🏆 reviewed paper

Utilisation of Urban Data in a Municipal Data Platform – A Field Report From the German MPSC Süd-West-Cluster

Martin Memmel, Rainer Kadel, Heinz Kirchmann

(Dr. Martin Memmel, Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI) GmbH, Trippstadter Straße 122, 67663 Kaiserslautern, DE, martin.memmel@dfki.de)
(Rainer Kadel, Stadtverwaltung Kaiserslautern, Willy-Brandt-Platz 1, 67657 Kaiserslautern, DE, rainer.kadel@kaiserslautern.de)
(Heinz Kirchmann, Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI) GmbH, Trippstadter Straße 122, 67663 Kaiserslautern, DE, heinz.kirchmann@dfki.de)

DOI: 10.48494/REALCORP2026.0109

1 ABSTRACT

Urban data are a key resource for evidence-based decision-making in municipalities, but are often underutilized due to organizational and technical barriers. This paper reports on the German MPSC Südwest-Cluster, where several municipalities jointly develop an open municipal data platform within a comprehensive Urban Data Management approach. The paper outlines challenges in municipal data handling, describes the project context, platform architecture, and development phases, and presents initial results in the form of data-driven use cases and interactive dashboards. The findings indicate that an open, cooperative platform approach can improve data accessibility and reuse while strengthening municipal data sovereignty and reducing vendor lock-in.

Keywords: Smart City, Data Platform, Urban Data Managament, Data Governance, Digital Twin

2 INTRODUCTION

Urban data constitute a foundational resource for understanding the status quo of urban systems, monitoring structural developments, and supporting evidence-based decision-making (Batty 2013, Mayer & Memmel 2026, Memmel et al. 2017). Municipal administrations typically hold a vast range of datasets originating from diverse departments and legacy systems. However, the potential of these data assets is rarely exploited in practice. The underlying causes are manifold: the existence and location of datasets are often unknown; responsibilities for data ownership and maintenance remain unclear; access procedures are inconsistent or undocumented; and technological fragmentation hinders systematic integration (Priestley et al. 2023). As a result, even data-rich cities struggle to deploy advanced analytical tools or digital services that rely on timely, harmonized, and trustworthy data (Weil et al. 2023).

Addressing these issues requires an integrated approach that simultaneously tackles organizational, strategic, and technical dimensions of municipal data governance. Such an Urban Data Management aims to establish transparency regarding available datasets, define coherent governance structures, clarify stewardship roles, and introduce processes for controlled data usage. Yet, organizational measures alone are insufficient. To operationalize urban data governance at scale, municipalities require adequate technological infrastructures – most notably, a municipal data platform capable of supporting data discovery, ingestion, harmonization, metadata management, quality assurance, and secure provisioning.

The growing relevance of urban data infrastructures must be understood within the broader paradigm of data-driven urbanism and smart city development. International research has emphasised how large-scale data collection, real-time analytics and digital infrastructures are reshaping urban governance and planning practices (Kitchin 2014; Batty et al. 2012). In particular, the increasing availability of fine-grained urban data has led to the emergence of urban analytics as a distinct field integrating spatial analysis, computational modelling and data science in planning contexts (Singleton et al. 2017).

Selecting and implementing a municipal data platform is a non-trivial task. The landscape of commercial solutions is often characterized by high investment and maintenance costs as well as long-term vendor dependencies, which can jeopardize municipal data sovereignty (Hess & Koch 2023). Open-source solutions offer a viable alternative by enabling transparency, adaptability, and reduced lock-in, and by providing a sound basis for inter-municipal cooperation in software development and operation. Recent findings from the MPSC accompanying research further underline that open-source software adoption in municipalities is closely linked to maintaining long-term control over digital infrastructures. The BBSR study identifies proprietary dependencies and limited transparency as recurring risks in municipal IT landscapes and

highlights open-source approaches as an effective strategy to mitigate vendor lock-in and preserve institutional autonomy (Berg et al. 2024). At the same time, it emphasizes that technological openness alone is insufficient: sustainable data sovereignty also requires complementary organizational measures, clearly defined responsibilities, and suitable operating and governance models.

The German MPSC Südwest-Cluster exemplifies how an open-source approach can be realized in practice. Within this collaborative framework, several municipalities jointly fund and coordinate the development and operation of an open-source data platform designed to meet public-sector requirements. The cluster focuses on integrating high-value administrative datasets that are harmonized and made accessible through shared platform components, enabling cross-domain analyses and supporting data-intensive urban management tasks.

The remainder of this paper is structured as follows: Section 3 introduces the concept of Urban Data Management. It first discusses the key challenges associated with municipal data handling (Section 3.1) and subsequently outlines the Urban Data Management (Section 3.2). Section 4 focuses on the MPSC Südwest-Cluster as a practical case study. It describes the funding context and overarching objectives of the collaboration (Section 4.1) and presents the development of the shared data platform, including its system architecture (Section 4.2). Section 5 reports on initial results and lessons learned from the implementation and use of the platform. Finally, Section 6 summarizes the main findings and provides an outlook on future developments and broader implications for Urban Data Management.

3 URBAN DATA MANAGEMENT

3.1 Challenges in Municipal Data Handling

Urban administrations need to rely on data to assess the status quo of the city, to justify and prioritize measures, and to monitor the effects of policies (Memmel et al. 2021). In principle, municipalities already possess a broad portfolio of datasets, ranging from geodata and statistics to administrative registers and sensor streams. In practice, however, the potential of these assets is frequently not realized. Core obstacles are (i) unknown data existence and insufficient transparency about what is available, (ii) missing or inconsistent documentation and metadata (e.g., content, quality, update cycles), (iii) unclear access procedures and responsibilities, and (iv) heterogeneous formats and low machine-readability, which prevent systematic reuse and cross-domain integration (Memmel 2015; Mayer & Memmel 2023).

These deficits are particularly critical for advanced urban applications such as citywide monitoring, simulation, or digital twins, which require consistent data pipelines, quality control, and reliable access over time. Yet, data-based governance tends to fail not primarily due to a lack of data, but due to fragmentation, limited interoperability, and organizational constraints around access and stewardship (Kitchin 2014; Zuiderwijk & Janssen 2014).

3.2 Urban Data Management

We refer to the integrated approach to develop and implement a sustainable strategy and infrastructure for data-driven processes within the administration and in collaboration with the public and external partners as Urban Data Management (UDM).

It explicitly combines organizational measures (roles, processes, competencies) with technical enablement (infrastructure, tools). Key objectives include safeguarding and improving data quality and timeliness, simplifying and accelerating data-related processes, defining standardized exchange procedures (internally and externally), embedding data protection and ethical requirements into operational routines, and providing a central point of contact for data-related questions. Importantly, UDM is not understood as a single project, but as a continuous capability that must evolve alongside changing legal frameworks and emerging technologies (including Artificial Intelligence).

This aligns with public-sector data governance perspectives that emphasize the life-cycle nature of data (creation to deletion), cross-domain coordination, and the need to reconcile value creation with privacy, intellectual property, and accountability (Schieferdecker et al. 2018; OECD 2022).

UDM can be operationalized along two tightly coupled levels: (1) Data strategy level and (2) governance and system level.

3.2.1 Data strategy and governance level

A municipal data strategy serves to clarify fundamental principles and objectives guiding the handling of data within the city administration. It functions as an internal orientation framework, primarily addressing municipal staff and providing clarity, consistency, and legal certainty in day-to-day data-related activities. At the same time, the data strategy articulates the guiding principles of data usage towards the public and external partners transparently, thereby contributing to trustworthiness and accountability in data-driven governance (IFG 2018).

To operationalize these principles, the data strategy defines a coherent set of measures aimed at achieving the stated objectives. These measures typically address multiple dimensions, including organizational action levels, clearly defined roles and responsibilities, standardized processes for data provision and use, and explicit quality criteria for data management. Measures to build the necessary skills within the administration are also an important aspect (Sautter et al. 2023). Further, the strategy establishes criteria for dealing with legal and regulatory issues, particularly regarding data protection, licensing, and ethical considerations. In this sense, the municipal data strategy constitutes a central governance instrument that translates normative goals into actionable guidance and provides a stable foundation for the technical and organizational components of UDM.

3.2.2 System level (technical infrastructure and tooling)

To translate the intent of a strategy capability, respective technical infrastructures and tools need to be provided for tasks such as dataset cataloguing, metadata management, quality mechanisms, role-based access, standardized interfaces, and reproducible integration pipelines. Reference architectures for Open Urban Platforms provide a relevant blueprint for structuring such systems and avoiding isolated "point solutions" (DIN 2017).

Within UDM, an urban data platform is the decisive enabling component because it operationalizes governance requirements in a stable infrastructure: it makes datasets discoverable (catalogue/metadata), accessible (controlled access paths), integrable (pipelines and standards), and usable (APIs and services). Without such a backbone, UDM risks remaining a set of intentions and isolated pilot activities. Conversely, a platform alone is insufficient if not embedded in data strategy and governance; the UDM concept explicitly requires both levels to be aligned.

4 THE MPSC SÜDWEST CLUSTER

The MPSC Südwest-Cluster is an inter-municipal cooperation network comprising five model municipalities from Rhineland-Palatinate (Kaiserslautern, Kusel, Mayen-Koblenz, Bitburg-Prüm, and Linz am Rhein) and St. Wendel (Saarland). The cluster was established to jointly fund and coordinate the development and operation of a shared, open-source municipal data platform. The cluster operates through regular coordination meetings, thematic workshops, and collaborative project work, thereby institutionalizing inter-municipal learning processes.

From an organizational perspective, the Südwest-Cluster can be characterized as a loosely coupled governance network that complements formal municipal responsibilities without replacing them. This structure allows municipalities to retain autonomy while benefiting from shared development efforts, particularly in technically and organizationally complex domains such as UDM.

4.1 Funding Context and Objectives

The Model Projects Smart Cities (MPSC) programme[1] from the German Federal Ministry for Housing, Urban Development and Building (BMWSB) constitutes the central national funding framework for the Südwest Cluster. Launched in 2019, the programme aims to support municipalities in developing integrated, long-term strategies for digital urban development. Rather than promoting isolated technological solutions, MPSC explicitly emphasizes strategic integration, inter-municipal cooperation, and transferability of results.

Across several funding rounds, a total of 73 municipalities, counties, and regions were selected nationwide. Funding periods typically span five to seven years and provide substantial financial resources for both strategic work and implementation-oriented projects. A core objective of the programme is to establish

[1] see https://www.smart-city-dialog.de/en/about-us/model-projects-smart-cities

sustainable digital infrastructures that remain operational beyond the funding phase and can serve as reference models for other municipalities. Within this framework, data-driven urban development and the establishment of municipal data infrastructures have emerged as cross-cutting themes, as data availability and interoperability are considered prerequisites for many smart city applications.

Kaiserslautern was funded within the MPSC programme since 2019, the project team in is made up of representatives from the city administration, the municipal digital agency KL.digital GmbH, and the German Research Center for Artificial Intelligence (DFKI) GmbH.

The central objective of the Südwest Cluster is the joint development and operation of an open municipal data platform. The platform is conceived as a foundational digital infrastructure that enables systematic access to, integration of, and analysis of municipal data across administrative boundaries. In contrast to proprietary, vendor-specific solutions, the cluster explicitly pursues an open-source approach. This decision is motivated by considerations of digital sovereignty, long-term sustainability, and interoperability (DIN 91357 2017). The platform is intended to follow modular architectural principles, allowing municipalities to adopt and extend functionalities according to local needs while relying on a shared technical core.

The municipal data platform operationalizes strategic and organizational objectives through a set of interrelated functional components. These components are not isolated technical elements, but directly reflect the core requirements identified at the governance and strategy level in UDM.

First, the platform provides functionality for secure identity and access management, enabling role-based and purpose-bound data access across administrative units and external partners. This capability is essential for translating data governance principles – such as responsibility, accountability, and compliance with data protection regulations – into enforceable technical mechanisms. By systematically managing identities, roles, and permissions, the platform supports trustworthy data sharing while maintaining legal and organizational control.

Second, the platform enables data integration and process automation across heterogeneous source systems. UDM requires that data from diverse administrative domains, formats, and update cycles can be connected and harmonized in a reproducible manner. Integration and automation functionalities support the configuration of data ingestion, transformation, and routing workflows, thereby reducing manual effort and increasing transparency and repeatability. In this way, the platform implements the UDM objective of simplifying and accelerating data-related processes while improving consistency.

Third, the platform supports analytical access and visualization through dashboard and business intelligence functionalities. These capabilities allow integrated datasets – particularly time-dependent data such as sensor streams or administrative statistics – to be explored, monitored, and interpreted by different user groups. From a UDM viewpoint, dashboards are not merely presentation tools but instruments for organizational learning, monitoring of urban indicators, and evidence-based decision-making.

Fourth, the platform provides functionality for open data provision and data cataloguing. A central catalogue supports data discovery by documenting datasets with standardized metadata, including information on content, quality, provenance, update frequency, and usage constraints. This function directly addresses one of the core challenges identified by UDM: the lack of transparency regarding existing data assets. By enabling structured publication and reuse of data, the platform supports both internal collaboration and external engagement with citizens, research, and the private sector.

Finally, the platform incorporates core data backbone functionalities for managing contextual and historical data. Context management capabilities enable the representation of the current state of urban systems, while time-series persistence supports historical analysis, trend detection, and evaluation of interventions. Geospatial front-end functionalities allow spatially referenced data to be explored and combined with other urban information. Together, these elements form the technical foundation for advanced applications such as simulations or digital twins, which are envisaged in the long-term perspective of UDM.

Taken together, these functional components demonstrate how an urban data platform translates the abstract goals of UDM – such as data quality, accessibility, interoperability, and compliance – into a coherent, reusable, and scalable technical infrastructure. The platform thus acts as the central system layer that enables UDM to move from strategic intent to operational practice.

By consolidating these capabilities within a shared platform, the cluster seeks to reduce redundant development efforts, improve data transparency within administrations, and enable cross-domain and cross-municipal analyses.

4.2 System Development

4.2.1 Project Phases

The joint development of the intermunicipal data platform within the MPSC Südwest-Cluster is structured into three consecutive project phases, each addressing distinct objectives along the path from exploration to long-term operation.

The first phase was the sandbox phase, which ran from January 2024 to June 2025 and has been completed. Its primary objective was to explore the functional and technical possibilities of an urban data platform in a protected experimental environment. During this phase, initial platform components were tested, data integration scenarios were explored, and early visualizations were created. Based on these practical experiments, concrete requirements and development needs were derived in close cooperation with the participating municipalities. The sandbox phase thus served as a foundation for consolidating technical, organizational, and functional requirements and directly informed the subsequent public procurement process for the platform's further development.

The second phase is the development phase, which started in August 2025 and will run until December 2027. This phase is currently ongoing. Its main objective is the establishment and operation of a shared intermunicipal urban data platform, including its continuous technical enhancement and the implementation of both joint and municipality-specific use cases. During this phase, the platform is incrementally expanded, productive data integrations are realized, and concrete administrative and public-facing applications are developed and refined in close coordination with municipal stakeholders.

The third phase is the continuity and productive operation phase, planned to begin after 2027 and currently in preparation. Its goal is the long-term, cooperative operation of the intermunicipal data platform beyond the funding period. This phase focuses on organizational and financial consolidation, the establishment of sustainable governance and operating models, and the continued joint use and evolution of the platform as a permanent digital infrastructure for the participating municipalities.

At the time of writing, the platform is under active development, with initial modules being deployed and tested using real administrative datasets. A staged rollout and pilot operation are planned, allowing participating municipalities to gradually integrate additional data sources and use cases. The Südwest-Cluster thus represents an ongoing field experiment in inter-municipal data platform development, providing empirical insights into both the potentials and challenges of cooperative urban data infrastructures.

4.2.2 Architecture and Components

The technical foundation of the intermunicipal data platform is the Urban Data Space Platform (UDSP) developed by the German GovTech company Hypertegrity AG[2]. The UDSP is an open, modular data platform for the secure integration, processing, and provision of urban data. It is based on modern open-source technologies and is fully compliant with DIN SPEC 91357 (DIN 91357 2017). It uses a cloud-agnostic, containerized infrastructure based on Kubernetes and is architecturally based on the FIWARE framework to ensure interoperability and digital sovereignty. Key components of the platform include an ETL system for standardized data integration (e.g., via NGSI/Node-RED), specialized databases for time series and geodata, API management for controlled data provision, and visualization tools such as Grafana, Apache Superset, and the master portal for evaluating and displaying urban data. An open data portal and open APIs enable data to be efficiently made available to citizens, public authorities, and external service providers, while robust rights management and security features support the reliable operation and scalability of the overall architecture. Fig. 1 provides detailed information about the system architecture.

The UDSP is licensed under the EUPL 1.2 open source licence, and the source code is fully accessible to the public.[3]

[2] see https://www.hypertegrity.de
[3] see https://gitlab.com/urban-dataspace-platform/core-platform

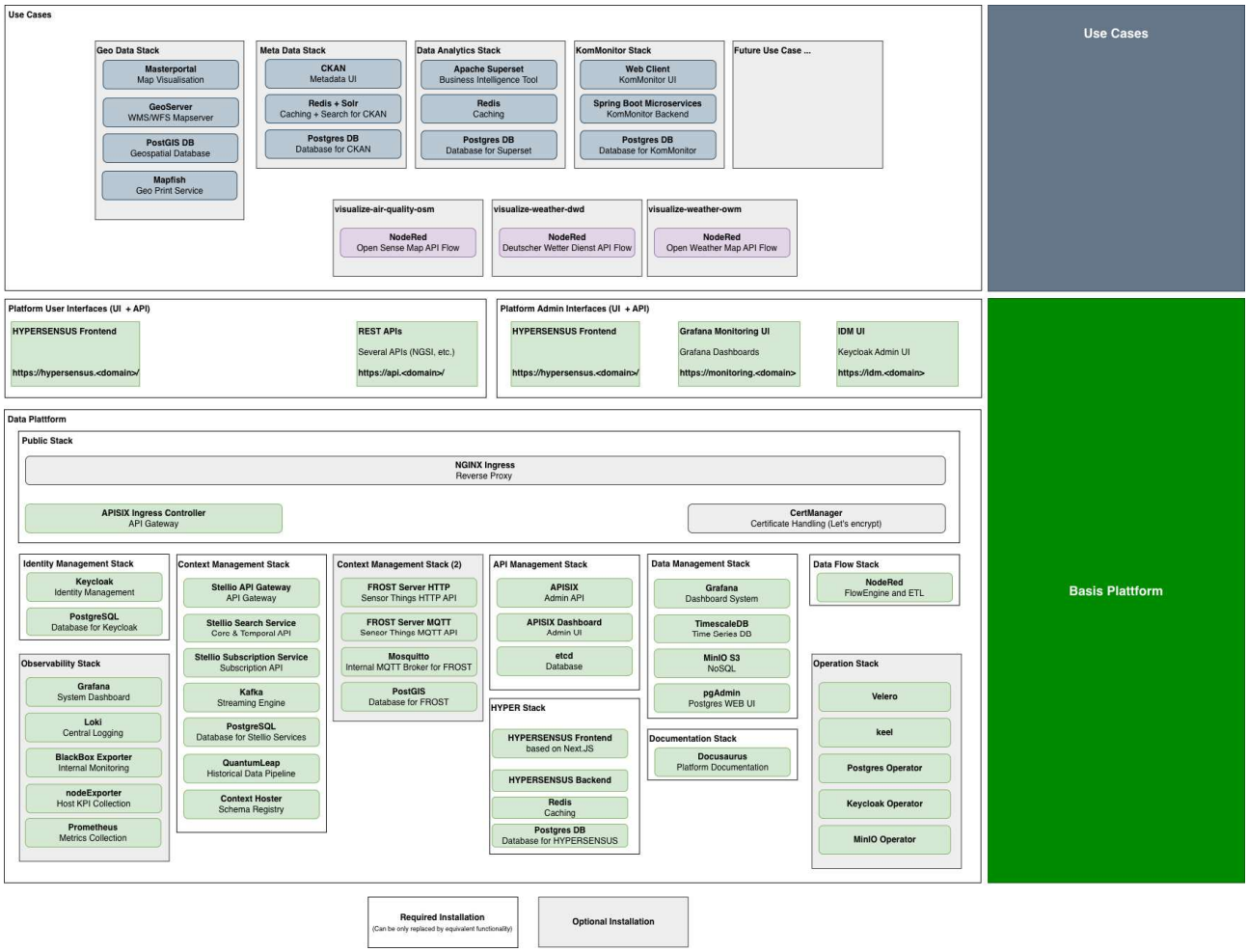

Fig. 1: The UDSP system architecture (Urban Data Space Platform 2026)

5 INITIAL RESULTS

In Kaiserslautern, MPSC project members have worked closely with municipal stakeholders to define concrete data-driven use cases that can support internal administration. For each use case, relevant datasets were identified in workshops with city departments, and interactive dashboards are being developed using the platform's dashboard component (based on Apache Superset). The dashboards integrate the harmonized data (as described in Section 4.2) and allow officials and other stakeholders to explore, compare, and filter the information on demand.

These use cases have been organized into thematic areas covering a wide range of city functions. Table 1 provides an overview of the topics and the data sets currently used in visualizations.

thematic area	**used data sets**
population data	- GDPR-compliant derivatives from registration data (German "Melderegisterdaten")
work & social affairs	- unemployment figures - benefit units (German "Bedarfsgemeinschaften") - commercially provided socio-economic micro-area indicators (MICROM)
mobility	- vehicle registration records (German 'KFZ-Zulassungen') - parking garage occupancy
election results	- results from 2024 city council elections
tourism	- visitor counts - number of brochures sent (with recipient zip codes)

Table 1: An overview of thematic areas and data sets used so far

Dashboards in Apache Superset are composed of individual charts, each representing a specific indicator, distribution, or relationship derived from the underlying datasets. These charts can take different forms, such

as time series, bar charts, tables, or map-based visualizations, depending on the analytical purpose. Multiple charts are combined within a dashboard view, allowing users to explore several aspects of a topic in a single, coherent interface. To improve usability and thematic structuring, dashboards can be organized into tabs, which group related charts and enable a clear separation of analytical perspectives (e.g., temporal trends, spatial patterns, or comparative indicators). Interactive elements such as filters and selections allow users to dynamically adjust the displayed information, for example by time period, spatial unit, or data category. In this way, dashboards support both exploratory analysis and routine monitoring, while remaining adaptable to different user needs and evolving analytical requirements.

Figures 2–4 provide examples of current dashboards that are currently being developed. These initial visualizations demonstrate how the platform helps translate raw municipal data into useful knowledge for decision-makers and the public, consistent with earlier findings on efficiency gains in the cluster.

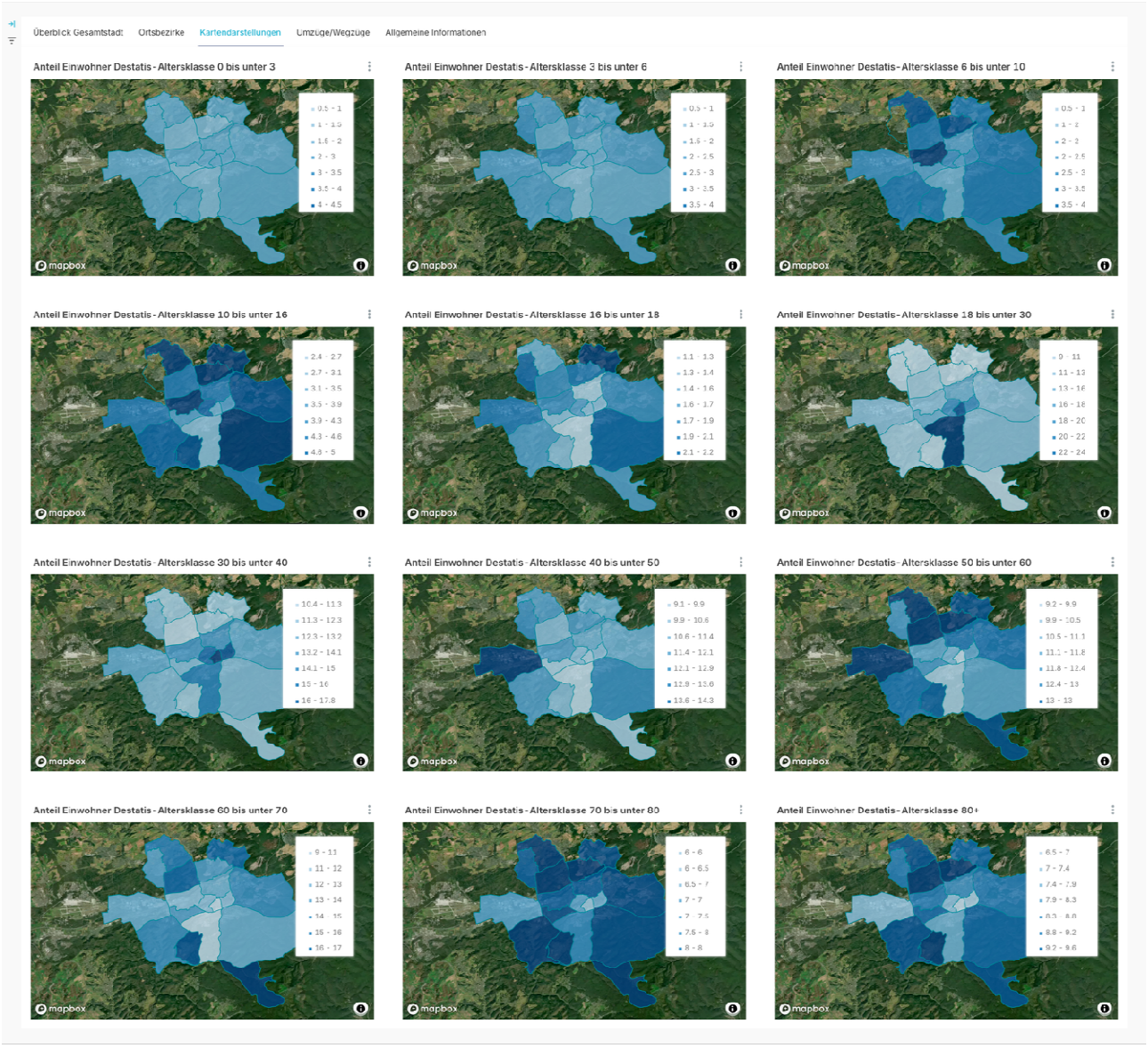

Fig. 2: Dashboard with map-based representations of shares of different age groups from population data in Kaiserslautern.

The first dashboard (Fig. 2) visualizes the spatial distribution of different age groups across the districts of Kaiserslautern. Age-group shares are represented using a choropleth map, where darker shading indicates a higher proportion of the selected age cohort within a given district. From an analytical perspective, this dashboard supports rapid exploratory analysis of demographic patterns and helps municipal actors to identify areas with specific age-related characteristics. Such insights can inform planning and decision-making processes in fields such as housing policy, social infrastructure, education, or mobility planning. Moreover, the map-based representation facilitates communication of demographic trends to non-technical stakeholders by providing an easily interpretable visual overview.

Editors: M. Schrenk, C. Beyer, T. Popovich, J. Ryser, D. Mawlood
ISBN 978-3-9504945-5-6

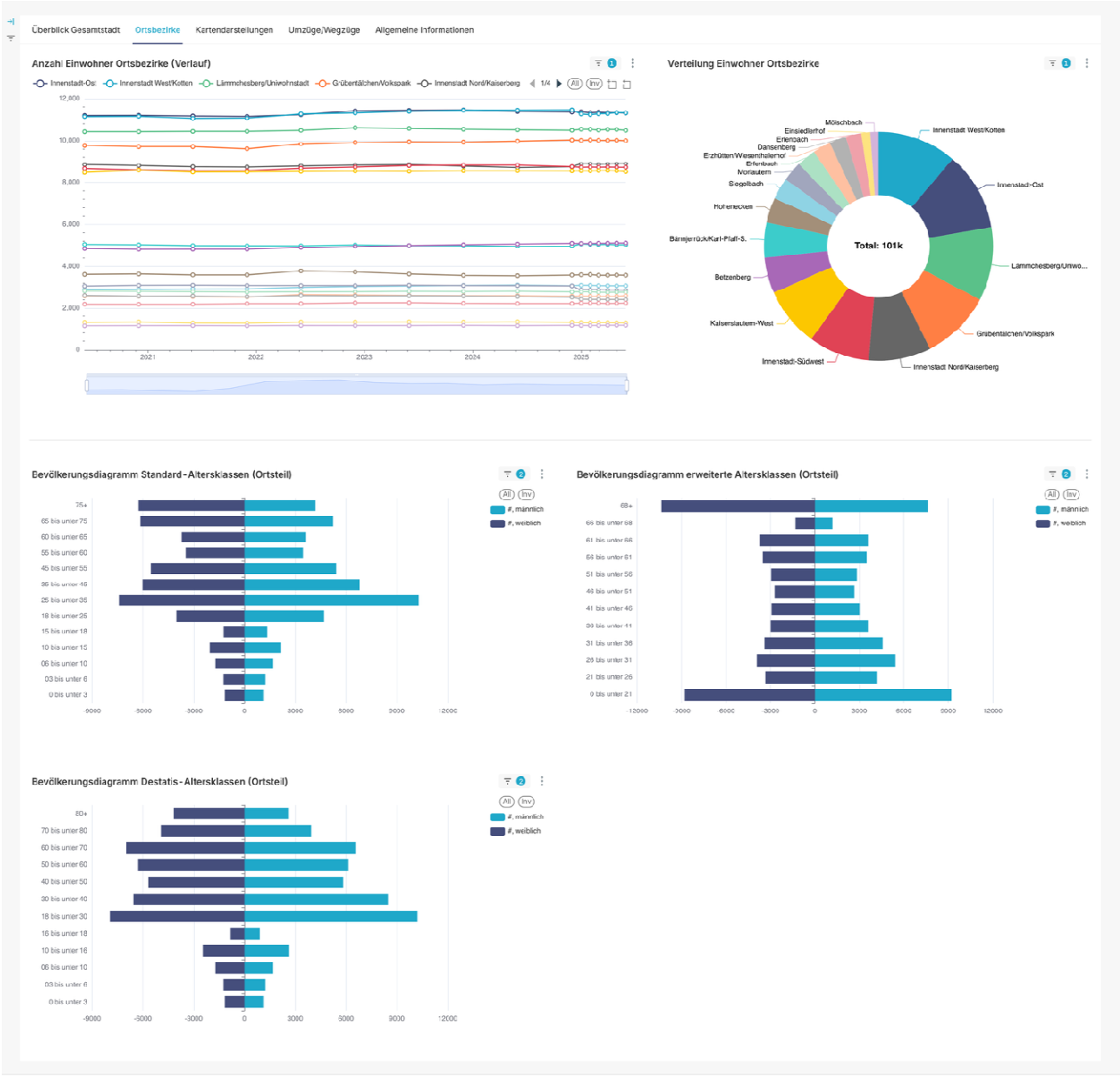

Fig. 3: Dashboard with different information about population data from different city quarters of Kaiserslautern.

The dashboard shown in Fig. 3 presents population data at district level with a focus on temporal development and internal demographic composition. It combines a time series showing the evolution of the total population for individual districts with a comparative view of population distribution across administrative subunits. For the currently selected district, additional charts display the population structure by age, using different age group classifications. This dashboard enables users to analyse both long-term demographic trends and current population structures at a fine-grained spatial level. It supports tasks such as monitoring population growth or decline, comparing demographic developments between districts, and assessing age-specific dynamics. In administrative practice, these insights can be used to support evidence-based planning of public services, such as schools, childcare facilities, or elderly care infrastructure, as well as to inform strategic discussions on urban development and neighbourhood change.

As a last example, Fig. 4 shows a dashboard that allows users to select and compare multiple districts with regard to selected socio-economic dimensions. In particular, it focuses on the distribution of household income classes and educational attainment levels. By enabling side-by-side comparison of districts, the dashboard highlights structural differences and similarities in socio-economic conditions across the city. This comparative perspective supports a more nuanced understanding of social and economic disparities within the urban area. It can be used to identify districts with specific socio-economic profiles, inform targeted policy interventions, and support cross-departmental coordination in areas such as social policy, education,

and urban regeneration. In addition, the dashboard provides a valuable basis for discussing socio-economic developments with political decision-makers and external stakeholders, as it translates complex data into a clear and comparable visual format.

Fig. 4: Dashboard with a comparison of socioeconomic information from different city quarters in Kaiserslautern

The visualizations are continuously refined in an iterative exchange with users, extending and adapting them as new requirements emerge. Early user feedback has been very positive: for example, testing the dashboards revealed the need to establish a common terminology for social statistics across departments. This highlights that technical integration must go hand in hand with semantic alignment.

6 SUMMARY AND OUTLOOK

UDM constitutes a key challenge and opportunity for municipalities aiming to make better use of their growing data assets. While cities already collect large volumes of administrative and statistical data, these resources often remain underutilized due to organizational fragmentation, unclear responsibilities, and heterogeneous technical systems. Addressing these issues requires more than isolated technical solutions: effective UDM must combine governance structures, strategic orientation, and suitable technological infrastructures. On the one hand, clearly defined roles, processes, and shared objectives are essential to enable coordinated data use across departments and municipalities. On the other hand, these governance principles must be operationalized through a capable municipal data platform that supports data integration, controlled access, and analytical use. Without such a technical backbone, strategic data governance remains largely ineffective. Since municipal data platforms represent critical digital infrastructure, data sovereignty and the avoidance of vendor lock-in are of central importance. Dependence on proprietary solutions can restrict flexibility, transparency, and long-term control over data and systems. In contrast, the open and modular approach pursued in the Südwest-Cluster demonstrates significant advantages. By relying on open-source components and shared development, participating municipalities retain control over their data and are able to jointly evolve the platform according to public-sector requirements.

First results from the intermunicipal, cooperative approach applied in the Südwest-Cluster indicate that shared platform development reduces redundant effort, accelerates implementation, and fosters learning across organizational boundaries. At the same time, the collaborative development of dashboards and use cases has revealed additional benefits, such as improved mutual understanding between departments and the need to harmonize terminology and data interpretations.

As a next step, the joint development of additional use cases will be continued and extended, both for internal administrative support and for public-facing open data services. Furthermore, the data platform is to be increasingly integrated into the standard service portfolio of the participating municipalities, moving beyond project-based usage. Finally, particular attention will be given to the development of a sustainable

operating and governance model that enables the long-term, cooperative operation of the platform beyond the end of the funding period. These steps are essential to ensure that UDM evolves from a project initiative into a permanent element of municipal digital infrastructure.

7 REFERENCES

BATTY, M.; Axhausen, K. W.; Giannotti, F.; Pozdnoukhov, A.; Bazzani, A.; Wachowicz, M.; Oluwole, O.; Portugali, J.: Smart Cities of the Future. In: The European Physical Journal Special Topics, Vol. 214, pp. 481–518, 2012.

BATTY, M.: Big Data, Smart Cities and City Planning. In: Dialogues in Human Geography, Vol. 3, No. 3, pp. 274–279, 2013.

BERG, M.; Brandt, S.; Meides, N.; Schmitt, A.; Vollmer, A.: Open-Source-Software in Kommunen – Einsatz und Schnittstellen in der kommunalen Planungspraxis. Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR), Bonn, 2024.

DIN – Deutsches Institut für Normung e.V.: DIN SPEC 91357:2017-12 – Reference Architecture Model Open Urban Platform (OUP). Berlin, 2017.

HESS, S.; Koch, M.: Urbane Datenplattformen – Von der Idee bis zur Umsetzung: Entscheidungshilfen für Kommunen. Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR), Bonn, 2023.

IFG (Informationsfreiheitsgesetz). Transparenz der Verwaltung beim Einsatz von Algorithmen für gelebten Grundrechtsschutz unabdingbar. Position paper by eight Freedom of Information commissioners, 2018.

KITCHIN, R.: The Real-Time City? Big Data and Smart Urbanism. In: GeoJournal, vol. 79, no. 1, pp. 1–14, 2014.

MAYER, J.; Memmel, M.: Daten als Schlüssel zur erfolgreichen Entscheidungsunterstützung. In Annette Spellerberg and Stefan Ruzika, editors, Ageing Smart – Digitale Instrumente im kommunalen Kontext: Daten, Analysen und Strategien (nicht nur) für Babyboomer, Springer VS, Wiesbaden, pp 295-321, 2026.

MAYER, J.; Memmel, M.: Mit Metadaten durch den urbanen Datendschungel – Verwaltung und Nutzung kommunaler Daten im Forschungsprojekt „Ageing Smart – Räume intelligent gestalten“. In vhw Verbandszeitschrift Forum Wohnen und Stadtentwicklung, 2023(1), pp 5-8, 2023.

MEMMEL, M.; Berndt, J.O.; Timm, I.: AScore – Developing a Cockpit for Regional Pandemic Management in Germany with Agent-Based Social Simulation. In Proceedings of the Proceedings of REAL CORP 2021; Schrenk, M.; Popovich, V.V.; Zeile, P.; Elisei, P.; Beyer, C.; Ryser, J.; Stoeglehner, G., Eds., pp. 65–75, 2021.

MEMMEL, M.; Abecker, A.; Bretthauer, S.; Kirchmann, H.; Korf, R.; May, M.; Wacker, R.: Smart Regio – Employing Spatial Data to Provide Decision Support for SMEs and City Administrations. In Manfred Schrenk, Vasily V. Popovich, Peter Zeile, Pietro Elisei and Clemens Beyer, editors, Proceedings of REAL CORP 2017, pp 507-519, 2017.

MEMMEL, M.: Socially Enhanced Access to Digital Resources. PhD diss., University of Kaiserslautern, 2015.

OECD: Going Digital Guide to Data Governance Policy Making, OECD Publishing, Paris,2022.

PRIESTLEY, M., F. O’Donnell, and E. Simperl: A Survey of Data Quality Requirements That Matter in ML Development Pipelines” Journal of Data and Information Quality 15, pp 1–39, 2023.

SAUTTER, J.; Henze-Sakowsky, A.; Lödige, M.; Schweigel, H.; Dobrokhotova, E.; Seick, J. P.; Schüle, R.; Kirchner, J.; Braun, S.: Datenkompetenz in kommunalen Verwaltungen. Bonn: Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR), 2023.

SCHIEFERDECKER, I.; Bruns, L.; Cuno, S.; Flügge, M.; Isakovic, K.; Klessmann, J.; Lämmel, P.; et al.: “Urbane Datenräume – Möglichkeiten von Datenaustausch und Zusammenarbeit im urbanen Raum.” Fraunhofer FOKUS, 2018.

SINGLETON, A. D.; Spielman, S. E.; Folch, D. C.: Urban Analytics. London: Sage Publications, 2017.

URBAN DATA SPACE PLATFORM (Repo-Team / Hypertegrity AG): Architecture Diagram – Core Platform. GitLab: Urban Data Space Platform. https://gitlab.com/urban-dataspace-platform/core-platform/-/raw/master/00_documents/Admin-guides/img/architecture.drawio.png (accessed 12 March 2026).

WEIL, C., S. E. Bibri, R. Longchamp, and F. Golay: Urban Digital Twin Challenges: A Systematic Review and Perspectives for Sustainable Smart Cities. Sustainable Cities and Society 99: 104862, 2023.

ZUIDERWIJK, A.; Janssen, M.: Open data policies, their implementation and impact: A framework for comparison. In: Government Information Quarterly, Vol. 31, Issue 1, pp. 17–29, 2014.