International Journal of Cartography

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tica20

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To cite this article: Martin Davis & Alexander J. Kent (2022): Soviet City Plans and OpenStreetMap: a comparative analysis, International Journal of Cartography, DOI: 10.1080/23729333.2022.2047396

To link to this article: https://doi.org/10.1080/23729333.2022.2047396

INTERNATIONAL JOURNAL OF CARTOGRAPHY
https://doi.org/10.1080/23729333.2022.2047396

Soviet City Plans and OpenStreetMap: a comparative analysis

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ABSTRACT
The rapid growth of urban populations presents challenges to the sustainable management of cities and requires accurate geospatial data. Historical maps offer a largely untapped resource for enhancing OpenStreetMap (OSM) and Soviet military mapping presents a potentially rich geospatial resource for this purpose. This paper compares these global mapping initiatives through an analysis of the symbology used in Soviet 1:10,000 city plans of La Paz, Bolivia (1977), Port-au-Prince, Haiti (1983) and Frankfurt am Main, West Germany (1983), and in modern OSM coverage of the same cities. The results indicate that Soviet and OSM symbologies are similarly comprehensive regarding their inclusion of some topographic features, notably road infrastructure, but that they exhibit key differences in their coverage of physical and urban environments. This highlights some areas in which the symbology, coverage and content of OSM may be enhanced by Soviet mapping and developed to serve its wide range of user groups. The paper also indicates how the harmonisation of Soviet and OSM symbologies could form an accessible and comprehensive global geospatial resource for applications that require detailed knowledge of amenities and terrain, such as disaster relief and environmental management, particularly in locations where other geospatial resources are scarce.

ARTICLE HISTORY
Received 29 July 2021
Accepted 24 February 2022

KEYWORDS
Soviet maps; OpenStreetMap; topographic map; urban mapping; symbology

1. Introduction

Today, over 55% of the world's population live in cities and the UN predicts that this will grow to 68% by 2050 (United Nations, 2018). Rapid urbanisation presents particular challenges for the sustainable management of cities, especially in low-income and lower-middle-income countries. The construction of new housing, transportation, energy systems and other infrastructure, alongside the provision of employment and basic services, such as education and health care to support the growing population, requires access to accurate and comprehensive geospatial data. Addressing this demand will become an increasingly important cartographic objective over the next few decades.

The Soviet military mapping programme was the most comprehensive global cartographic project of the twentieth century (Kent et al., 2019). Although the full extent of

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the project is yet to emerge, recent studies indicate that its scope and detail include topographic maps at a variety of scales for most of the globe and over 2,000 city plans, mostly at 1:10,000 and 1:25,000 (Watt, 2005; Kent & Davies, 2013; Davies & Kent, 2017). These large-scale city plans employed extensive symbologies, incorporating some 630 different cartographic symbols (Davis, 2021; Davis & Kent, 2021). After they were first offered for sale by Latvian publisher Jāņa Sēta at the International Cartographic Conference in Cologne, Germany, in 1993, the Soviet military city plans have become increasingly available online and from a variety of sources, such as the US Library of Congress, EastView Cartographic and RedAtlasBook.com.

Since its foundation in 2004, OpenStreetMap (OSM) has evolved to become a freely editable and accessible detailed map of the world (Ramm et al., 2010). The project was initiated in the United Kingdom by Steve Coast as a means of creating free digital mapping as an independent source of urban topographic data, which comprise 20 zoom levels at scales from 1:1,000 to 1:500,000,000. As of 2021, there are over 7 million registered users with OSM and more than 4.5 million edits are made daily (OpenStreetMap, 2021a).

While the origins and characteristics of these global mapping projects are markedly different (one, a highly secretive analogue mapping programme from the Cold War and the other, a twenty-first century, digital open-source map), both share some common traits:

- an aspiration to achieve global coverage through mapping at multiple scales;
- the utilisation of comprehensive and standardised symbologies that are designed to be applied anywhere on the globe (and therefore independently of the national contexts and longstanding structures that have usually directed topographic mapping); and
- an aspiration in their large-scale mapping to include a significant quantity of topographic information for any given location.

Additionally, both mapping projects are characterised by a continuous process of data gathering and updating, despite their different media. Successive editions of Soviet city plans were made when sufficient new data became available, and were intended to: 'have the capacity, and a graphical and colour design, which may allow more information to be put on the plans, or imprinted on them' (General Staff, 1978, p. 3). Similarly, OSM is dynamic and interactive, with users encouraged to view different layers and contribute additional data to the map, with all the advantages that its digital medium affords.

The evolution of topographic mapping to ensure that its symbolisation of landscape meets the needs of a growing range and number of users presents an ongoing challenge. Since all topographic maps are selective, analysis of their symbologies can reveal how (and to what extent) various types of geographical feature are classified and represented, highlighting themes of particular focus. In turn, this can provide some insights into whether existing symbologies are adequate in terms of the relative balance of themes and in their level of detail and completeness.

This paper presents a comparative analysis of the symbologies of Soviet mapping and OSM. It explores similarities and differences in their comprehensiveness and focus, with three aims: firstly, to identify aspects of OSM symbology that have potential for future expansion while remaining globally standardised; secondly, to suggest where there are possibilities for Soviet mapping to supplement OSM data in some contexts; and thirdly, to indicate the scope for Soviet mapping to serve as a geospatial resource in areas with less detailed coverage on OSM.

The empirical investigation in this study comprises two parts. The first compares the documents and legends that define the symbologies of Soviet military city plans (this series utilised the most comprehensive Soviet symbology for mapping foreign territories) and of the OSM standard layer (also known as OSM Carto; the most comprehensive and widely used of OSM's tile layers). The second part compares the symbologies as they are applied in the context of a map of three real urban locations: the cities of Frankfurt am Main (Germany), La Paz (Bolivia) and Port-au-Prince (Haiti). This will indicate the extent to which these global symbologies are implemented in real-world contexts and therefore provide some insights into their relevance and currency.

Overall, the comparison between the symbologies of these global mapping projects and their implementation aims to reveal the extent to which future applications of OSM might draw on Soviet mapping as a geospatial resource. Accordingly, there is potential for the application of automated methods of feature extraction to Soviet mapping, with a view to expanding the datasets currently available via OSM and beyond.

2. Existing studies

Comparisons of contemporaneous topographic mapping have adopted qualitative (e.g. Piket, 1972; Forrest et al., 1997; Collier et al., 1998; Forrest & Kinninment, 2001; Collier et al., 2003) and quantitative (e.g. Kent, 2009; Kent & Vujakovic, 2009) approaches to analyse and identify differences in their symbology, regarding cartographic style in topographic maps as a function of both content and appearance.

Since topographic maps follow standard specifications that comprise exhaustive symbologies as well as other requirements, symbols exist in these specifications in isolation as well as on the maps. The implementation of all symbols defined in the map specifications is unlikely to be required in any given area, but the recognition of a style depends on their context and use, as the complex interplay of symbols creates an overall graphic effect. Ory et al. (2015) demonstrated, for example, that the symbolisation of particular features can represent the salient stylistic characteristics of a single topographic series and are recognised as such by users. It is therefore important to question whether the symbologies used in topographic maps are optimised for users in terms of their comprehensiveness as well as their appearance.

Soviet mapping has become a growing area of research during the last decade (e.g. Kent & Davies, 2013; Davies & Kent, 2017; Davis & Kent, 2018; 2021; Kent et al., 2019; Cruickshank, 2020; Svenningsen & Perner, 2020). Systematic comparisons between the symbologies used in Soviet and in other topographic maps (e.g. Vereshchaka, 2002; Davis & Kent, 2021), however, are rarely made. Since Soviet topographic maps were produced at a range of scales, from 1:10,000 to 1:1,000,000, and were designed to cover the globe and its many diverse environments, it is worth investigating how their symbologies might inform topographic mapping today, and, in particular, collaborative projects such as OSM.

Studies concerned with OSM have tended to highlight its status as a crowd-sourced mapping initiative and focus on assessments of its quality in terms of its accuracy or consistency. These often involve comparisons with topographic mapping in national contexts (e.g. Girres & Touya, 2010; Haklay, 2010); with commercial web map servers (e.g. Helbich et al., 2012), or with specific types of feature (Canavosio-Zuleski et al., 2013; Brovelli & Zamboni, 2018). Assessments of OSM have so far neglected any exclusive focus on its symbology, particularly regarding the relative balance of landscape features and their comprehensiveness. This is perhaps surprising, given the global aspirations of the OSM community, and the availability of national topographic mapping to allow meaningful national and international comparisons to be made. Ultimately, these could yield recommendations for how the classification of landscape and symbology adopted by OSM could evolve to serve a greater number and diversity of users more effectively.

3. Empirical investigation

In order to analyse the similarities and differences in the mapping of cities by the Soviet General Staff and by OSM, the methodology involves two stages. Firstly, the symbology specifications of the Soviet military city plans and of the OSM standard layer are compared, which allows an analysis to be independent of their utilisation. Secondly, the application of these symbologies in the cities of Frankfurt am Main (Germany), La Paz (Bolivia) and Port-au-Prince (Haiti) is analysed to allow a comparison of their implementation.

3.1 Comparing symbologies described in the specifications

3.1.1 Compiling the Soviet and OSM symbologies

In order to enable the symbologies of these two global mapping initiatives to be categorised, quantified and directly compared, it is necessary to compile comprehensive legends for Soviet military city plans and OSM, based on their various specifications and accompanying documents. As there is no single document which defines the full symbology of Soviet military city plans, it is important to identify the relevant official documents that together comprise this symbology. For OSM, a comprehensive symbology is provided via OpenStreetMap Wiki. These sources are used to define and to compare the symbologies that were derived in isolation of their use, as well as in their implementation for real locations.

The Soviet military city plan symbology used in this investigation was adopted between 1970 and 1990; the period during which the majority of known Soviet city plans were produced. This symbology may be determined from a combination of sources: the specification documents for 1:10,000 and 1:25,000 Soviet topographic maps (Figure 1), in addition to a small supplement of additional symbols within the compilation manual for city plans (General Staff, 1966; 1968; 1978). The latter indicates which symbols may be used at which scales, making it possible to compile a comprehensive symbology for Soviet city plans at both 1:10,000 and 1:25,000.

As the focus of this investigation is to compare the mapping of cities by the Soviet Union and by OSM according to their classification of landscape as expressed through cartographic symbology, only discrete graphical symbols are involved (thereby excluding text annotations). Whereas most of the graphical symbols in the Soviet city plan specifications are presented as discrete graphics, others are presented on extracts of maps of fictitious locations to demonstrate the context of their use. In order to be quantified and

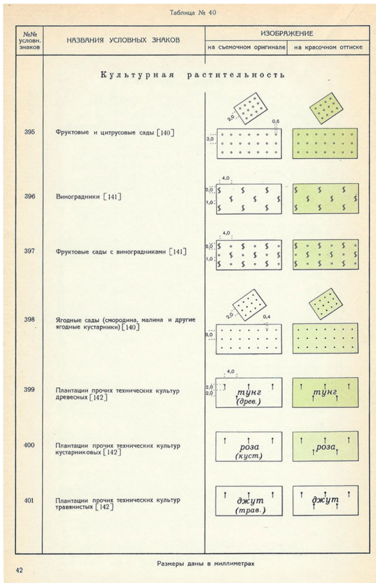

Figure 1. Extract from 'Conventional Signs for Topographic Maps of the USSR at 1:10,000' (General Staff, 1968), showing symbology for different types of vegetation (reproduced courtesy of a private collection).

categorised for this study, these symbols are isolated from these demonstrative contexts and counted as discrete symbols. Where very similar graphical symbols are included in the specifications for plans at both 1:10,000 and 1:25,000 but with different descriptions, these are considered as different symbols despite their graphical similarity. Where minor graphical differences exist between the two scales but the symbol descriptions are the same, these are treated as the same symbol. This process resulted in the collation of a list of 630 different cartographic symbols from the Soviet city plan specifications.

The full symbology for the OSM standard layer is published on OpenStreetMap Wiki and does not differentiate between scales (OpenStreetMap, 2018). The OSM standard layer (or OSM Carto) has been selected for this comparison because of its function as a 'general purpose map' and 'exemplar stylesheet' for OSM data (OpenStreetMap, 2021b); in parallel with the multi-thematic approach of the Soviet city plans. Unlike the Soviet specifications, the symbol legend for the OSM standard layer includes only discrete graphical symbols, avoiding the need to separate the symbols from an illustrative cartographic context.

3.1.2 Categorising Soviet and OSM symbols

The Soviet and OSM symbols identified using the process outlined above were categorised using a typology of landscape features similar to the method used by Kent (2009) for classifying the symbologies of European state 1:50,000 topographic maps. The categories developed in this study broadly reflect those used to classify symbols in the Soviet specifications themselves (General Staff, 1966; 1968), which were intended for global use. The most notable departure is the division of the Soviet category 'Industrial, agricultural and socio-cultural objects' into five separate categories, which allows a

Table 1. Symbol categories from the Soviet 1:10,000 specification, OSM standard layer and the new categories adopted in this investigation.

Soviet 1:10,000 symbol categories (General Staff, 1968)	OpenStreetMap standard layer symbol categories (OpenStreetMap, 2018)	Typology categories
N/A	Gastronomy	Retail and restaurants
	Shops and services	
	Culture, entertainment and arts	Leisure, tourism and public services
	Historical objects	
	Leisure, recreation and sports	
	Waste management	
	Outdoor	
	Tourism and accommodation	
	Finance	
	Healthcare	
	Administrative facilities	
Settlements	Places	Settlements
Highways, dirt roads and trails	Road features	Road transport
Railways and their facilities	Transportation	Rail transport
Industrial, agricultural and socio-cultural objects		Air and water transport
	Communication	Industry and communications
	Landmarks, man-made infrastructure, masts and towers	
	Electricity	Natural resources and utilities
	Religious place	Religious and burial sites
		Agriculture and animal enclosures
Borders and Fences	*N/A*	Boundaries
Geodetic Points		Geodetic points
Hydrography		Hydrography and coasts
Relief	Nature	Relief and geomorphology
Vegetation and Soils		Vegetation and soils

finer analysis of these features. The Soviet categories in the 1:10,000 and 1:25,000 specifications differ, in that the former splits 'Transport networks' in two ('Highways, dirt roads and trails' and 'Railways and their facilities'). Again, in order to enable a finer analysis, a classification more similar to the Soviet 1:10,000 categories has been adopted here. In order to be equally suitable for OSM, two additional categories were included which have no equivalent in the Soviet specifications: 'Retail and restaurants' and 'Leisure, tourism and public services'. These adjustments resulted in a final typology of 15 categories (Table 1).

Where the placement of a symbol in more than one category could be equally justified, a consistent decision was made for both the Soviet symbols and OSM equivalents. For example, whereas the classification of a level crossing symbol for both 'Road transport' and 'Rail transport' would be justified, both the Soviet and OSM symbols for this feature have been placed in the former category. This approach enables the categories to be mutually exclusive, with no symbol appearing in more than one, or with the same feature from different symbologies appearing in different categories.

3.1.3 Results of the comparison of specifications

In terms of the total number of graphical symbols appearing in the specifications, the OSM standard layer symbology (281 symbols across all scales) was found to be smaller than the Soviet city plan symbology (526 symbols at 1:10,000 and 378 symbols at 1:25,000). However, the OSM symbology is far more comprehensive with regard to some human-made features and far less so in its symbology relating to the natural environment (Figure 2). In terms of the distribution of these symbols across the 15 categories, 'Retail and restaurants' (64 symbols) and 'Leisure, tourism and public services' (54 symbols) are the largest in the OSM symbology and do not feature at all in the Soviet symbology. While a small number of features in these categories appear on some Soviet city plans, they are marked by descriptive text labels in these instances. In the OSM legend, these categories include such symbols as 'library', 'café', 'theatre' and 'ice cream shop', which do not have Soviet equivalents.

The largest category used by both the OSM and Soviet symbologies is 'Road transport', with 48 OSM symbols and 74 and 51 Soviet symbols at 1:10,000 and 1:25,000 respectively. OSM features in this category which are absent from the Soviet symbology include 'car park', 'taxi rank' and 'bicycle parking'. This symbol count is similar to that from the Soviet 1:25,000 specification (51). Together, the 'Retail and restaurants', 'Leisure, tourism and public services' and 'Road transport' categories make up 59% of the OSM standard layer symbology.

The next largest category in the OSM symbology, 'Vegetation and soils' (17 symbols), has a substantially smaller symbol count than 'Road transport', despite this being one of the largest feature classes in the Soviet symbology (80 symbols at 1:10,000; 66 symbols at 1:25,000). The OSM symbol counts are smaller than the Soviet equivalents in all other

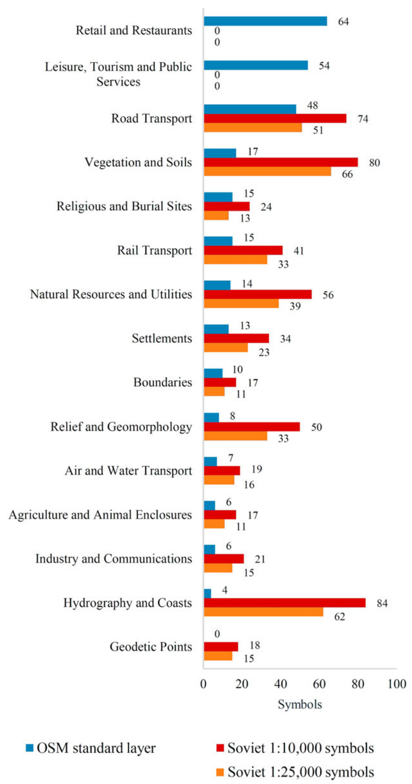

Figure 2. OSM standard layer symbols and Soviet city plan symbols in the specifications for 1:10,000 and 1:25,000 scales.

categories. The most stark differences are in 'Natural resources and utilities', which has 14 OSM symbols, compared with 56 Soviet 1:10,000 symbols, along with 'Relief and geomorphology' and 'Hydrography and coasts' which reflect similar differences.

In summary, the OSM standard layer symbology accommodates many more features relating to the built environment than the symbology of the Soviet city plans. While this may be explained by the difference between the projects' intended purposes (e.g. retail and leisure facilities may not be considered as having sufficient military or administrative importance), it may also reflect the Soviet plans' treatment of this type of information as text. This takes the form of labels or abbreviations on the plans themselves, in addition to a list of strategic objects (such as factories and their products) and a descriptive essay (the *spravka*), which accompany each plan.

3.2 Comparing symbologies used on the maps

3.2.1 Selecting cities for the analysis

In order to compare the implementation of Soviet and OSM symbologies, the cities of Frankfurt am Main (Germany) (Figure 3), La Paz (Bolivia) and Port-au-Prince (Haiti) (Figure 4) were chosen. In a previous study (Davis & Kent, 2021), the Soviet city plans

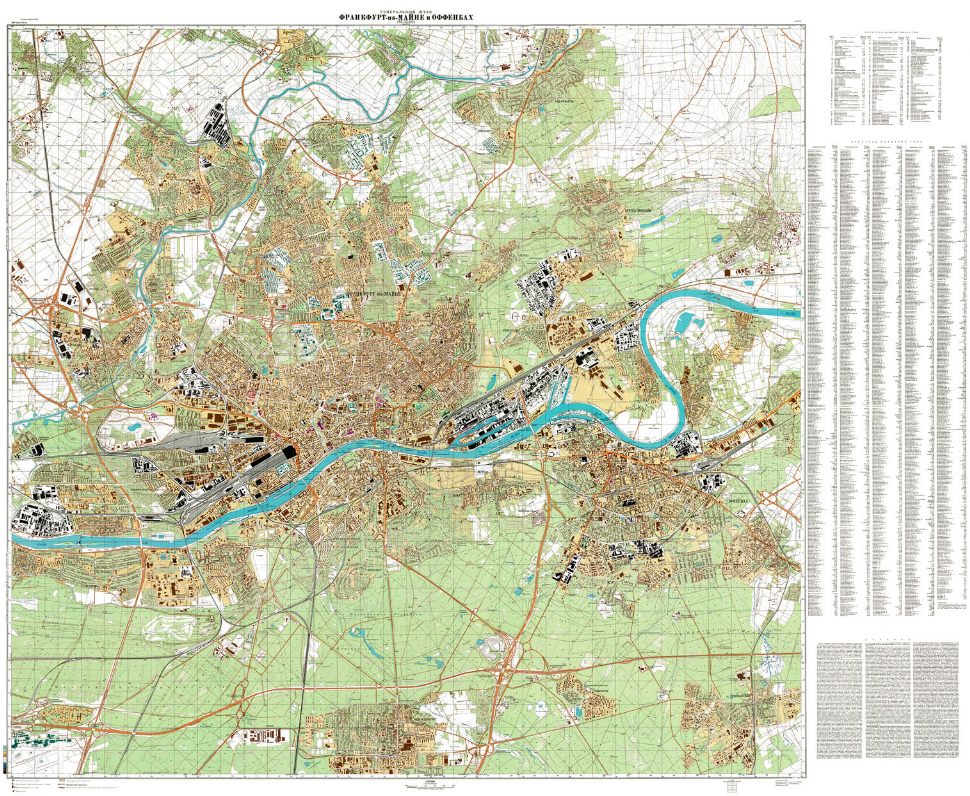

Figure 3. Composite image of the four-sheet 1983 Soviet military 1:10,000 city plan of Frankfurt am Main, West Germany (reproduced courtesy of a private collection). Each 500 m x 500 m grid square was inspected during the course of this comparison.

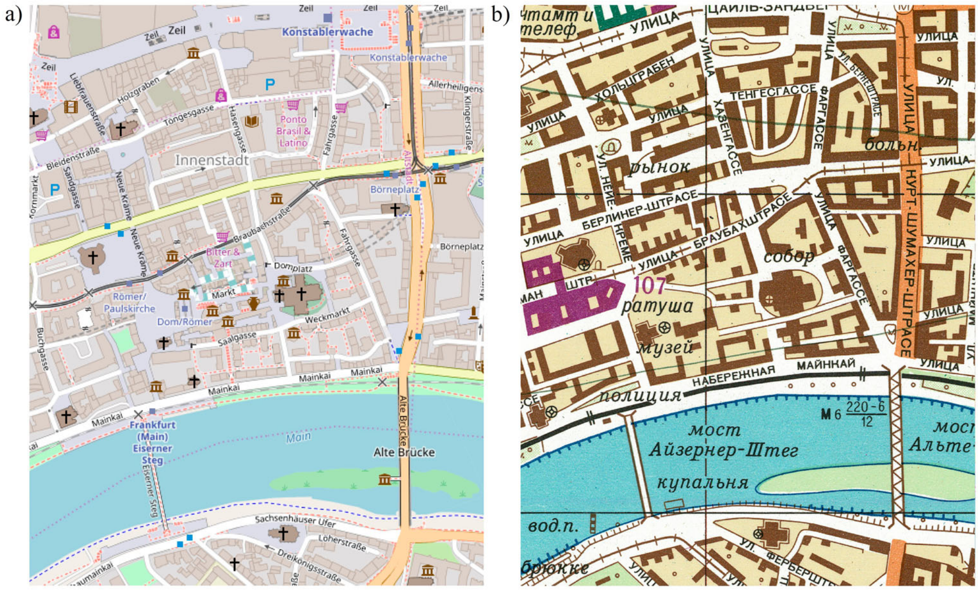

Figure 4. Central part of Frankfurt am Main, Germany, (a) on the OSM standard layer (originally 1:8,000) (© OpenStreetMap contributors, licensed under CC BY-SA 2.0), and (b) on the Soviet 1:10,000 city plan (reproduced from a private collection).

of Frankfurt am Main and La Paz were respectively found to include the greatest and smallest number of Soviet symbols used among a global sample of 19 cities. Their inclusion in this comparison ensures that a wide spectrum of Soviet city plans, in terms of their comprehensiveness, is considered. Germany is also one of the most well-mapped countries on OSM (OpenStreetMap, 2021c). Port-au-Prince, which has a Soviet symbol count between that of Frankfurt am Main and La Paz, has been selected due to the extensive expansion of OSM coverage of the city in the aftermath of the 2010 earthquake (Kent, 2010).

As Soviet city plans are static paper maps (unlike the OSM standard layer, which can be viewed at 20 different zoom levels), this comparison uses one OSM zoom level to maintain consistency between the two projects. Since there is no zoom level at 1:10,000 (the scale of the Soviet plans in this study), the closest comparable scale in OSM of 1:8,000 is the most appropriate for ensuring a similar level of generalisation. The symbols appearing on the Soviet plans are counted by systematically inspecting each grid square on a high-resolution digital copy and recording every unique symbol this square contains (multiple instances of the same symbol were not recorded to avoid any influence that the geography of the three cities, i.e. similar features, may have on the range of symbols present). The same process is applied to OSM via the standard online interface. This results in counts for each type of symbol according to the landscape feature categories described in Table 1 for both the Soviet city plans and the OSM standard layer.

3.2.2 Results of the comparison of Frankfurt am Main, La Paz and Port-au-Prince

The emphasis on cultural features, as identified in the comparison of specifications, is also apparent in the analysis of their implementation on the maps (Figure 5). While the Soviet specifications included many more symbols in the 'Road transport' category than the OSM

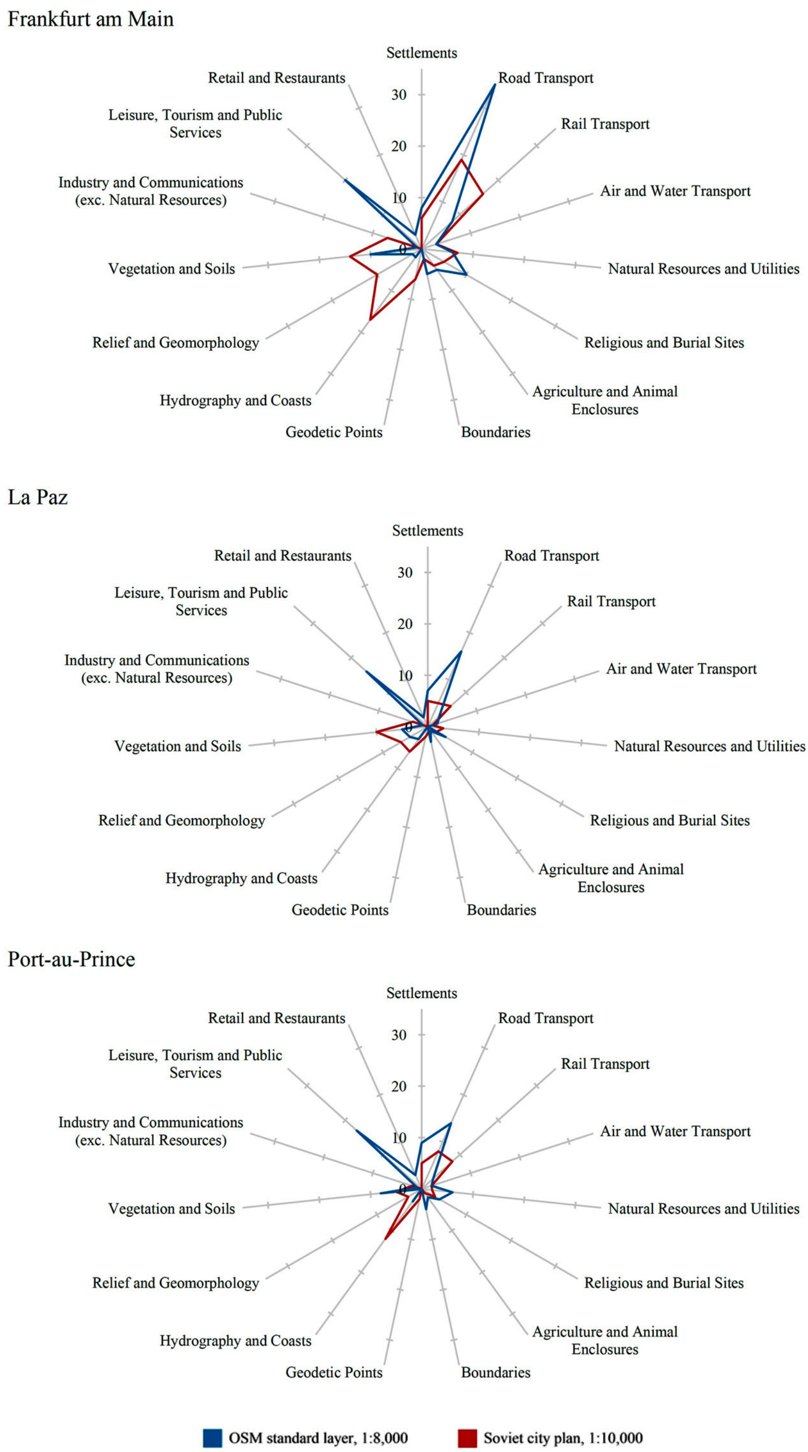

Figure 5. Star plot indicating counts of symbols by category used at least once on the Soviet city plans of Frankfurt am Main, La Paz and Port-au-Prince (1:10,000) and the equivalent areas on OSM (1:8,000).

equivalent, this is reversed on Soviet plans, with 35 OSM symbols and only 19, 5 and 8 Soviet symbols from this category used on the plans of Frankfurt am Main, La Paz and Port-au-Prince respectively. This difference is not due to the number of road classes displayed on the maps, which are broadly similar. Rather, the inclusion on OSM of smaller features such as 'gate', 'ford' and 'bollard', as well as additional information not appearing on the Soviet plan, such as a 'one way arrow', contribute to this higher symbol count. Of the 54 'Leisure, tourism and public services' symbols in the OSM legend, 20 (Frankfurt am Main), 16 (La Paz) and 17 (Port-au-Prince) are included in the OSM coverage of each city, which is still the largest or second largest category.

As indicated in Figure 2, the number of 'Vegetation and soils' symbols is much higher in the Soviet specifications than in the OSM legend. Although this is reflected on the maps of La Paz, the number of symbols in this category used on each map of Frankfurt am Main and Port-au-Prince is more similar, with only a very small range of Soviet symbols used (Figure 5). For Port-au-Prince, OSM uses marginally more symbols than the Soviet city plan. Many other categories have a consistently higher symbol count for OSM than for the Soviet plans, such as 'Religious and burial sites', 'Settlements', 'Boundaries', 'Agriculture and animal enclosures' and 'Retail and restaurants'. However, in mirroring the comparison of specifications, symbols from four categories are used much more extensively on the Soviet plan than on OSM: 'Relief and geomorphology', 'Hydrography and coasts', 'Industry and communications' and 'Geodetic points'.

While the absence of geodetic information on OSM may reflect a lack of significance to non-military users, the absence of other features on OSM that are common to Soviet city plans may suggest the unavailability of suitable open sources of these data, particularly those with standardised global coverage. For example, hydrographic information, including spot depths, isobaths and the condition of river banks, frequently appear on Soviet city plans, but are generally more scarce on OSM. Although higher-resolution global terrain and bathymetric datasets may become available, Soviet data may provide a useful interim and supplementary resource as well as offering a valuable historical record of dynamic phenomena and measuring impacts of climate change.

Irrespective of the city, there are some themes that are consistently covered in more detail (i.e. using a greater range of symbology) by Soviet mapping than OSM and vice versa. 'Vegetation and soils', 'Hydrography and coasts', 'Relief and geomorphology' and 'Rail transport' have a tendency to be covered in more detail on the Soviet plans than on the equivalent OSM mapping. The exception to this is Port-au-Prince, where OSM includes greater detail on 'Vegetation and soils'. Conversely, cultural features including 'Leisure, tourism and public services', 'Retail and restaurants' and 'Religious and burial sites' are consistently covered in more detail on OSM than the Soviet plans. OSM also includes a greater number of symbols in the 'Road transport' category.

4. Discussion and conclusion

With their global scope, multi-scale outputs, standardised symbologies and shared aim of completeness, several parallels can be drawn between Soviet maps and OSM. Similarities exist between these comprehensive mapping projects, despite their very different methods of production, intended functions, and the contrasting political and economic contexts from which they originated. However, the comparison undertaken in this paper also highlights the differences between these projects in their classification of landscapes as expressed through their symbologies, particularly in their varying content and contrasting priorities. For example, the prominence of social and cultural features on OSM (such as leisure, tourism and public services) contrasts with the Soviet focus on the physical environment (such as relief, hydrography, soils and vegetation cover).

These differences indicate thematic areas in which Soviet data may helpfully supplement OSM data, particularly in parts of the world with little existing coverage on official topographic maps and/or OSM. These data, which include elevation and terrain, are perhaps less likely to have changed in the intervening years than data regarding infrastructure and the built environment. They should therefore continue to have relevance for landscape assessments, particularly in conjunction with imagery and volunteered geographic information (VGI), for a range of applications including disaster relief. Any expansion of OSM data would need to be supported by a concordant development of its landscape classification and symbology, allowing users to add new features.

Although this study has utilised three city plans as a sample of Soviet military mapping, the bulk of the known cartographic output of the global project comprises topographic maps at several scales. There is considerable scope, therefore, to build on the research presented here by comparing OSM with Soviet topographic mapping of different areas and scales. This would reveal further insights into the potential complementarity of the two projects, in particular for rural or inaccessible areas where OSM coverage may otherwise be less detailed.

Harmonising the symbologies of OSM and Soviet maps presents an opportunity to create a more comprehensive global mapping solution. This is particularly relevant for urban areas, where Soviet city plans offer a rich source of detailed information regarding hydrography, vegetation, and terrain that could supplement OSM and broaden its range of applications. In turn, this could lead to the development of a more useful resource for OSM's existing user groups, including those in humanitarian contexts, as well as new OSM mapping communities with particular interests in archaeology, conservation, environmental management, geomorphology, tourism and other areas. The potential of this harmonisation to help address the challenges presented by the rapid urbanisation of populations in low-income and lower-middle-income countries builds upon the complementary approaches of Soviet mapping and OSM towards accuracy and completeness. Ultimately, this could provide a free, accessible, comprehensive, reliable and universal geospatial resource – a goal which has so far eluded many international collaborative mapping efforts.

Biographical Notes

Martin Davis is based in the Research and Higher Education Division of the Royal Geographical Society (with IBG) in London. After receiving the British Cartographic Society's inaugural Ian Mumford Award in 2015, Martin completed his PhD in Geography at Canterbury Christ Church University in 2018. He has been Editorial Assistant and Book Reviews Editor of *The Cartographic Journal* since 2014 and, in 2019, was appointed Executive Secretary of the International Cartographic Association (ICA) Commission on Topographic Mapping.

Alexander J. Kent is Reader in Cartography and Geographic Information Science at Canterbury Christ Church University in the UK, where he lectures on map design, GIS, remote sensing and on European and political geography. His research explores the relationship between maps and

society, particularly the intercultural aspects of topographic map design and the aesthetics of cartography. A former President of the British Cartographic Society, he is currently Editor of *The Cartographic Journal* and Chair of the International Cartographic Association (ICA) Commission on Topographic Mapping.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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