Report on the Public Contracts of the Canadian Government

March of 2020

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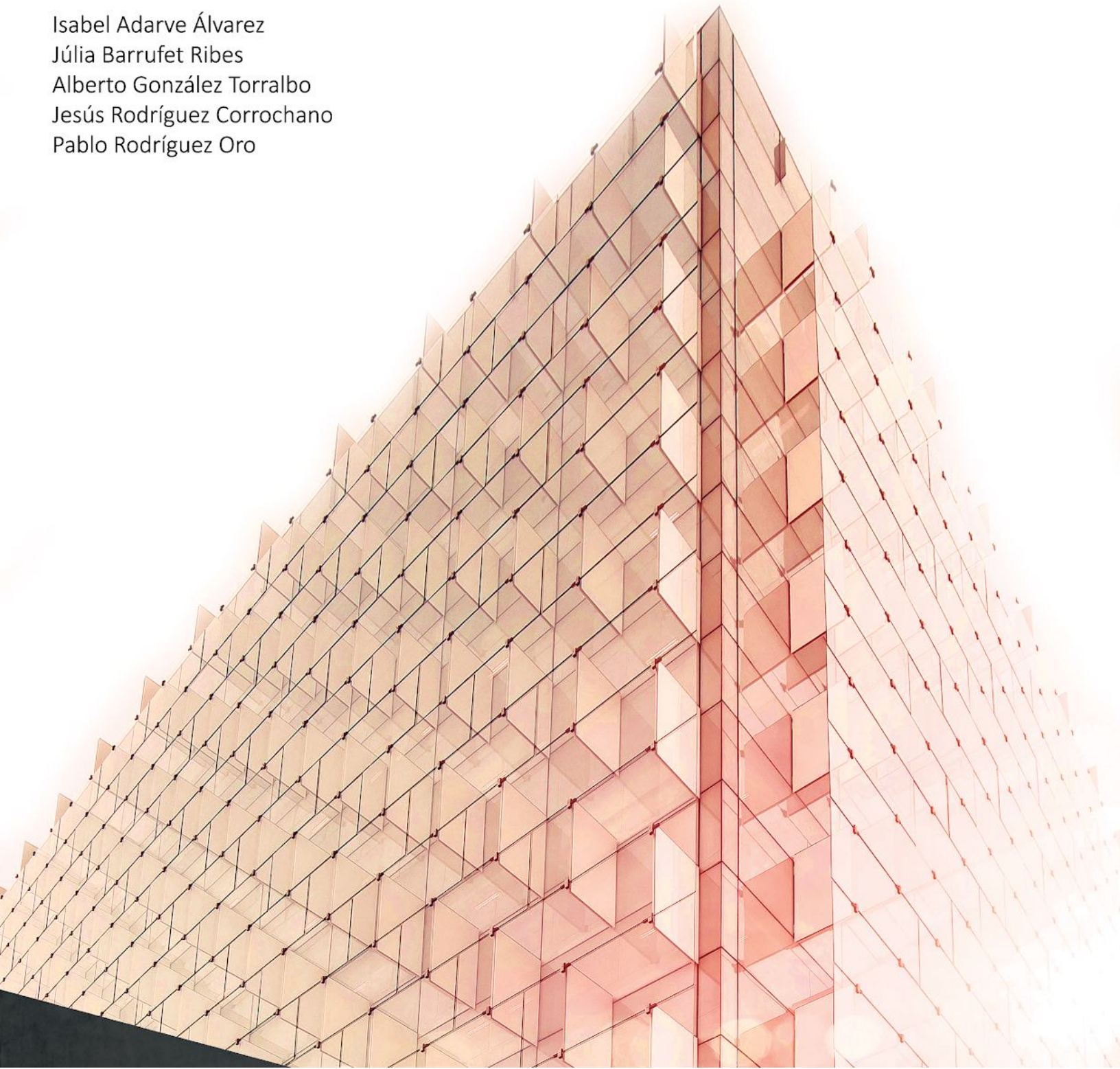


SUMMARY

INTRODUCTION

This report contains an analysis of public procurement from the Government of Canada for the month of March 2020. The purpose of this report is to obtain information about the contracts issued in this time and to provide an overview on the overall expending. The overview can be broken down into three sections: a budget breakdown by department, the main suppliers by department and a breakdown by province.

The data used has been gathered from the Government of Canada website's Contract History dataset on the 2019-2020 fiscal year in CSV format. This data was then cleaned and transformed into RDF.

Then we will run queries to extract data from this RDF, the third query will have linked data from an external dataset in its result.

Finally, we will show three different reports that use the data extracted from the three queries we runned before. We will finish this work making some conclusions about this application, what we learned and about the subject.

METHODOLOGY

The data

The analysis provided in this report has been developed with the information gathered in the Contract History page from the Canada Open Government site and available under an Open Government License, so we are free to: Copy, modify, publish, translate, adapt, distribute and use the information in any medium, mode or format for any lawful purpose.

The data studied corresponds to the month of March of 2020. Information about the public contracts, the supplier and end user entity for each contract has been extracted from this source in order to develop this analysis.

The dataset

The dataset used contains information about contracts awarded by the Government Services and Public Works of Canada since January 2009, however, we used information from March of 2020.

In order to achieve that, we performed the following transformations:

- We erased all the rows that did not contain information in the month of March.
- We removed columns with redundant or trivial information that was not useful for making this report.
- Since some rows have no ASCII characters we had to get rid of them since they would cause problems related to SPARQL queries outputs.

After this set of operations we will have a dataset with three different classes with their different properties:

- Contract: Using contract-number as the ID and properties like date or the contract value.
- Supplier: Using the legal name as the ID and location attributes and the number of employees as properties.
- EndUser: Using the name of the contracting organization as the ID and location attributes as properties as well. The province of the contracting organization is reconciled with wikidata and labeled as wikiProvince.
- City: This class collects the cities of the suppliers and the end users of the contracts, their values are reconciled with wikidata.

We will use this reconciliation to link this csv with the wikidata database, so we can get the number of inhabitants of these provinces since we do not have the number of inhabitants in our original dataset.

In order to study the data previously described, the CSV file was transformed into an RDF file. This document was built through an RML mapping provided by a Yarrrml script using Matey.

We made the queries against this nTriples file that contains our whole dataset structured as an RDF graph. The queries were made using python importing **rdflib**. For more information about the queries please check the annex 1.

Reproducibility

Reproducing this report is actually a semi-automatic task, it can be done with every dataset that the Canadian Government provides us.

Once we have chosen a dataset from a year, the first thing we should do is filter the month or quarter or even year we want to keep, then remove the results that do not fit to the timeline chosen.

Then we apply the json file that will apply the transformations required to have the data ready to be transformed into and RDF.

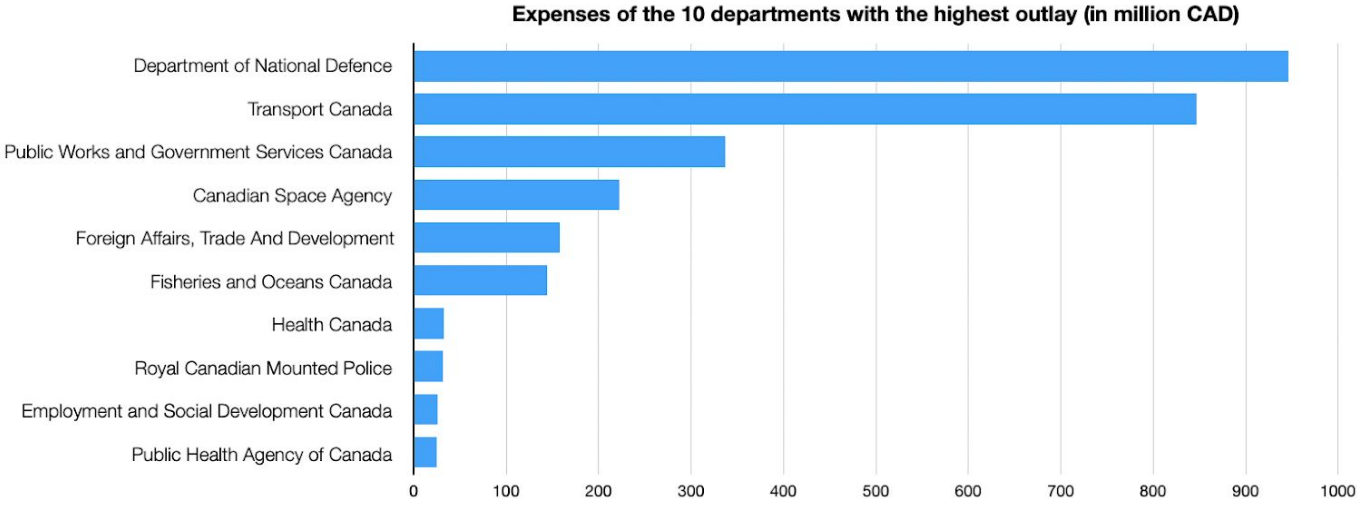
Since the Yarrrml will be the same code for this new timeline, we have to introduce the new dataset in the matey, resulting in a new mapping for this new dataset. Finally, with this mapping we can compute the data in an Ntriples file that will be our RDF graph. We can make SPARQL queries against this file to extract the data.

PUBLIC PROCUREMENT OVERVIEW

Expenses breakdown by department

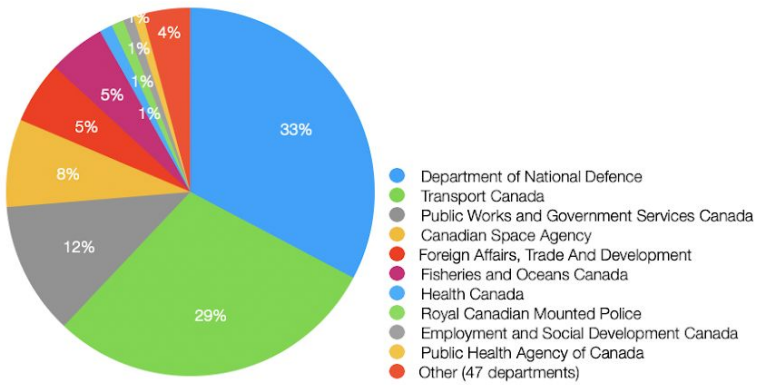
During the month of March a total of 2890 million CAD (canadian dollars) were spent by the Canadian Government on public contracts. These contracts were issued by 57 departments of the Canadian Government to various companies based mainly in Canada, USA and the UK.

As we can see below, the department that spent a higher amount on public contracts is the Department of National Defense, which spent almost one million dollars (a third of this month's outlay). This department is followed by Transport Canada, the expenses of which represent almost another third of the total outlay. The departments following these in amount of expenses are Public Works and Government Services Canada, the Canadian Space Agency, the Foreign Affairs, Trade And Development department and Fisheries and Oceans Canada.



Expenses breakdown by department (in million CAD)

Government Department	Total expenses
Department of National Defence	945,836
Transport Canada	846,849
Public Works and Government Services Canada	336,838
Canadian Space Agency	222,847
Foreign Affairs, Trade And Development	158,033
Fisheries and Oceans Canada	144,606
Health Canada	32,355
Royal Canadian Mounted Police	31,806
Employment and Social Development Canada	25,950
Public Health Agency of Canada	24,684
Other (47 departments)	120,564



Leading companies by department

The following table shows which are the supplying companies that received a higher income from each of the top ten previously presented government departments. We can also see what proportion of each department's expenses was dedicated to that leading company.

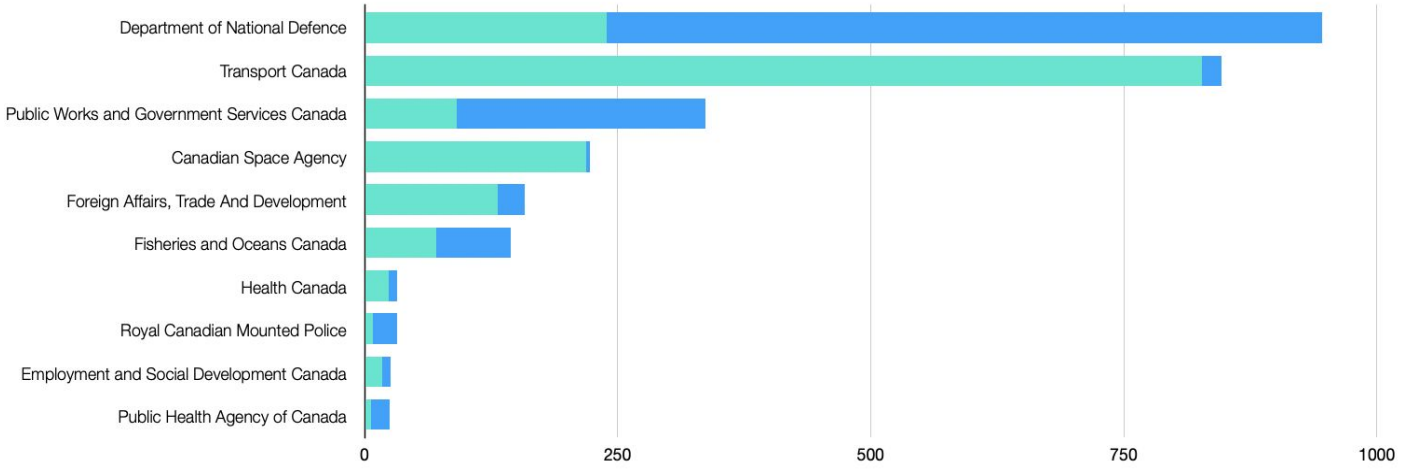
In the case of Transport Canada and the Canadian Space Agency, 98% of the department's expenditures were dedicated to the corresponding leading companies which are, respectively, Mid-Canada Mod Center and MacDonald Dettwiler & Associates Corporation. For the rest of departments, this percentage is above 25% (with a mean value of 57.14%) meaning that the government spends more than half of the public contract budget on these leading companies.

Finally, by observing the amounts spent on each of these companies, we can see that the highest expenditure has been on Mid-Canada Mod Center (more than 800 million CAD by Transport Canada), followed by the United States department of the navy (by the Department of National Defense) and the MacDonald Dettwiler & Associates Corporation (by the Canadian Space Agency).

Expenses on the main company by department (in million CAD)

Department	Supplier	Expenses on the main company	Total expenses	% of the main company
Department of National Defence	United States department of the navy (NAVSEA)	239,445	945,836	**25,32%**
Transport Canada	Mid-Canada Mod Center	827,270	846,849	**97,69%**
Public Works & Government Services Canada	Maple Reinders Constructors Ltd, Construction Demathieu & Bard (CDB) inc.	90,838	336,838	**26,97%**
Canadian Space Agency	MacDonald Dettwiler & Associates Corporation	218,774	222,847	**98,17%**
Foreign Affairs, Trade And Development	Siemens Ltd. Seoul	131,800	158,033	**83,40%**
Fisheries and Oceans Canada	Vancouver Shipyards Co. Ltd.	70,839	144,606	**48,99%**
Health Canada	Cossette Media inc.	23,422	32,355	**72,39%**
Royal Canadian Mounted Police	Quorex Construction Services Ltd.	8,282	31,806	**26,04%**
Employment and Social Development Canada	Deloitte inc.	17,350	25,950	**66,86%**
Public Health Agency of Canada	D.S.L. Diagnostic Products Incorporated	6,313	24,684	**25,58%**

Proportion of expenses on the main company by department (in million CAD)



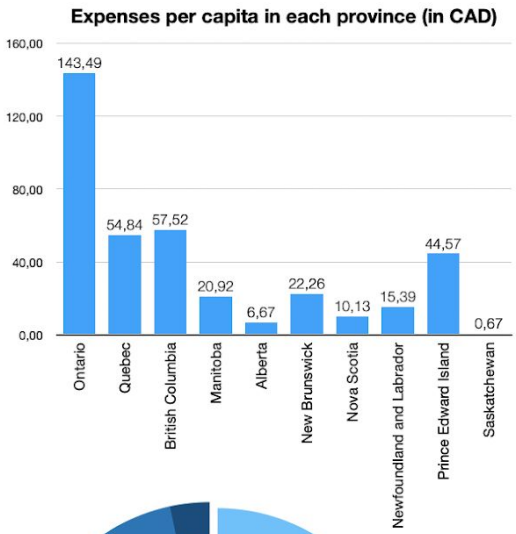
Expenses breakdown by province

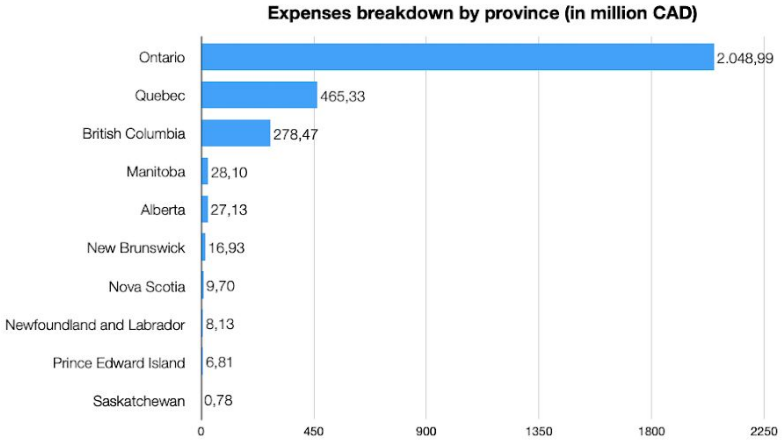
In this section we show how government expenditures on public contracts are distributed among provinces. We see that 71% of the outlay is produced in the province of Ontario, where the country's capital (Ottawa) and Canada's largest city (Toronto) are found. Therefore, the reason for this large percentage is that most of the public contracts issued in this province will benefit the whole country, not only Ontario's citizens. It is worth mentioning that 97% of the money dedicated to public contracts is spent in only three provinces: Ontario, Quebec and British Columbia.

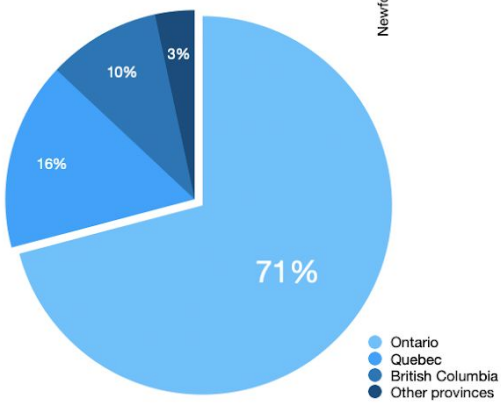
In the top-right graphic we can see the per capita expenditures in each province, calculated as the ratio between the total expenses in public contracts of the province and its population. Considering the total expenses of the country and its total population, a mean value of 37.65 CAD per capita were spent on public contracts. The large value for Ontario could be explained by the reasoning provided above. Even disregarding this value, we can see that per capita expenditures in Quebec and British Columbia are considerably above the mean. Another detail to notice is that even Saskatchewan is the 6th largest province in population, its per capita outlay is 56 times smaller than the mean while in Prince Edward Island, the smallest province in population, the expenditures per capita are way above the mean, being the fourth province with a higher outlay per capita.

Expenses breakdown by province

Province	Expenses (million CAD)	% of total expenses	Population	% of population	Per capita expenditure
Ontario	2.048,99	70,89%	14279196	39,03%	143,49
Quebec	465,33	16,10%	8484965	23,19%	54,84
British Columbia	278,47	9,63%	4841078	13,23%	57,52
Manitoba	28,10	0,97%	1343371	3,67%	20,92
Alberta	27,13	0,94%	4067175	11,12%	6,67
New Brunswick	16,93	0,59%	760868	2,08%	22,26
Nova Scotia	9,70	0,34%	957600	2,62%	10,13
Newfoundland and Labrador	8,13	0,28%	528430	1,44%	15,39
Prince Edward Island	6,81	0,24%	152784	0,42%	44,57
Saskatchewan	0,78	0,03%	1168057	3,19%	0,67







CONCLUSIONS

We fulfilled an analysis of this information, trying to expose the most relevant facts of these contracts using the designed queries in order to do it. You can find the result of this learning in the Public procurement overview section of this document.

Canada has raised positions in the global military ranking during the last years; the country has increased the number of personnel from 88.000 in 2018 to 108.300 in 2020. This fact can be reflected in the first query, the expenses breakdown by department provided in the Public procurement overview section.

It makes sense that Ontario, Quebec and British Columbia have 97% of the expenses in the whole country, this is due to its proximity to the USA and their most relevant cities in the west and east coast.

By doing this report, the whole team has developed their skills in RDF generation, SPARQL queries and the use of Linked data. We can prove this knowledge because we prepared the dataset specially for this purpose, we designed proper queries to answer our needs of information and we used reconciled resources to extract information from other databases that are different from our dataset.

EXTERNAL

The Jupyter Notebook used to generate the queries and obtain the data has been provided as an external resource.