

Seeding Wikidata with Municipal Finance Data

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Abstract. ³ The paradigm shift from cash-based to accrual accounting in the public finances of Austrian municipalities as of 2020, together with the availability of uniform spending data from Austria provides an ideal environment to research the potential of Wikidata for improving awareness of public finance information.

The importance of publicly available municipal finance information is of significant interest for citizens to ensure trust in public spending and governance at a local level. It is all the more surprising that such spending data is hardly available. The present paper is a first push towards integrating comparable municipal finance data into Wikidata.

Our analysis reveals a lack of joint, standardized representation of common public spending data. Thus we have begun seeding Wikidata with a unified corpus of finance data from 379 Austrian municipalities by batch uploading, re-using already existing properties. Our approach is a first step towards the question whether and how Wikipedia and Wikidata could serve as spaces for information on public finances.

Keywords: Public Finances · Wikidata · Wikipedia · Municipal Spending · Local Governments · Open Spending Austria.

1 Introduction

Access to high quality and recent finance data is crucial both for decision makers in cities as well as for the public [3,20].

The current disruptive innovation [2] from cash-based to accrual accounting in the public finances of Austrian municipalities as of 2020, together with the availability of the multi-award-winning internet platform Open Spending Austria⁴, provides an ideal environment to research the international dimension and the potential of Wikidata for improving awareness of public finance information.

While empirical evidence shows that transparent budgets increase fiscal discipline, scholars argue that it is far from certain that accrual-based accounting

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⁴ <https://www.offenerhaushalt.at/english-information>

increases transparency [4], because of the high complexity of public finance information. Potential users such as journalists, CSOs, citizens, and even politicians often fail to take advantage of budget data being put in the public domain [14], because they are not expected to know the technicalities of accrual accounting principles and might have difficulty understanding the content of accrual accounting financial reports [5].

Indeed, for citizens to understand information regarding the financial performance and financial position of central and local governments, parallel actions need to be taken: publishing accounting information and educating citizens to provide them with the necessary skills to make use of this information [13].

We argue that, apart from top-down Open Government Data initiatives, free knowledge bases such as Wikidata⁵—which everyone can edit with the goal ”of creating a world in which everyone can freely share in the sum of all knowledge” [23]—can play an important part in both of these actions.

The aim of this paper is therefore to investigate and explore the potential of Wikidata to be a hub for (uniform, semantically aligned) municipal finance data. To this end, we began seeding financial data from 379 Austrian municipalities to Wikidata, by batch uploading and proposing re-use and extension of already existing properties, where possible/necessary (Section 3).

2 Background and Related Work

While we have access to a fairly complete corpus of systematically collected finance data for Austria (cf. Section 2.1), the international situation is highly fragmented, both in terms of available standards and available data (Section 2.2).

2.1 Open Spending Austria

Before the fiscal year begins, municipalities are required to prepare a budget (*Voranschlag*) containing all planned revenue, spending, capital spending, and borrowing, which has to be sent to the respective supervisory body [11]. The first budgets to comply with the new regulations were the planned budgets 2020.

Statistics Austria defines a dataset referred to as *GHD (Gemeindehaushaltsdatensatz)* [22] in the XML format, which is the format municipalities are required to deliver their financial data in. The specified GHD dataset includes financial statement (*Rechnungsabschluss*) (i.e. the actual spending data of a year, e.g., 2020) as well as the planned budget for the next year (e.g., 2021). The municipalities that voluntarily take part in the free Open Spending Austria platform can upload their data in this format, which is then visualized.⁶ The uploaded data is not only displayed but is also transferred into a simple CSV

⁵ <https://www.wikidata.org>

⁶ For example, the three-component system for the city of Eisenstadt <https://www.offenerhaushalt.at/gemeinde/eisenstadt>

format⁷ and delivered to the Austrian open government data portal data.gv.at⁸, which then transfers the dataset to the European data portal.⁹ As most of the Austrian municipalities are not actively publishing data on the national portal data.gv.at, but instead (at least for financial data) are uploading their own data to Offenerhaushalt.at, our platform can be regarded as primary data source. The municipalities agree to make their uploaded data available with a CC-BY-4.0 license. This license makes it possible to publish it in Wikidata, since the "reference URL" property (P854) can be used to take care of the required attribution.

2.2 International Public Finance Standards and Data

The use of standardized vocabularies increases open fiscal data re-usability and enables the comparative analysis of fiscal datasets. Unfortunately, the number of datasets that use standardized classifications for open fiscal data is very limited [15].

Very recently, a framework for the *IOTA (Interlinking of Heterogeneous Multilingual Open Fiscal DaTA)* has been proposed, which is the first approach to enable the multiregional, context-free, open interlinking of fiscal data in a scalable manner [17].

The *XBRL (Extensible Business Reporting Language)* is an open international standard for digital business reporting managed by a global not-for-profit consortium. [1]. Application of XBRL to public sector reporting is less common (with some implementations in Spain, Italy, and Brazil). US regulators have mandated the use of XBRL for several financial reporting requirements but have yet to apply the standard to state and local government reports [12].

Neither *IPSAS (International Public Sector Accounting Standards)*¹⁰ or *EP-SAS (European Public Sector Accounting Standards)*¹¹ being the main existing set of international accounting standards for use in the public sector [21], nor the *ESA 2010 (European System of Accounts)* [7] provide a public finance vocabulary or technical specification of a format; instead they are more akin to conceptual guidelines for public financial management.

While most international efforts on building collections of public finance data aim at the national level (e.g., International Monetary Fund, OECD, CIA World Factbook), the *PEFA (Public Expenditure and Financial Accountability)*¹² program also includes cities. However, the assessment of public finance management in this program consists of indicators (e.g., aggregate expenditure outturn, aggregate revenue outturn or revenue composition outturn), mostly in percentages, with no directly comparable monetary values.

⁷ <https://www.offenerhaushalt.at/gemeinde/eisenstadt/downloads>

⁸ <https://www.data.gv.at/katalog/dataset/36b5488d-96ed-441d-a621-c9b903b4f124>

⁹ <https://www.europeandataportal.eu/data/datasets/36b5488d-96ed-441d-a621-c9b903b4f124?locale=en>

¹⁰ <https://www.ipsasb.org/>

¹¹ <https://ec.europa.eu/eurostat/web/epsas/>

¹² <https://www.pefa.org/>

The *GMD (Global Municipal Database)* [10] is a collection of indicators for 109 municipal governments around the world, focusing on budget data and led by UN-Habitat and partners. It includes standardized municipal budget indicators (per capita finance data) for 94 cities, but hardly any recent data. The GMD indicates the following values in USD per year: budget per capita, own source revenue, own source revenue per capita, percent own source revenue, debt service payments, and debt service payments per capita. While this looks promising at first, a data download that appears to be available does not specify any license and does not work.¹³

On a European level, the *Urban Audit* project was introduced at the end of the 1990s in response to growing demand for an assessment of the quality of life in European towns and cities, with the project having been integrated into Eurostat ever since. The methodological handbook [6] lists the following financial indicators:

- CI2001V Total municipal authority income (euro)
- CI2002V Municipal authority income derived from local taxation (euro)
- CI2003V Municipal authority income transferred from national or regional government (euro)
- CI2004V Municipal authority income derived from charges for services (euro)
- CI2005V Municipal authority income derived from other sources (euro)
- CI2006V Total municipal authority expenditure (euro)

The original Urban Audit website seems to have been offline since 2014.¹⁴ While some data can still be found¹⁵ on the Web archive, the above-mentioned financial indicators seem to be missing in this data. However, even if these indicators are also missing in the more current Eurostat Urban Audit Database¹⁶, they could serve as a suitable reference for our task of identifying a set of suitable standardized indicators.

A platform for fiscal data storage, ingestion, metadata annotation, and visualization is available at *OpenSpending.org*, developed and maintained by the Open Knowledge Foundation, containing fiscal data records from public administrations, uploaded and maintained by civil communities. There are two formats available to visualize heterogeneous open fiscal data in comparable structures: Fiscal Data Package (FDP, a specification providing additional JSON metadata for CSV-formatted datasets) and OBEU Ontology (a way to represent fiscal datasets as RDF triples based on the Data Cube Vocabulary) [15]. The OBEU ontology was developed as part of the three-year EU-funded project OpenBudgets.eu [16].¹⁷ Parts of the project seem to have been integrated into the current

¹³ The Global Municipal Database: <https://data.unhabitat.org/datasets/cff85a47b416480bb4d46da27ba35d62>, accessed on April 1, 2021, resulted in an error indicating that it seems to have been removed.

¹⁴ http://web.archive.org/web/20140201000000*/www.urbanaudit.org

¹⁵ <https://web.archive.org/web/20120209094633/http://www.urbanaudit.org/CityCountryPDFLongList.aspx>

¹⁶ <https://ec.europa.eu/eurostat/web/cities/data/database>

¹⁷ <https://cordis.europa.eu/project/id/645833>

version of OpenSpending.org¹⁸, but the project website was shut down at the end of 2020.¹⁹

CSPF (European Cities for Sustainable Public Finances) is a European reference group in local public financial management that unites the Chief Executive Officers/Chief Financial Officers and Finance Managers of the Cities of Amsterdam (NL), Barcelona (ES), Bordeaux (FR), Hamburg (DE), the City of London Corporation (UK), and the City of Trondheim (NO). CSPF is the successor of what was previously known as the European City Economic and Financial Governance (CEFG) Group.²⁰ These cities include current expenditure data from 2015 [18] in their City Fact Sheets.

3 Municipal Finance in Wikidata

Summarizing our findings so far, neither a unique, comprehensive source of financial data at municipal level nor a widely accepted spending vocabulary seems to exist, a fact that fuels our drive to integrate and initiate such a collection in a bottom-up fashion as part of collaboratively maintainable sources such as Wikidata.

In order to populate Wikidata with municipal finance data, we first analyzed Wikidata’s schema for suitable properties, and in a second step added the respective seed corpus.

3.1 Finance Terminology

In Wikidata, many finance-related terms were identified by a simple search (again, using keyword search on entity labels). For the search, we used basic financial terms such as *budget*, *spending*, *revenue*, but also special vocabulary such as *accrual*. We also used special German terms that would ideally reflect our data such as *Auszahlung* (payments), *Einzahlung* (receipts), *Aufwand* (expense), *Ertrag* (revenue), *Voranschlag* (budget), and *Rechnungsabschluss* (closed accounts).

From this basic search we identified 36 terms as Wikidata items²¹ that are detailed in Table 1 such as

- Q271855 (government budget, 52 instances, mostly state budgets from New Zealand and the UK),
- Q41263 (budget, 40 instances, mostly for US state budgets),
- Q27998498 (public budget, 1 instance),
- Q850210 (revenue, 2 instances) or
- Q385503 (tax revenue, 1 instance), and
- Q294324 (public household, 0 instances).

¹⁸ <https://blog.okfn.org/2017/08/16/openspending-platform-update/>

¹⁹ https://web.archive.org/web/20200101000000*/openbudgets.eu

²⁰ <https://www.cspf.eu>

²¹ <https://www.wikidata.org/wiki/Help:Items>

Table 1. Wikidata finance items.

ID	Item name	Item description
Q192803	double-entry bookkeeping system	seamless, chronological and factual ordered recording of all business processes in a company based of documented evidence
Q192907	financial statement	formal record of the financial activities and position of a business, person, or other entity
Q240673	cost	value of money that has been used up to produce something
Q271855	government budget	government document presenting the government's proposed revenues and spending for a fiscal year
Q294324	public household	economic unit, the State with all its public budgets
Q350205	income	propagation of financial assets
Q384475	accrual	in finance, adding together of interest or different investments over a period of time
Q385503	tax revenue	income gained by governments through taxation
Q444600	budget deficits	(Differenz der Ausgaben und Einnahmen eines öffentlichen Haushalts mit Ausnahme der Nettokreditaufnahme)
Q784285	(Auszahlung)	(Abfluss an Zahlungsmitteln aus einem Zahlungsmittelbestand)
Q850210	revenue	income that a business has from its normal business activities
Q868257	economic value	measure of the benefit provided by a good or service to an economic agent
Q949180	financial accounting	field of accounting concerned with the summary, analysis and reporting of financial transactions related to a business
Q1275989	(Vermögensgegenstand)	(alle materiellen und immateriellen bilanzierungsfähigen Sachen und Rechte)
Q1309918	(Einzahlung)	
Q1363492	single-entry bookkeeping system	method of bookkeeping relying on a one sided accounting entry to maintain financial information
Q1416409	(Finanzierungssaldo)	Wikimedia disambiguation page
Q1499548	monetary value	
Q1527264	income	consumption and savings opportunity gained by an entity within a specified timeframe
Q1642280	value adjustment	(Korrekturposten auf der Passivseite der Bilanz)
Q2135289	Rechnungsabschluss	
Q2467512	Voranschlag	
Q2598003	Haushaltssaldo	
Q2695445	budget surplus	opposite of Q444600
Q3707847	bookkeeping	recording of financial transactions
Q4116214	accounting	measurement, processing and communication of financial information about economic entities
Q11788946	budget surpl s (<i>sic!</i>)	
Q13516686	expense	use or service to be provided to achieve a certain benefit
Q15077368	income	sum of the economic performance
Q27998498	public budget	government document explaining public spending
Q60158614	bookkeeping system	
Q77370351	funding source	
Q91776508	financial record	type of record (document or otherwise) containing financial information

However, since our goal was to add Wikidata factual statements²² to existing entries of (Austrian) municipalities, we particularly looked for suitable properties in order to model these statements on finance figures. The seven Wikidata properties²³ identified are shown in Table 2.

Table 2. Wikidata finance properties.

ID	Property name	Property description
P2139	total revenue	income gained by an organization during a given time frame. Not to be confused with fiscal revenue
P2232	cash	the value of cash and securities held by a state government
P2402	total expenditure	amount of spending by this public or private entity, not to be confused with fiscal expenditure
P2403	total assets	value of assets held by a private or public entity
P2769	budget	assigned monetary amount for a project (for the estimated cost of a film, also commonly referred to as budget, use P2130)
P2770	source of income	source of income of an organization or person
P3087	fiscal/tax revenue	fiscal revenue of a public entity (not for private entities)

The following SPARQL query was used in order to retrieve values for property usage, with the result shown in Table 3:

```
SELECT (COUNT (DISTINCT ?item) AS ?count) WHERE {
  ?item wdt:P2769 ?value.
  # omit next line to count all occurrences
  ?item wdt:P31/wdt:P279* wd:Q15284.
}
```

Table 3. Counting usage of Wikidata properties.

ID	Property name	Used in Municipalities (Q15284)	Used in total	Percent
P2139	total revenue	4	12789	0.03%
P2232	cash	0	1	0.00%
P2402	total expenditure	51	601	8.49%
P2403	total assets	1	1783	0.06%
P2769	budget	32	4997	0.64%
P2770	source of income	4	362	1.10%
P3087	fiscal/tax revenue	1504	1658	90.71%

²² <https://www.wikidata.org/wiki/Help:Statements>

²³ <https://www.wikidata.org/wiki/Help:Properties>

The following properties were selected for the task of uploading the first spending data from Austrian municipalities to Wikidata: *budget*, because it is more frequently used in Wikidata than revenue, and it is used in the Global Municipal Database (budget per capita), *total expenditure*, which would equal CI2006V in Urban Audit and is also more frequently used for municipalities in Wikidata. “Fiscal/tax revenue” (P3087) was discarded, because it cannot be exactly matched to the data from Austrian municipalities, where a distinction is made between revenue from own taxes (CI2002V in Urban Audit) and revenue from fees (CI2004V in Urban Audit). The other properties seemed hardly to be used for municipalities (total revenue, source of income) or would require different data (cash, total assets).

3.2 Data Preparation and Uploading

In order to test the feasibility of Wikidata as a public knowledge graph to store financial information about municipalities, we prepared current data from Open Spending Austria. Since the information available about all of the Austrian municipalities in Wikidata already includes their GKZ (*Gemeindekennziffer*, an Austrian municipality key), it was only necessary to retrieve a list of all of the municipalities in order to get their Wikidata IDs. After downloading the resulting CSV, the Q numbers were added to the table in order to prepare for the upload of statements to Wikidata.²⁴

Aside from manual data entry, Wikidata provides the following alternatives for batch adding data:

- The *primary sources tool*²⁵ was broken at the time of writing (end of March 2021).
- *Mix’n’match*²⁶, which is especially useful if data to be imported has to be matched to Wikidata IDs. Since all Austrian municipalities including their GKZ (municipal identifier) were already present in Wikidata, this was not necessary.
- *QuickStatements*²⁷, a tool for batch uploading data using simple text commands.
- Pushing data from the source via the *Wikidata API*.²⁸ or programming a *bot*.²⁹

Furthermore, the WDPPlus framework leverages Wikidata to link, search and augment tabular data [9], but we did not explore this approach further.

²⁴ see <https://w.wiki/394M> for the SPARQL to retrieve Austrian municipalities

²⁵ https://www.wikidata.org/wiki/Wikidata:Primary_sources_tool

²⁶ <https://meta.wikimedia.org/wiki/Mix'n'match>

²⁷ <https://quickstatements.toolforge.org/#/>

²⁸ <https://www.wikidata.org/w/api.php>

²⁹ https://www.wikidata.org/wiki/Wikidata:Creating_a_bot

For our purposes, batch uploading data from 2021 to Wikidata via QuickStatements proved sufficient, where we used the regular command sequence syntax, which can be prepared via spreadsheet. The following line shows the command sequence for the first entry, for the city of Eisenstadt (Q126321):

```
Q126321 P2769 42256600U4916 P585 +2021-00-00T00:00:00Z S854
"https://www.offenerhaushalt.at/gemeinde/eisenstadt"
/* added municipal budget */
```

The command sequence, separated by tabs, can be explained as follows:

- Q126321: tem (Eisenstadt)
- P2769: property (budget)
- amount and unit (Q4916 is euro, but has to be indicated as U4916)
- P585 (point in time)
- 2021: year indicated in full notation
- S854 (reference URL)
- reference URL in quotation marks
- comment (between /* */)

This sequence was copied and pasted into the QuickStatement tool. Tests were carried out using “import V1 commands” in order to obtain a correct sequence. Then “run in background” was selected. After minor corrections of remaining errors, the following results now document the Wikidata batch uploading process:

- Announcement and discussion on the Wikidata project chat³⁰
- First batch, budget data: <https://quickstatements.toolforge.org/#/batch/51980>, done on March 29, 2021.
- Second batch, total expenditure: <https://quickstatements.toolforge.org/#/batch/52118>, done on April 2, 2021.

Furthermore, the information from Wikidata was manually added to the articles about Eisenstadt in the English³¹ and German³² Wikipedias. While it was possible to enter data into the fact box in the English Wikipedia, it was not possible to do so in the German Wikipedia, which is why we proposed a change to the specialized template for the fact boxes about Austrian municipalities there.³³

4 Lessons Learned

The finance terminology in Wikidata is very heterogeneous: Many items exist, some with very ambiguous or unclear meaning. The same is true for Wikidata

³⁰ https://www.wikidata.org/wiki/Wikidata:Project_chat#Municipal_finance_data

³¹ <https://en.wikipedia.org/wiki/Eisenstadt>

³² <https://de.wikipedia.org/wiki/Eisenstadt#Haushalt>

³³ Vorlage Diskussion:Infobox Gemeinde in Österreich

properties. The Wikidata community is currently engaged in an ongoing discussion about whether the data should be provided in the city items or whether separate items like “City of Eisenstadt” should represent the city administration rather than “Eisenstadt”³⁴, an issue that resembles the “classic” W3C TAG Issue-14 discussions.³⁵ Just recently, the *Govdirectory* project has started aiming to improve the data model on government agencies.³⁶

While our batch upload of two financial values (budget and expenditure) for 379 Austrian municipalities (that had uploaded spending data for 2021 at the time) was easy to implement, it is a valid seed in our opinion, which can be regularly updated and did not result in any negative feedback from the community.

The integration of this data into Wikipedia fact boxes appears less straightforward, but will be followed up upon.

Even though the research community agrees on the importance of financial data being made available in an easy-to-understand form [3,5,14,20], actual availability is surprisingly poor in general and certainly still underdeveloped in Wikidata and Wikipedia.

5 Conclusions and Future Work

Our research demonstrated the lack of availability of current, easy-to-find municipal financial information, even though specialized databases and international initiatives have long been established.

Given these circumstances, it is not surprising that the Wikidata ontology is large and messy, with numerous underpopulated classes and uneven depth. [19]

Our future work will be targeted at building a public finance knowledge graph from the Austrian municipal finance data as well as continuing to suggest improvements to the Wikidata ontology as well as publishing more data from Austrian municipalities.

While we see a chance to overcome the lack of uniform, semantically aligned financial data within collaborative encyclopedic databases, the general interest in municipal financial information seems to be rather limited so far in the Wikipedia/Wikidata ecosystem of voluntary editors: Even though a lot of specialized vocabulary already exists, it is hardly used. This is in line with the findings of Müller-Birn, who suggests to investigate and study Wikidata usage in various disciplines, in particular from a non-technical perspective [8], which is in effect where we are coming from.

Wikipedia and Wikidata could serve as spaces for municipal finance information, for which we hope the present work will provide a good starting point.

³⁴ https://www.wikidata.org/wiki/Wikidata:Project_chat/Archive/2021/04#Municipal_finance_data

³⁵ <https://www.w3.org/2001/tag/issues.html#httpRange-14>

³⁶ https://www.wikidata.org/wiki/Wikidata:WikiProject_Govdirectory

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