFlowObserved
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion
Sharing terms	CC-BY-4.0
Restrictions	no restrictions
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.9 Environmental data

Data source table	
Name	Environmental data
Description	Temperature, humidity and air quality (particles), radio-activity, noise, weather - integrated from different systems, see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/umweltdaten
General information	
Type	data stream (NGSI-LD)
Data format	smartDataModel: "AirQualityObserved" smartDataModel: "WeatherObserved" smartDataModel: "WaterQualityObserved" smartDataModel: "NoiseLevelObserved" smartDataModel: "RadiationObserved"
Data nature	dynamic
Update frequency	unclear
Data structure	https://github.com/smart-data-models/dataModel.Environment/tree/master/AirQualityObserved https://github.com/smart-data-models/dataModel.Weather/tree/master/WeatherObserved https://github.com/smart-data-models/dataModel.WaterQuality/tree/master/WaterQualityObserved https://github.com/smart-data-models/dataModel.Environment/tree/master/NoiseLevelObserved https://github.com/MLA-der-KielRegion/use-cases/blob/main/umweltdaten/datamodels/RadiationObserved_schema.json
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion

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Sharing terms	unclear
Restrictions	unclear
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.10 Traffic flow control system status

Data source table	
Name	Traffic flow control system status
Description	Traffic flow control system on Theodor-Heuss-Ring (B76) measures traffic density and triggers a flow control system. The status of this is available see more: https://github.com/MLA-der-KielRegion/use-cases/tree/main/zuflussregelanlage
General information	
Type	data stream (NGSI-LD)
Data format	smartDataModel: "Binary switch"
Data nature	dynamic
Update frequency	event based
Data structure	https://github.com/smart-data-models/dataModel.OCF/tree/master/BinarySwitch
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	LH Kiel / KielRegion
Sharing terms	unclear (possibly CC-BY-4.0)
Restrictions	unclear
Data access information	
Access portal	Mobility Live Access (MLA) Kiel Region. See: https://github.com/MLA-der-KielRegion)
URL	Scorpio Broker address and topic url
Access keys, token	API keys/credentials for broker access

2.5.11 City of Kiel Map WFS Service

Data source table	
Name	City of Kiel Map WFS Service
Description	This service is based on the city map WMS service, but exposes data as WFS geo-service. All layers are available under wfs:FeatureTypeList>wfs:FeatureType. The wfs:Name is used for specific filtering (e.g. query param "typeName=lhkiel:Adressen_Kiel"). ows:Parameter is listing all available output formats (e.g. GeoJSON, GML,

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	CSV). The license text is available under ows:AccessConstraints In the following examples layers are listed which may be relevant for uses cases. Please suit yourself to look for more relevant data in the WFS service (around
General information	
Type	WFS service
Data format	XML
Data nature	static
Update frequency	unclear
Data structure	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetCapabilities&service=WFS
Use case information	
UC reference	TBC
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	unknown
URL	unknown
Access keys, token	unknown

2.5.12 Addresses City of Kiel

Data source table	
Name	Addresses City of Kiel
Description	Geo-referenced locations of streets, based on house numbers, in the city of Kiel
General information	
Type	WFS service
Data format	geojson
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Adressen_Kiel
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	

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Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Adressen_Kiel&outputFormat=geojson
Access keys, token	none

2.5.13 Locations of Fire Stations

Data source table	
Name	Locations of Fire Stations City of Kiel
Description	Geo-referenced locations of fire stations in the city of Kiel (professional & volunteer fire brigades)
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&typeName=lhkiel:Feuerwehr
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Feuerwehr&outputformat=geojson
Access keys, token	none

2.5.14 Locations of Police Stations

Data source table	
Name	Locations of Police Stations City of Kiel
Description	Geo-referenced locations of police stations in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear

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Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Polizeidienststellen
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Polizeidienststellen&outputformat=geojson
Access keys, token	none

2.5.15 Police district boundaries

Data source table	
Name	Police districts City of Kiel
Description	Geo-referenced locations of police districts in the city of Kiel
General information	
Type	WFS service
Data format	none
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Polizeirevierbereiche
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Polizeirevierbereiche&outputformat=geojson
Access keys, token	none

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2.5.16 Tourist information

Data source table	
Name	Tourist information
Description	Geo-referenced locations of tourist informations in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Touristinformation
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Touristinformation&outputformat=geojson
Access keys, token	none

2.5.17 Speed limit zones (30km/h)

Data source table	
Name	Speed limiting zones 30km/h city of Kiel
Description	Geo-referenced locations of speed limiting zones for 30 km/h the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Tempo30-Zonen
Use case information	

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UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Tempo30-Zonen&outputformat=geojson
Access keys, token	none

2.5.18 Road network

Data source table	
Name	Road network city of Kiel
Description	Geo-referenced road network of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Strassennetz
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Strassennetz&outputformat=geojson
Access keys, token	none

2.5.19 All road constructions as points

Data source table	
Name	All road constructions as points city of Kiel

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Description	Geo-referenced road constructions as points of the city of Kiel		
General information			
Type	WFS service		
Data format	GeoJSON		
Data nature	static		
Update frequency	unclear		
Data structure	no	semantic	description available;
	syntactic descriptions (XSD):		
	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen		
Use case information			
UC reference	disaster management?		
Purpose	TBC		
Legal information			
Owner	City of Kiel		
Sharing terms	CC-BY-4.0		
Restrictions	none		
Data access information			
Access portal	City of Kiel Map WFS Service		
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen&outputFormat=GEOJSON		
Access keys, token	none		

2.5.20 Current road constructions which are available as lines

Data source table			
Name	Current road constructions which are available as lines city of Kiel		
Description	Geo-referenced current road constructions which are available as lines of the city of Kiel		
General information			
Type	WFS service		
Data format	GeoJSON		
Data nature	static		
Update frequency	unclear		
Data structure	no	semantic	description available;
	syntactic descriptions (XSD):		
	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=Baustellen L - Aktuell		
Use case information			
UC reference	disaster management?		
Purpose	TBC		
Legal information			
Owner	City of Kiel		
Sharing terms	CC-BY-4.0		

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Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen_L - Aktuell&outputFormat=GEOJSON
Access keys, token	none

2.5.21 Current road constructions which are available as polygons

Data source table	
Name	Current road constructions which are available as polygons city of Kiel
Description	Geo-referenced current road constructions as polygons of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&typeName=lhkiel:Baustellen_F - Aktuell
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.1
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen_F - Aktuell&outputformat=geojson
Access keys, token	none

2.5.22 Current road constructions which are available as points

Data source table	
Name	Current road constructions which are available as points city of Kiel
Description	Geo-referenced current road constructions as polygons of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static

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Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen_P_-_Aktuell
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.2
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=Baustellen_P_-_Aktuell&outputformat=geojson
Access keys, token	none

2.5.23 Future road constructions which are available as lines

Data source table	
Name	Future road constructions which are available as lines city of Kiel
Description	Geo-referenced future road constructions as lines of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen_L_-_Zukunft
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.3
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen_L_-_Zukunft&outputformat=geojson

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Access keys, token	none
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2.5.24 Future road constructions which are available as polygons

Data source table	
Name	Future road constructions which are available as polygons city of Kiel
Description	Geo-referenced future road constructions as polygons of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen_F_-_Zukunft
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.4
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen_F_-_Zukunft&outputformat=geojson
Access keys, token	None

2.5.25 Future road constructions which are available as points

Data source table	
Name	Future road constructions which are available as points city of Kiel
Description	Geo-referenced future road constructions as points of the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen_P_-_Zukunft

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Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.5
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Baustellen_P_-_Zukunft&outputformat=geojson
Access keys, token	none

2.5.26 POI: Breastfeed friendly locations

Data source table	
Name	Breastfeed friendly locations City of Kiel
Description	Geo-referenced of breastfeed friendly locations in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&typeName=lhkiel:Stillfreundliche_Orte
Use case information	
UC reference	tourism?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Stillfreundliche_Orte&outputformat=geojson
Access keys, token	none

2.5.27 POI: Pharmacies

Data source table	
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		Version:	1.0
		Status:	Draft

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Name	Pharmacies in the City of Kiel
Description	Geo-referenced location of pharmacies in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Apotheken
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Apotheken&outputformat=geojson
Access keys, token	none

2.5.28 POI: Clinics

Data source table	
Name	Clinics in the City of Kiel
Description	Geo-referenced locations of clinics in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Kliniken
Use case information	
UC reference	disaster management?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0

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Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Kliniken&outputformat=geojson
Access keys, token	none

2.5.29 POI: Cinemas

Data source table	
Name	Cinemas in the city of Kiel
Description	Geo-referenced locations of cinemas in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&typeName=lhkiel:Kinos
Use case information	
UC reference	tourism?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Kinos&outputformat=geojson
Access keys, token	none

2.5.30 POI: Museums and galleries

Data source table	
Name	Museums and galleries in the city of Kiel
Description	Geo-referenced locations of museums and galleries in the city of Kiel
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static

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Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Baustellen_P_-_Zukunft
Use case information	
UC reference	tourism?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Museen_und_Galerien&outputformat=geojson
Access keys, token	none

2.5.31 POI: Stolperstein

Data source table	
Name	Stolperstein in the city of Kiel
Description	Geo-referenced locations of "Stolperstein" in the city of Kiel, incl. links to PDF, images and more. Stolperstein are small memorials in the sidewalks, remembering the program against Jews, Romani and political prosecuted people during WW2 in Germany.
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Stolpersteine
Use case information	
UC reference	tourism?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service

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URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Stolpersteine&outputformat=geojson
Access keys, token	none

2.5.32 Park walking tracks

Data source table	
Name	Stadtgartenwanderweg
Description	Geo-referenced locations of "Stadtgartenwanderweg" in the city of Kiel. A 44,5 km long trail around the Kieler Förde
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear
Data structure	no semantic description available; syntactic descriptions (XSD): https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&typeName=lhkiel:Stadtgartenwanderweg
Use case information	
UC reference	tourism?
Purpose	TBC
Legal information	
Owner	City of Kiel
Sharing terms	CC-BY-4.0
Restrictions	none
Data access information	
Access portal	City of Kiel Map WFS Service
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Stadtgartenwanderweg&outputformat=geojson
Access keys, token	none

2.5.33 POI: Public toilets

Data source table	
Name	Public toilets
Description	Geo-referenced locations of public restrooms in the city of Kiel, incl. information about diaper changing table and accessibility
General information	
Type	WFS service
Data format	GeoJSON
Data nature	static
Update frequency	unclear

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Data structure	no	semantic	description	available;
	syntactic		descriptions	(XSD):
	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?SERVICE=WFS&REQUEST=DescribeFeatureType&TypeName=lhkiel:Toiletten			
Use case information				
UC reference	tourism?			
Purpose	TBC			
Legal information				
Owner	City of Kiel			
Sharing terms	CC-BY-4.0			
Restrictions	none			
Data access information				
Access portal	City of Kiel Map WFS Service			
URL	https://ims.kiel.de/geodatenextern/services/Stadtplan/LHKielWmsWfs/MapServer/WFSServer?request=GetFeature&service=WFS&srsName=EPSG:4326&typeName=lhkiel:Toiletten&outputformat=geojson			
Access keys, token	none			

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3 Data source integration requirements

The previous section has provided a comprehensive catalogue of data sources that can be used for the realization of the different CityVerse use cases across Kiel and Cartagena. The nature of the data varies widely- data may be static or dynamic, it may be accessed via file downloads or APIs from a range of different systems. Furthermore, the terms and conditions and licenses of the different data sources are heterogeneous and need to be assessed in detail before an integration is possible.

In this section we derive requirements for how the diverse data sources can be integrated in interoperable and unified ways into a common SENSE data space, from where they can be consumed effectively by the CityVerse application stack. We do so by looking at common patterns across all data sources and the systems they provide.

Our overall approach is to analyse common patterns across the different data sources and group them according to different integration needs. Wherever possible, we aim to use data standards and APIs that are more widely used across cities and the web at large.

Our initial priority is to make data sources accessible in the SENSE data space in formats that are natively supported by CityVerse application environment developed by our partner NUR. In cases where they are not supported (e.g. for real time data) we align with a few standard-based data models and APIs to which native integrations can developed.

Specifically, we aim to align with the recommendations provided by Open and Agile Smart Cities in the form of minimum interoperability mechanisms (MIMs). This will ensure that the CityVerse applications developed in the SENSE project will become more portable across cities and can be scaled to different city environments.

Furthermore, metadata, describing the data sources, needs to be generated and made available through a Gaia-X dataspace catalogue, following best practices for interoperability, i.e. following the Gaia-X Trust Framework and its ontology.

3.1 Data source clustering

Our initial analysis of data sources from section 2, provides a clustering of the different data sources based on common properties. Data sources in a specific cluster can be all treated in the same way when it comes to their integration.

The first level of clustering differentiates between the nature of data of the underlying data source:

1. Static: file-based data sources that do not change over time. These can be downloaded from web-based repositories or file servers for the use within CityVerse applications.
2. Dynamic: data sources that change over time and are accessed via APIs resulting in time-series data that require continuous updates of features within CityVerse applications

Static data sources can be further subdivided into the following file types and formats”

- Vector map files
 - Shape files (e.g. shp)
 - SVG
- Structured data
 - CSV, JSON, TXT, XLS, GeoJSON, XML
- Media files

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- Images (JPG, TIFF, etc.)
- Video (AVI, mp4, etc.)
- Documents
 - Markdown, Text (e.g. pdf, md, txt, html)

Dynamic data sources/data services can be clustered according to the nature of their API and the underlying data models returned by them. The following types have been identified:

- Data services based on OGC standards used for providing maps, map tiles and underlying data linked to them. These can be further split into:
 - WMS (Web Map Service) - returns a map image (1000x1000)
 - WMTS(Web Mapping Tiled Service) – returns smaller map tiles (eg. 256 or 512)
 - WFS(Web Feature Service) – returns geographic data in GML or JSON format
- Data services based on the NGSI-LD standard are used for accessing real-time data/time series data. They typically return data formatted according to Smart Data Models.
- Data services with custom REST-APIs. Although web-based, the API calls and the data formats returned are proprietary and do not follow specific guidance by established standards.

3.2 Proposed data source integration approach

Figure 1 shows the overall integration approach for the different identified data source clusters. The top part of the figure depicts the approach taken for all static data sources.

In order to simplify access to such files, which are currently held in many systems under different ownership, we will provide a common file server, in addition to the decentralised storage locations where various datasets reside today, from which the data is made accessible. This will require data sources to be initially uploaded, and their integrity validated. We will then generate consistent metadata that describes these data sources before publishing them into the SENSE data space.

Having them on a common file server will increase their availability, as no access to potentially unreliable third-party systems is needed. However, this approach will introduce redundancy and additional maintenance workload to keep information up to date. In cases where the file formats cannot be directly used by the CityVerse application server of NUR, potential data converters can be applied either prior to upload or upon download and further use in the applications. The exact approach will be determined at later stages, when applications will be developed.

Data sources that provide dynamic data are currently divided into 3 categories:

- Data sources accessible via OGC-compliant data services are aligned with OASC MIM7.
- Data sources accessible via NGSI-LD compliant data services are aligned with OASC MIM1 and MIM2
- All remaining data sources are exposed via proprietary APIs.

Our integration approach is to enable direct exposure of OASC MIMs compliant data sources (first two categories) via the APIs provided by their hosting systems. In the case of proprietary APIs, which represent only few examples, we will provide suitable adapters towards NGSI-LD/Smart data models to make them MIM1/2 compliant. This will ensure that the CityVerse application server will only have

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to implement integrations to a limited number of OASC MIMs compliant APIs. At the same time, we will generate suitable meta-data for the exposed dynamic data sources, so they can be registered and become discoverable in the SENSE data space.

We envision that appropriate metadata can be automatically generated from the data source descriptions captured in the tables of section 2. Suitable data space connectors will be identified to connect the data sources alongside suitable metadata into the data space. From the very beginning on the Pontus-X data space, based on Gaia-X, will be available. This also includes the provision of adequate terms and conditions for data source access in the form of data sharing agreement and licenses as legal basis for data sharing and further usage.

On the other end, the CityVerse application server will leverage a participant adapter to connect into the SENSE data space. Once the required data sources have been identified and access rights to these have been acquired, data access can also occur directly with the end points providing the data through side channel interactions outside the data space.

The CityVerse application server may need in some cases to implement specific adapters to map data from a few standards based APIs into its own internal data model based on VRML. As we limit the number of APIs only to OASC MIM-compliant ones, the integration effort on the application service will be limited. In future, these integrations can be reused for other MIMs-compliant data sources.

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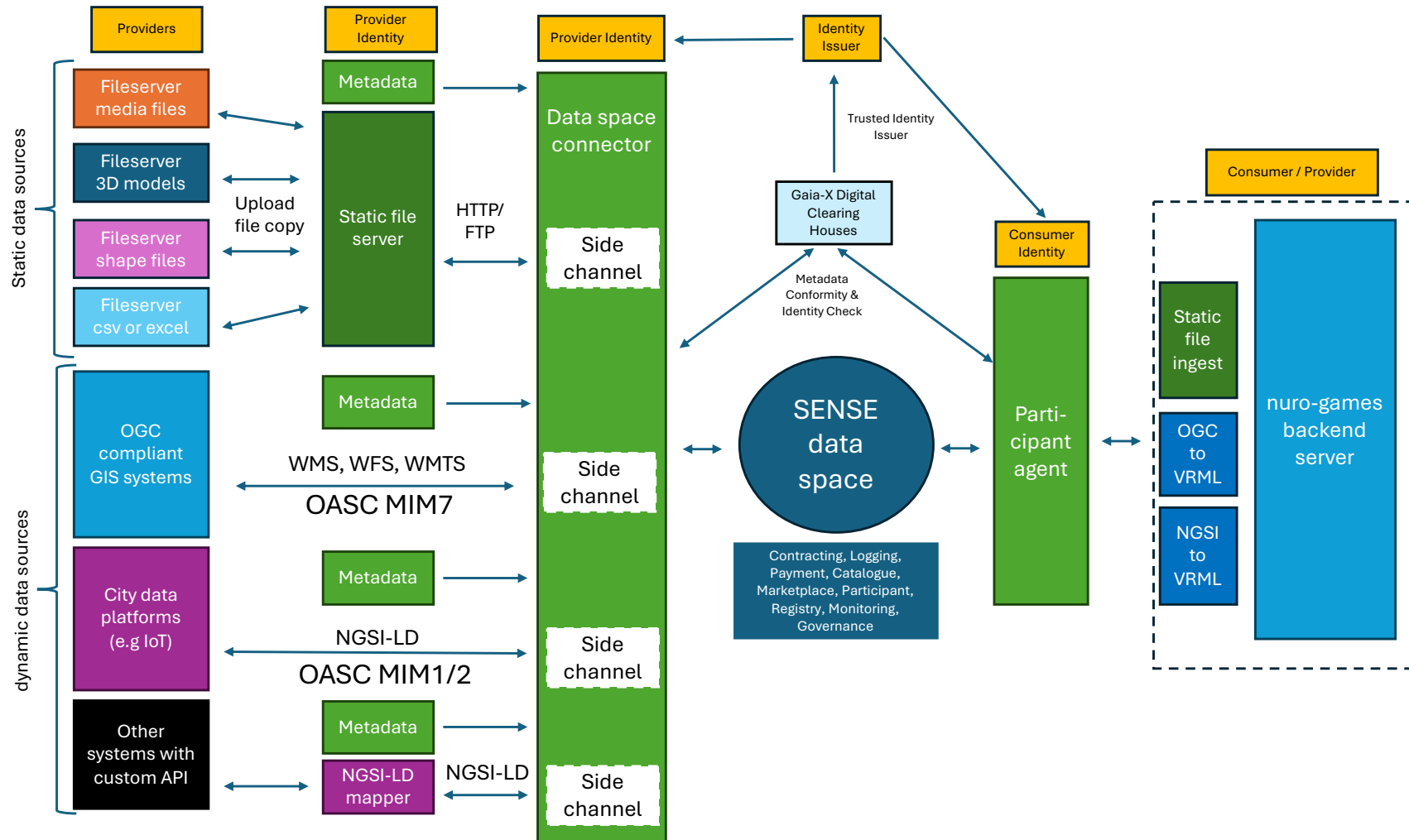


Figure 1: Data source integration architecture.

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			Draft

4 Conclusions

The deliverable concludes the initial work in T2.2 to establish interoperable data foundations for the SENSE project. It provides a comprehensive survey of data sources available in Kiel and Cartagena for the development of the envisioned CityVerse use cases in these. For each data source relevant meta-data was collected to enable later a better reuse in the SENSE data space by data users. Overall 90 data sources were considered, making this document the most comprehensive data source register in both cities so far.

An analysis of the data sources identified integration requirements to ensure the data sources are compatible with emerging standards as recommended by OASC MIMs. This especially applies to map-based data services that are OGC Compliant (MIM7) and real time data services that follow the NGSI-LD format (MIM1 and MIM2). Where proprietary APIs are used to expose data services a further adaptation to NGSI-LD will be performed. This will allow access to data sources in the data space in an interoperable way using only few well-known standards-based protocols.

The data source register and integration requirements provide a robust data foundation for further project activities related to the development and refinement of the CityVerse use cases in WP4 as well the creation of the SENSE data space as part of T2.3. While the identified data sources serve as a starting point, it is expected that some of the data sources may not end up being relevant for the use case implementations, while other sources may be procured/added as the work on use cases progresses. Further work on the data space creation in T2.3 will focus on the setup of a GAIA-X compliant data space infrastructure through which all relevant data sources will become accessible.

An important part of this work is the generation of suitable metadata for each data source and terms of conditions for data sharing.

Where necessary, suitable data adapters will be developed to ensure standards-compliant data consumption by CityVerse applications.

The SENSE data space will also be augmented with data sources from other European data spaces that are found beneficial for the CityVerse applications.

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