CARMA 2026

8th Int. Conf. on Advanced Research Methods and Analytics
1-3 July 2026, Valencia, Spain
DOI: https://doi.org/10.4995/CARMA2026.2026.21889

Public debt by municipality in Veracruz, Mexico 2024. In search of reliable data.

Diana Donají Del Callejo Canal, Margarita Edith Canal Martínez, René Mariani Ochoa[3], Flor Lucila Delfín Pozos

[1]Instituto de Investigaciones en Estudios Superiores, Económicos y Sociales (IIESES), Universidad Veracruzana, México, [2]Instituto de Investigaciones en Estudios Superiores, Económicos y Sociales (IIESES), Universidad Veracruzana, México, [3]Instituto de Investigaciones en Contaduría, (IIC), Universidad Veracruzana, México, [4]Instituto de Investigaciones en Contaduría, (IIC), Universidad Veracruzana, México.

How to cite: Del Callejo Canal, D. D.; Canal Martínez, M. E.; Mariani Ochoa, R.; Delfín Pozos, F. L. (2026). Public debt by municipality in Veracruz, Mexico 2024. In search of reliable data. In: 8th International Conference on Advanced Research Methods and Analytics (CARMA 2026). Valencia, 26-28 June 2026. https://doi.org/10.4995/CARMA2026.2026.21889

Abstract

All debt represents an obligation, especially when it is public in nature, as it must answer to the respective institution and, ultimately, to the citizens who comprise it. The Observatory for the Management and Control of Public Resources (OGECORP-UV) aims to calculate the public debt per capita in each of the 212 municipalities of the state of Veracruz, Mexico. To do so, it was necessary to consult five official sources. Tools for automating tabular data were used as part of the data processing stage, revealing discrepancies in the official information. After several analyses and personal consultations, the correct data was identified. This work highlights three issues: a) information not readily accessible to a non-specialized audience; b) the need for information technology expertise within academia; and c) the importance of human input in achieving the objective.

Keywords: *Automatic data extraction; public debt; Veracruz; official statistics*

1. Introduction

In Mexico, as in the broader international context, the growing social demand for a more equitable, efficient, and transparent use of public resources has led to the creation of mechanisms to monitor and evaluate public expenditure management from a territorial perspective.

Within this framework, the Observatory for the Management and Oversight of Public Resources (OGECORP) of the Institute of Accounting at Universidad Veracruzana was established as an

Article in Press

This work is licensed under a Creative Commons License CC BY-NC-SA 4.0
Editorial Universitat Politècnica de València

academic space devoted to the analysis, monitoring, and systematic measurement of compliance with laws, operating rules, and regulatory provisions applicable to investment processes, transparency, and accountability in the allocation and use of public resources, particularly at the municipal level (Universidad Veracruzana, 2026).

The state of Veracruz, located in southeastern Mexico, has an estimated population of approximately eight million inhabitants distributed across a territorial area of nearly 71,800 km² and is politically organized into 212 municipalities. The state is characterized by significant natural wealth and cultural diversity—including the presence of various Indigenous communities—as well as a diversified economic structure encompassing agricultural, tourism, industrial, port, and petroleum activities. These features position Veracruz as a strategic territory for analyzing national and subnational economic dynamics.

In this context, public debt constitutes a financial instrument through which governments obtain additional resources to finance activities aimed at economic and social development (Villegas, 2017). However, pursuant to Article 134 of the Political Constitution of the United Mexican States (2026), such resources must be administered under principles of efficiency, effectiveness, economy, transparency, and integrity to fulfill the purposes for which they were allocated (Government of Mexico, n.d.).

In alignment with this constitutional framework, the Financial Discipline Law for Federative Entities and Municipalities (Ley de Disciplina Financiera de las Entidades Federativas y los Municipios LDFEFM) was enacted in 2016 with the primary objective of promoting budgetary balance and ensuring sustainable levels of indebtedness at both the state and municipal levels. Under this law, local legislatures, by a two-thirds majority vote, must authorize maximum amounts for long-term obligations and financing, specifying the purpose of the resources, the source of repayment, and their duration (Ruelas-Ávila, Jiménez, & Letelier-Saavedra, 2023). Consequently, the analysis of municipal public debt is particularly relevant in a country characterized by pronounced territorial disparities such as Mexico.

Based on these premises, OGECORP undertook the task of generating, in an initial phase, four indicators for the 212 municipalities of Veracruz: (1) Debt burden per capita; (2) Debt service coverage ratio; (3) Municipal budget availability ratio; and (4) Debt-to-income ratio.

During the construction of the first indicator—debt burden per capita—a significant methodological challenge emerged: the existence of at least five official sources reporting municipal public the 2024 debt information, each using different formats, reporting criteria, and levels of disaggregation. Given this fragmented information landscape, automation tools were employed to extract and process tabular data during the data integration stage.

This article highlights three central findings: (a) information on municipal public debt in Veracruz is fragmented and not easily accessible to non-specialized audiences; (b) there is a

Article in Press

growing need to strengthen competencies in automation and artificial intelligence within the academic sector to facilitate data access and processing for research purposes; and (c) despite the indispensable role of information technologies, the human dimension—through institutional dialogue and direct verification—remains essential to ensuring data reliability.

2. Methodology

Public debt data for the 212 municipalities of the state of Veracruz for fiscal year 2024 were collected from five sources (see table 1):

Table 1. Type, methodology, and challenge of the five sources. Public debt (2024).

Source	type	Method	Challenge
The municipality itself, through its official website.	37% of municipalities have information.	Exclude	Lack of information
The Ministry of Finance and Public Credit (SHCP), through a Public Single Registry (RPU).	Consultation portal with Excel download capability (SHCP, 2026). Wide format.	Read in R-Studio. Municipality as a key variable for union tables.	The name of the municipality as a key variable, because of the accents, the lowercase and uppercase and the similar names (e.g., Ixhuatlán del Café, Ixhuatlán de Madero, Ixhuatlán del Sureste, Ixhuatlancillo).
The Municipal Information System of INEGI	Downloadable Excel files (INEGI, 2025). Long format.	Read and transform the table into a wide format, with Municipality as a key variable for union tables.	The name of the municipality as a key variable, because of the accents and the similar names (e.g., Ixhuatlán del Café, Ixhuatlán de Madero, Ixhuatlán del Sureste, Ixhuatlancillo).
ORFIS, through its 212 individual audit reports for 2024.	212 PDF format (ORFIS, 2026a).	An algorithm was designed in RStudio with an automated process to extract structured information from 212 PDF documents. (see section 2.1.)	In the transformation phase, the extracted values are cleaned and converted to a numeric format, removing thousands of separators and standardizing their structure for quantitative analysis.

Article in Press

ORFIS2 through a table included in the Public Accounts for 2024. report in PDF format for 2024. (ORFIS, 2026b).	1 report in PDF format for 2024. (ORFIS, 2026b).	An algorithm was designed in R-Studio with an automated process for extracting structured information from 1 specific table into PDF format.	The extracted values are cleaned and converted to a numeric format, removing thousands of separators and standardizing their structure for quantitative analysis.

2.1. Automation process architecture for source d)

An algorithm was designed in RStudio (Posit Software, 2023), with an automated process for extracting structured information from 212 PDF documents. The system follows a pipeline approach, composed of five sequential modules: data reading, preprocessing, entity extraction, variable transformation, and structured storage. This architecture corresponds to a rule-based information extraction approach, characterized by its efficiency in contexts where documents have a semi-standardized structure.

- In the ***data reading phase***, the identification and bulk loading of PDF documents contained in a specific directory is performed, generating a set of input files for iterative processing.
- Subsequently, in the ***preprocessing module***, each document is transformed into plain text using PDF parsing techniques, preserving the page segmentation.
- The ***entity extraction module*** implements rules based on regular expressions and textual heuristics. Specifically, the municipality name is identified by locating the pattern “INDIVIDUAL REPORT” and extracting the subsequent line. For the public debt variable, a global search is performed in the document, identifying the line that contains the descriptor "Public Debt" and extracting numerical values associated with estimated debt and accrued debt.
- In the ***transformation phase***, the extracted values are cleaned and converted to numeric format, removing thousands of separators and standardizing their structure for quantitative analysis.
- Finally, in **the structured storage module**, the processed data is consolidated into a tabular format, generating a dataset that integrates the variables of interest (municipality, estimated debt, accrued debt and source file name), which is exported to an Excel file for further analysis.

The validation of the rule-based extraction system was performed by comparing the automatically extracted values with a manually validated reference sample.

Article in Press

The datasets were subsequently integrated into a single table, a process that required change tables from long format to wide format and cleaning the key variable used for merging: the municipality name. In Veracruz, several municipalities have highly similar names (e.g., Ixhuatlán del Café, Ixhuatlán de Madero, Ixhuatlán del Sureste, Ixhuatlancillo), in addition to inconsistencies related to the use of accents, uppercase and lowercase letters, depending on the formatting standards of each information source.

Once the unified dataset was constructed, descriptive statistics and graphical analyses were employed to compare and visualize the public debt figures reported by each official source for the end of fiscal year 2024. The main intention of this section was to notice whether there were differences in the information. The plan was never to exhaust the differences through systematic processes, but to be able to consult with the official source.

Subsequently, a direct consultation with ORFIS was necessary, based on the compiled information, to determine which figure was reliable and to clarify the reasons for the discrepancies. ORFIS provided the necessary guidance and tools to ensure the reporting of accurate and validated data.

3. Results

After reviewing the available information on municipal public debt, the following scenario was identified:

- Not all municipalities have an official website, and not all of those that do maintain an official website report the requested data. Information was located for 78 municipalities (37%). Therefore, this source was excluded as a reliable data source.
- The Ministry of Finance and Public Credit (SHCP) reports information for 199 of the 212 municipalities (94%).
- INEGI reports information for 193 of the 212 municipalities (91%).
- ORFIS, through its individual audit reports, provides information on accrued debt for 192 of the 212 municipalities (90%).
- ORFIS, through the Public Accounts report (ORFIS2), reports information for 202 of the 212 municipalities (95%).

None of the sources provided complete (100%) municipal-level information for Veracruz. The reasons for this absence of information remain unknown at this stage and constitute a pending line of inquiry with the institutions responsible. Based on the available data, a preliminary comparison using descriptive statistics was conducted.

Article in Press

Table 2. Descriptive statistics for public debt in the State of Veracruz, 2024, by source of information.

Source	Max.	Min.	Media	Median	St. Dev.
SHCP	436,509,935.97	1,436,830.36	10,466,759.67	3,844,233.85	34,141,393.90
INEGI	80,228,535.00	64,147.00	4,796,310.49	1,073,757.00	10,156,321.24
ORFIS	80,228,534.81	64,147.00	4,789,828.65	1,064,525.99	10,180,929.45
ORFIS2	868,427,730.80	1,436,830.37	18,440,266.77	4,772,235.67	72,591,344.21

Prepared using data from the cited sources.

As shown in Table 2, the discrepancy in the information collected by each source is significant. The scatter plot with a 45° line clearly illustrates the similarities and differences between the information sources (see Figure 1). If the points are close to the 45° line, there is similarity; if they are outside the line, there are discrepancies. Therefore, as shown in Figure 1, there is some similarity between the SHCP and ORFIS2, and some similarity between INEGI and ORFIS.

Based on these results, a personal visit was made to ORFIS to seek guidance. Staff members of the institution provided clear explanations:

INEGI and ORFIS report public debt for a single fiscal year—in this case, 2024—and discrepancies were identified in 10 municipalities; a follow-up consultation with INEGI remains pending.

The information reported by SHCP and ORFIS2 corresponds to total accumulated debt, with discrepancies observed in 31 municipalities. According to ORFIS (2024b), these differences are attributable to a lack of registration and updating of the following financing instruments and/or obligations: (a) PROFISE zero-coupon bonds that were not included in SHCP records; (b) public–private partnerships not operating within the Public Single Registry (RPU) managed by SHCP; and (c) short-term obligations that were not registered in SHCP's RPU.

4. Conclusions

After consulting five official sources to analyze municipal public debt in the State of Veracruz, the information was found to be fragmented and presented in different formats (Excel in wide format, Excel in long format, and PDF), depending on the source consulted.

Comparing the data requires advanced skills in automated data extraction, as well as proficiency in specialized software for merging and integrating datasets. The process for merge different tables through a key variable and extracting structural information from 212 PDFs are both generalizable to any similar situation.

A direct consultation with ORFIS was necessary to understand these differences. INEGI and ORFIS report public debt balances specifically for fiscal year 2024, whereas SHCP and ORFIS2 report the total accumulated debt.

Article in Press

The final decision was to use the ORFIS2 data, as it proved to be the most comprehensive and reliable source because a) report the total accumulated debt and b) contemplates the full financing instruments and/or obligations. This finding demonstrates that, in matters of municipal public debt, although the information is technically available, it is neither clear nor readily accessible to the public. The role of OGECORP is therefore to support citizens in accessing this information in a more efficient and user-friendly manner.

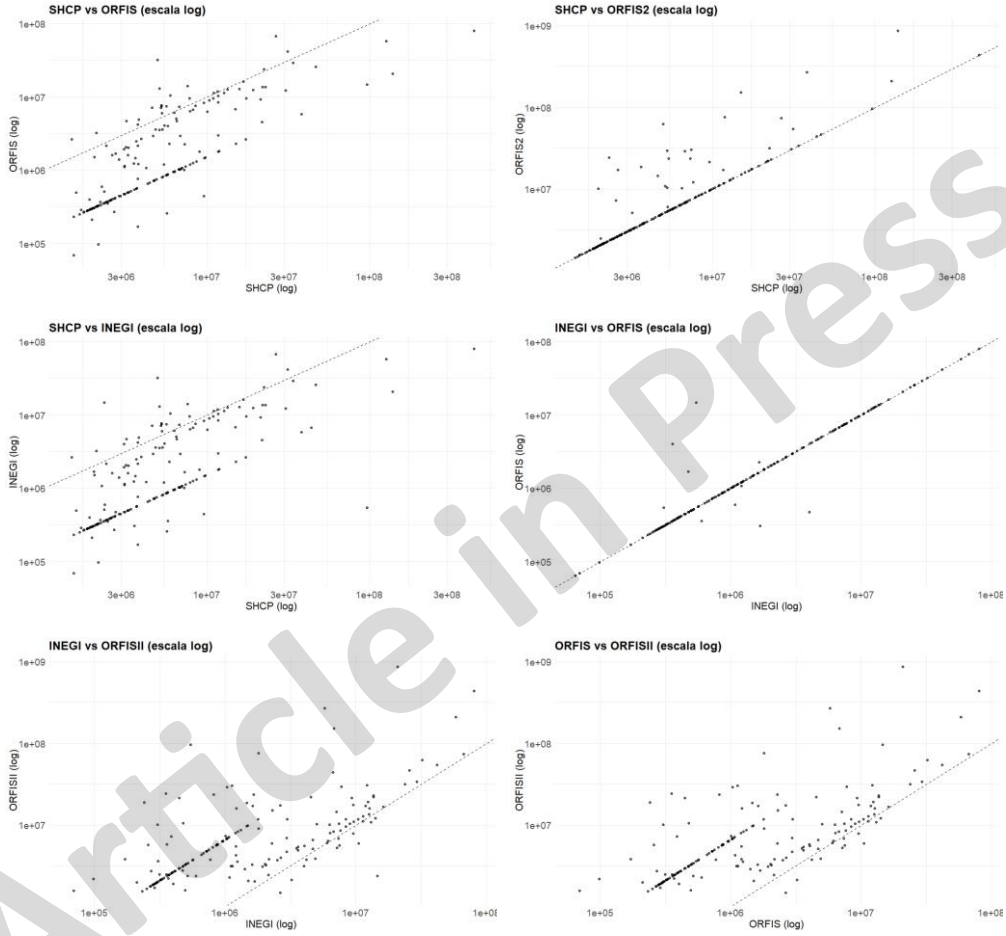


Figure 1. The scatter plot with a 45° line. Similarities and discrepancies between information sources

Article in Press

Acknowledgements

The authors used ChatGPT (OpenAI) exclusively for language editing and translation purposes. The intellectual content, analysis, and conclusions are entirely the authors' own.

References

Gobierno de México (2026) Artículo 134 de la Constitución Política de los Estados Unidos Mexicano. Reforms published in the Diario Oficial de la Federación on January 29, 2016. (PDF). https://www.gob.mx/cms/uploads/attachment/file/130421/ARTICULO_134.pdf

Instituto Nacional de Estadística y Geografía (INEGI) (2025). Finanzas públicas estatales y municipales 2024. https://www.inegi.org.mx/programas/finanzas/#tabulados

Órgano de Fiscalización Superior del Estado de Veracruz (ORFIS) (2026a). Tomo III. Informe general del resultado de la fiscalización superior entes municipales, Cuenta Pública 2024a. https://www.orfis.gob.mx/CuentasPublicas/informe2024/Tomo%20III.html

Órgano de Fiscalización Superior del Estado de Veracruz (ORFIS) (2026b). Informe general: Deuda pública. Cuenta pública 2024b (Tomo II, Vol. 1). https://www.orfis.gob.mx/CuentasPublicas/informe2024/archivos/Tomo%20II/Volumen%201/002%20Informe%20General%20Deuda%20Publica%20CP%202024.pdf

Posit Software (2023). RStudio: Integrated development environment for R (Version 2023.12.1) [Software]. https://posit.co/

Ruelas-Ávila, I., Jiménez, J.-P., & Letelier-Saavedra, L. (2023). Las decisiones de deuda en los municipios frente a la ley de disciplina financiera: *Evidencia y lecciones de política. Gestión y política pública*, 32(2), 97–129. https://doi.org/10.60583/gypp.v32i2.8122

Secretaría de Hacienda y Crédito Público (SHCP) (2026). Disciplina Financiera de Entidades Federativas y Municipios 2024. https://www.disciplinafinanciera.hacienda.gob.mx/es/DISCIPLINA_FINANCIERA/_2024

https://www.disciplinafinanciera.hacienda.gob.mx/es/DISCIPLINA_FINANCIERA/Registro_Publico_Unico

Universidad Veracruzana (2026). Observatorio de Gestión y Control de Recursos Públicos – Universidad Veracruzana. https://www.uv.mx/ogecorp/

Villegas Corona, V. A. (2017). Deuda pública de las entidades federativas y municipios en México: hacia un modelo de transparencia y vigilancia de los recursos. *Estudios En Derecho a La Información*, *1*(3), 57–81. https://doi.org/10.22201/iij.25940082e.2017.3.10824

Article in Press