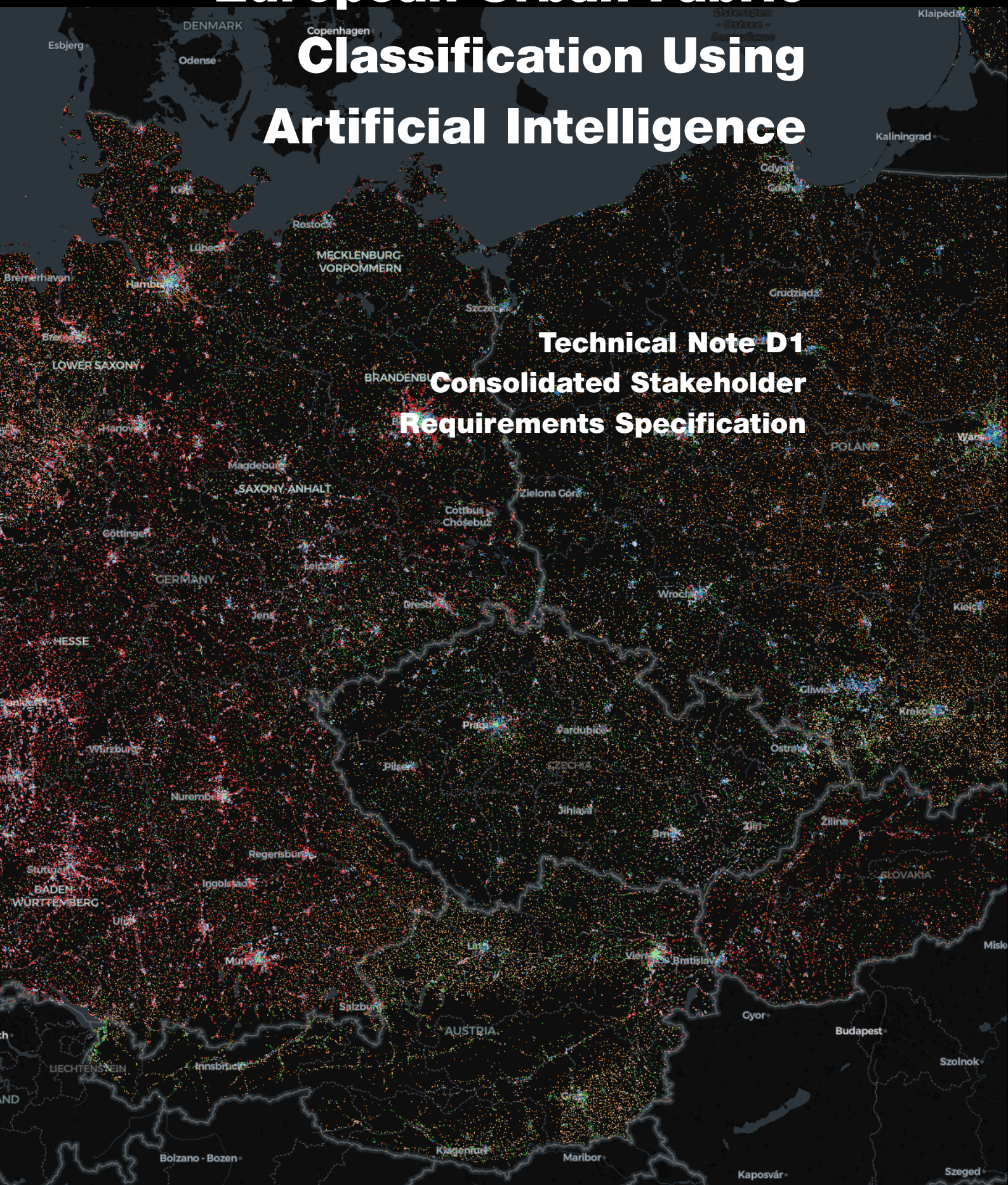


European Urban Fabric Classification Using Artificial Intelligence

Technical Note D1 Consolidated Stakeholder Requirements Specification



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Technical Note D1

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Table of contents

1	Executive summary	1
2	Stakeholder identification and engagement	2
2.0.1	URBIS 24	2
2.0.2	World Urban Forum	3
2.0.3	Detailed workshops & key stakeholder engagements	3
3	Performance specification	5
4	Regulations	6
5	Stakeholder Use Cases and Requirements	7
	References	9

1 Executive summary

The EuroFab project emphasises close collaboration with the end-users of the final project outputs. We are in recurring contact with various stakeholders and taking their feedback into account when carryout the technical work. This document describes the stakeholder engagement carried out to date, with the purpose of consolidating their requirements and idea for the maximum adoption and impact of our work. The work on the stakeholder requirements is currently ongoing as we needed to adapt to their (stakeholders') activity schedule which is quite tight, since we want to involve not just representatives from the networks/associations themselves, but also their constituency.

2 Stakeholder identification and engagement

The project team has participated in and co-organised 2 events with the objective to identify and consolidate the stakeholders involved in the mapping exercises. The bulk of the stakeholder work however, was carried out in detailed workshops with key stakeholders - The Construction Sector Development Agency of the Ministry of Environment, Lithuania (SSVA) - a national organisation, 4ct - a private company in the urban planning sector, and the Prague Institute for Planning (IPR) - a local planning body.

2.0.1 URBIS 24

During the **URBan Insights from Space workshop** hosted by ESA on 16th – 18th September 2024, the project concept has been presented during a key note presentation. The team also prepared a poster presentation to share a more detailed description of the project activities.

The team engaged with 2 key stakeholders: EU Covenant of Mayors for Climate and Energy (EU-CoM) and UIV Urban Innovation Vienna GmbH. UIV Urban Innovation Vienna GmbH is the climate and innovation agency of the City of Vienna and a company of Wien Holding. They work in close cooperation with all municipalities and local authorities in Austria. A meeting has been planned before the end of the year to discuss in detail how they will engage, i.e. getting feedback on preliminary outputs of EuroFab and how they can possibly engage other municipalities in Austria, beyond Vienna. The EU Covenant of Mayors for Climate and Energy is a voluntary initiative supported by the European Commission bringing together thousands of local governments that want to secure a better future for their citizens. The Covenant of Mayors was launched in 2008 in Europe, while the Global Covenant of Mayors was launched in 2015. EU-CoM expressed interest in participating in the stakeholder requirements mapping, leveraging on-going work of the network and possibly circulating a short survey to its members. We initiated the joint work at the 12th World Urban Forum (WUF) that took place in Cairo, from 4th to 8th November 2024.

2.0.2 World Urban Forum

The project team participated to the **12th World Urban Forum (WUF)**, organised by UN Habitat. The WUF was established in 2001 by the United Nations to examine rapid urbanisation and its impacts. The 12th WUF gathered 25,000 representatives from national, regional and local governments, academics, business organisations, community leaders, urban planners and civil society. The team organised a networking event titled “Monitoring urban fabric for data-driven planning and decision-making”, with the objective to engage in a joint discussion with both producers and users of data for the monitoring of urban fabric. Alongside the project team, speakers of the panel included: Thomas Kemper, leader of the GHSL project at the Joint Research Centre of the European Commission, and Bard Rama, International Component Coordinator at the EU Covenant of Mayors for Climate and Energy.

The discussion helped to highlight key issues to be addressed in order to enhance the usability of new data products. Amongst other, more technical considerations about file specifications and data accessibility, the issue of trust was flagged as a prominent one. In order to address it, the discussion highlighted also the need to use shared terminology and concepts.

Another key reflection was related to the need to take into account unexpressed needs and requirements of the prospective data users: how to map needs that are not yet emerging from the current experience?

The participants also welcomed favorably the possibility to use the data layers to produce alternative scenarios for different policy applications and urban or strategic planning.

Overall, the discussion provided useful inputs to fine-tune the survey that is under preparation and planned to be distributed to at least one city network (EU-CoM).

Amongst the audience participants, worth mentioning the Institute of Urban and Regional Development of Poland, which expressed the interest in engaging the project activities and offering the possibility to mobilise their constituency.

2.0.3 Detailed workshops & key stakeholder engagements

There are two in-person events to happen in Prague, scheduled for Q1 of 2025. The schedule had to be adjusted as both parts expressed their interest in being more involved in the collaboration once there are tangible preliminary data products they could further help shaping to their needs.

One workshop will be held with the Prague Institute of Planning and Development, with a focus on validating the usefulness of the WP300 outputs for their application in policy and planning. It is worth noting, that the work published in Fleischmann et al. (2022) has been incorporated into Prague’s planning documentation within the ‘Územně analytické podklady’ (Territorial analytical documents) since 2020, making IPR

2 Stakeholder identification and engagement

the unique stakeholder with a long-term experience with morphological classification of the sort used within the EuroFab.

Another workshop will be held with the 4ct, a private company within urban planning and institutional development sphere, focusing more on the application of the project outputs within private consulting for both public and private clients. It is assumed that the requirements will partially differ from those of IPR and other public entities.

Lastly, there are several online workshops scheduled to take place with The Construction Sector Development Agency of the Ministry of Environment, Lithuania (SSVA) to go over the methodology and work in detail. Since Lithuania was not part of the original scope of the pilot study, we had to adjust several aspects of the project to accommodate them.

3 Performance specification

The events and workshops yielded several key insights regarding the potential for pan-European classification, the practical applicability of the results and how to assess their quality.

First, a consistent requirement was that for most planning work grid squares exceeding 100 meters are generally too large for meaningful analysis. In fact, the majority of detailed analysis necessitates a much more granular scale. The morphometric work carried out at the building scale proved particularly well-received, primarily because even raw morphometric characteristics at this fine resolution are difficult and time-consuming to calculate manually. This insight highlighted another potential use case for the pan-European analysis.

Second, a significant challenge was encountered in establishing robust quantitative metrics to accurately describe data quality or analysis performance. This issue stemmed from two main factors: the diverse range of stakeholder applications (each having different priorities for ‘quality’ or ‘accuracy’), and critically, the absence of comprehensive large-scale ground truth data. Stakeholders tend to prioritize different facets of the analysis relevant to their particular application. Some are even not interested in the classification, and want to use the raw characteristics to label the configurations of buildings and streets using local terms and vocabularies. Similarly, an even greater lack of consensus exists regarding what constitutes accurate urban fabric classification across time. The challenge in this case is even bigger, since there is a larger scarcity of available longitudinal data, with most detailed analyses confined to small geographic areas and primarily relying on qualitative assessments, which are inherently difficult to standardize for quantitative validation.

Third, the limited scope of the pilot study presented another obstacle. Multiple stakeholders indicated a strong interest in integrating the project results with other complementary datasets (e.g., socio-economic data, environmental indicators) to fully assess their utility and impact. However, the existing timeframe of the pilot study proved insufficient for such comprehensive data integration and subsequent long-term evaluation. A proposed solution for identifying more robust and broadly accepted performance metrics involves the collaborative co-development of secondary derived products. For instance, instead of just providing a classification, working with stakeholders to develop an city or region urban fabric summary or ‘green space accessibility score’ directly from the classifications could provide more immediate, measurable utility. Further recommendations for overcoming this limitation are available in Technical Note 5 – Impact and Utility.

4 Regulations

A notable positive outcome from stakeholder engagement was the strong appreciation for the use of open-source products as both data input and for generating final results. Stakeholders emphasized that this enables them to avoid potential problems related to licenses or regulations. This outcome supports EuroFab’s foundational commitment to openness represents a key strategic asset for ensuring its long-term impact, widespread adoption, and overall sustainability. This includes maintaining the public GitHub repositories (e.g., `eurofab-project/morphometrics`, `eurofab-project/eo`) for all relevant code, tools, and documentation. The scope of the open-source work can also be extended to establish and maintain online forums, mailing lists, and developer channels (e.g., Slack, Discord) to provide support to users and foster a collaborative environment for contributors.

5 Stakeholder Use Cases and Requirements

We have gathered multiple insights and potential use cases from the stakeholder sessions:

- Data Integration
- Taxonomy Description and Naming
- Comparative Urban Analysis:
- Expanding Data Coverage
- Reducing Manual Effort in Land Use Analysis
- Geographical Scale of Results
- Taxonomic Tree & Evaluation
- Input data quality

A significant finding from the stakeholder engagements is the strong interest in integrating the EuroFab data with land use, geodemographic, land value and other spatial datasets. However, stakeholders differed in their technical ability to make such a merger themselves. This led to discussions about multiple potential derived data products such as classifications that incorporate both morphological and land use or other functional information.

The stakeholders showed significant interest in the taxonomic tree, discussing both its advantages and disadvantages. Potential use cases included, identifying the relationships between different urban forms, as well as comparisons at different scales between regions and cities. SSVA, in particular, conducted a detailed evaluation of the hierarchy within the Lithuanian context and proposed several modifications so it fits better the local context.

Significant time was spent discussing the issues of how to describe and name the taxonomic tree and the clusters. Different applications required different names, and even the same application (for example, for land use planning), but in different countries required different names and descriptions. One discussed approach to this was to give clusters and the taxonomy abstract names that focus only on the morphology. This would later make it easier for users to adapt and refine the classification names and descriptions according to their specific needs and application contexts.

A key application identified through discussions with 4ct, IPR, and SSVA is the use of EuroFab data for comparative urban analysis - stakeholders expressed a strong interest in leveraging the data to compare cities, regions, and even cross-border areas. This capability is seen as valuable for guiding planning decisions, facilitating knowledge transfer

5 Stakeholder Use Cases and Requirements

between local planning authorities and land developers, and understanding the factors that shape urban development patterns. This emphasis on comparisons also underscored the need to expand the geographic coverage of the data.

We have already taken steps to address this requirement. Due to the new stakeholders from Lithuania, we had to process the urban fabric of the whole country. This required adjustments to the processing pipeline, which improved its scalability and performance and currently, it's easier to include new countries in the analysis. We also note that even though Lithuania is excluded from the final modeling results with Microsoft and Overture Maps data, it is present in the interactive web application.

There were also multiple discussions with stakeholders about the geographical scale of the results. IPR expressed interest in both fine-grained units, such as morphotopes (local contiguous areas of similar urban morphology), and coarser aggregations, such as the hexagon-based aggregation featured in the web application. Conversely, 4ct and SSVA indicated a need for building-level information, as well as access to the raw data.

Related discussions covered input data quality and additional morphological variables to be included in the classification. The issues with the quality and inconsistencies of building footprints was raised multiple times, as well as problems with the street network. This was especially relevant for building height, which is a characteristic all stakeholders expressed interest in. However, we also discussed the unavailability of this data and the accuracy problems of existing building height data products.

Lastly, The Prague Institute of Planning and Development (IPR) highlighted the potential of EuroFab outputs to help with generating the official land use plan for the city. Furthermore, they expressed interest in potentially integrating the EuroFab data into their urban analytics products for Prague.

References

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