

# Mapping the Third Republic

## A Geographic Information System of France (1870–1940)

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Published in *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 54(4), 189–207.

<https://doi.org/10.1080/01615440.2021.1937421>



# The TRF-GIS

- The TRF-GIS ecosystem: a database and a data paper.
- Why an ecosystem?
- Methods and content.
- FAIR data in practice.

# The TRF-GIS Ecosystem

## A Database and a Data Paper

# The TRF-GIS Ecosystem: A Database

- The TRF-GIS: a GIS for Third-Republic France.



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- Annual nomenclatures and shapefiles (1870–1940):
  - General administrative constituencies: départements, arrondissements, cantons, communes.
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- Accessible at <https://dataverse.harvard.edu/dataverse/TRF-GIS>.

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- Content:
  - Elements of context.
  - Detailed description of historical and technical methods.
  - Detailed description of data files.
  - Advice on usage.

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# Why an Ecosystem?

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- A response to the reproducibility crisis in the (social) sciences. [Wilkinson et al. \(2016\)](#) [Christensen and Miguel \(2018\)](#)
- The Third Republic:
  - Unprecedented production of administrative statistics. [Desrosières \(1993\)](#)
  - Administrations operating at heterogeneous levels of aggregation.
  - Context of profound socio-economic changes.
- Revival of quantitative research in history. [Ruggles \(2021\)](#)



# Why an Ecosystem?

- France lags behind other countries (NHGIS, CAMPOP).
  - A few départements and cantons shapefiles, but not FAIR.  
[LARHRA \(2011\)](#)
  - No common frame of reference (nomenclatures), no documentation.
  - Waste of time, little interoperability, reduced credibility.

# Why an Ecosystem?

- A few exceptions:
  - cassini.ehess for general administrative constituencies.  
[Motte et al. \(2003\)](#) [Motte and Vouloir \(2007\)](#)
  - HGIS for transportation infrastructures.  
[Thévenin et al. \(2013\)](#) [Mimeur et al. \(2018\)](#)
  - HGIS for communes (ANR-COMMUNES). [Litvine et al. \(2022\)](#)

⇒ The TRF-GIS = documented and reproducible frame of reference.

# Why an Ecosystem?

- Data + data paper necessary and go hand in hand.
- Complete documentation of the production process.

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- Data + data paper necessary and go hand in hand.
  - Complete documentation of the production process.
  - Response to the lack of value given to data production.
    - Little incentives for research evaluations.
    - Little credit to data producers.
- ⇒ A citable data paper can align incentives.
- Bet on creation of public good with positive externalities.

# Methods and Content

# Methods and Content

- General methodology.
- Limitations.
- Institutional details.
- Data records.
- Technical validation.

# General methodology

# General Methodology

- TRF-GIS infrastructure builds on three elements:
  - ① INSEE's *Code Officiel Géographique* (COG) nomenclatures of communes (2005, 2011).



# General Methodology

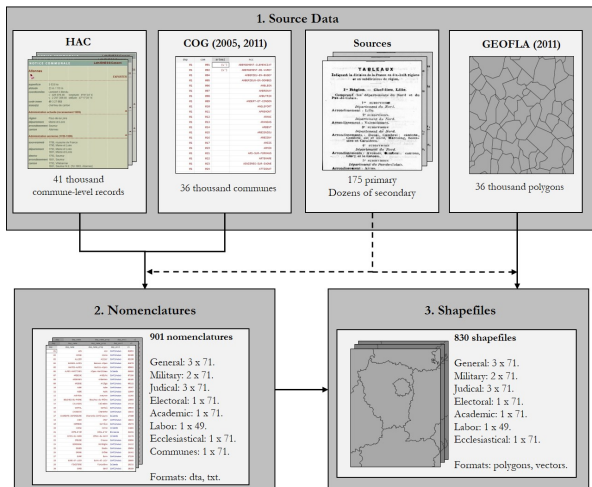
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  - ③ IGN's *GEOFLA Communes 2011 France Métropolitaine* shapefile (RGF93 Lambert-93 projection, 1:25,000).

# General Methodology

## Construction logic of the TRF-GIS



# TRF-GIS Shapefiles

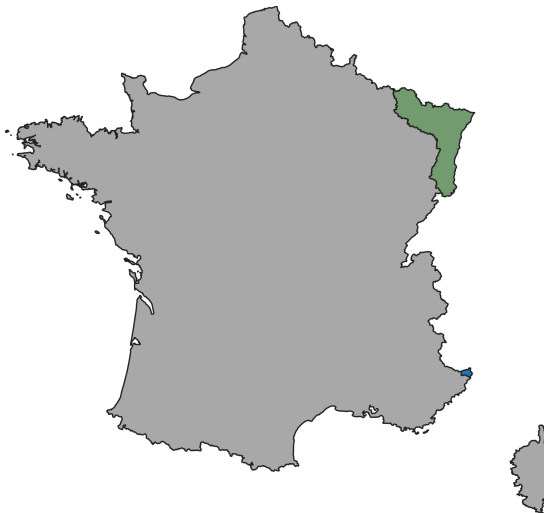
- GEOFLA 2011 as underlying frame except for:
  - Alsace-Lorraine (1871–1918).
  - La Brigue and Tende (1870–1940).

# TRF-GIS Shapefiles

- GEOFLA 2011 as underlying frame except for:
  - Alsace-Lorraine (1871–1918).
  - La Brigue and Tende (1870–1940).
- Of the 36,568 communes of 2011:
  - 36,566 represented for 1870 and 1919–1940.
  - 34,932 represented for 1871–1918.

# TRF-GIS Shapefiles

Missing territories compared to IGN's GEOFLA 2011



# TRF-GIS Shapefiles

- Assign to each commune a general administrative constituency following HAC.
- HAC 2005 geography → 2011 COG → GEOFLA 2011.

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- HAC 2005 geography → 2011 COG → GEOFLA 2011.
- Issue: communes created after 1870.
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  - Assign constituencies of parent commune.



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  - Assign constituencies of parent commune.
- Dissolve commune-level polygons into general constituencies.
- Basis for special administrative constituencies.

# TRF-GIS Nomenclatures

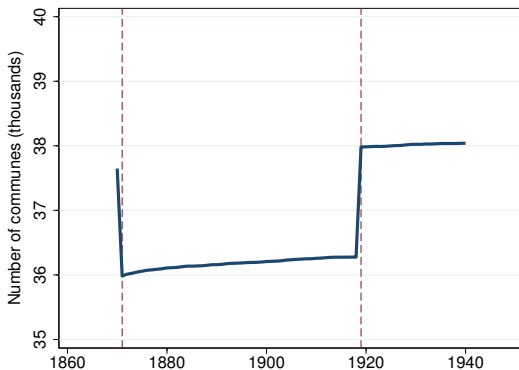
- General constituencies: toponyms and codification from HAC.
- Special constituencies: archival sources.

# TRF-GIS Nomenclatures

- General constituencies: toponyms and codification from HAC.
- Special constituencies: archival sources.
- Commune-level nomenclatures: only contemporaneous communes.
  - Minimum: 35,974 communes in 1871.
  - Maximum: 38,038 communes in 1939–1940.

# TRF-GIS Nomenclatures

Number of communes in commune nomenclatures



# Municipal Arrondissements (Paris, Lyon, Marseilles)

- Different treatment of 45 municipal arrondissements of PLM:
  - GEOFLA: independent elements (36,610 entities; 36,568 communes).
  - COG and HAC: no differentiation (PLM = 3 entities).

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  - GEOFLA: independent elements (36,610 entities; 36,568 communes).
  - COG and HAC: no differentiation (PLM = 3 entities).
- TRF-GIS:
  - Distinguishes 20 arrondissements of Paris (stable since 1859).
  - Lyon and Marseilles unique entities (changes since 1870).

# Limitations

# Shapefiles Limitation 1

- Delineations of communes in 2011 geography.
  - GEOFLA 2011 earliest IGN shapefile accessible open license.
  - Commune boundaries: ANR Communes (2019–2022).  
[Litvine et al. \(2022\)](#)



# Shapefiles Limitation 1

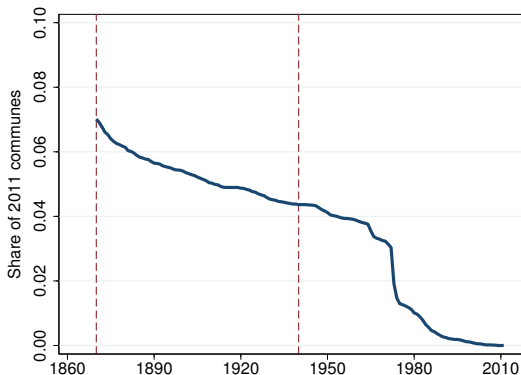
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- Not a dramatic issue.
  - Limited changes in commune boundaries: less than 7%.
  - Constituencies defined at higher levels of aggregation.

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  - Not a dramatic issue.
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    - Constituencies defined at higher levels of aggregation.
- ⇒ Usage for national / regional extents.

# Shapefiles Limitation 1

Share of 2011 communes with modifications

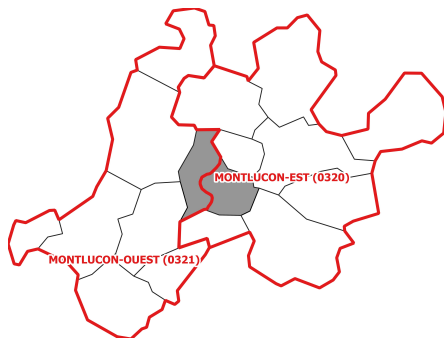


# Shapefiles Limitation 2

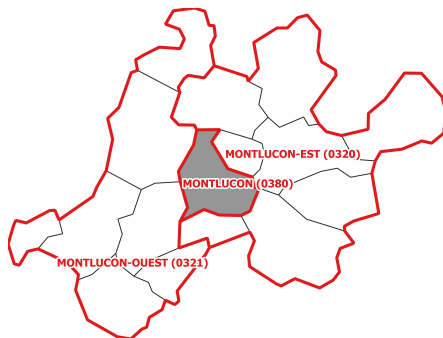
- Constituencies defined across commune boundaries (e.g., cantons).
  - No issue for nomenclatures.
  - Shapefiles: communes as base units.
  - Follow INSEE and IGN methodology: pseudo-constituencies.
  - Cross-walks documented in the database.

# Shapefiles Limitation 2

Cantons and pseudo-cantons of Montluçon (1870–1940)



(a) Cantons



(b) Pseudo-cantons

# Institutional Details

# General Administrative Constituencies

- Annexation (1871) and recovery of Alsace-Lorraine (1919):
  - 1,694 communes (Bas-Rhin, most Haut-Rhin, parts Moselle, Meurthe, Vosges).
  - Reconfiguration:
    - Haut-Rhin → Belfort
    - Meurthe and Moselle → Meurthe-et-Moselle.
    - Changes in arrondissements and cantons 1871–1873.
  - Recovery:
    - Belfort and Meurthe-et-Moselle unchanged.
    - Former Haut-Rhin, Bas-Rhin, Moselle: recover pre-war structure.
    - Keep changes under German rule.

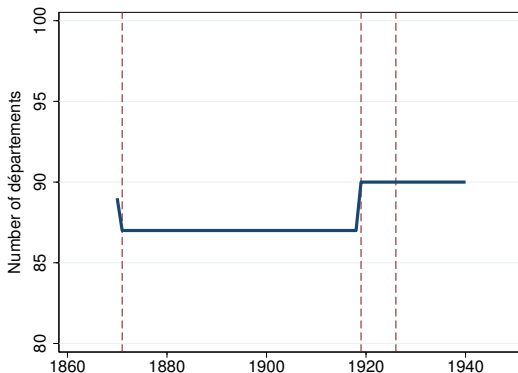
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    - Keep changes under German rule.
- Arrondissement reform of 1926: 106 suppressions, 4 re-established by 1940.



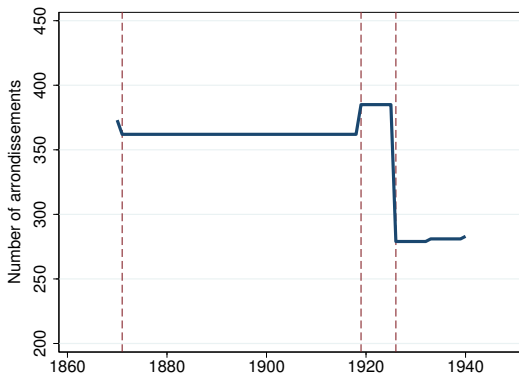
# General Administrative Constituencies

Number of départements



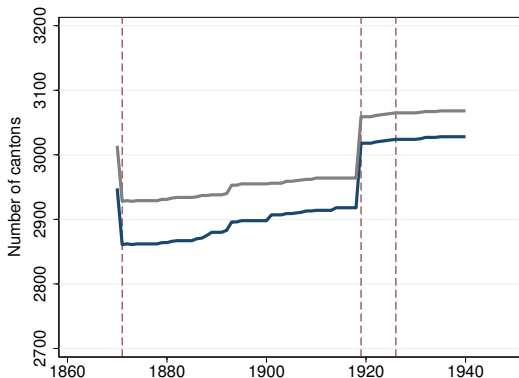
# General Administrative Constituencies

Number of arrondissements



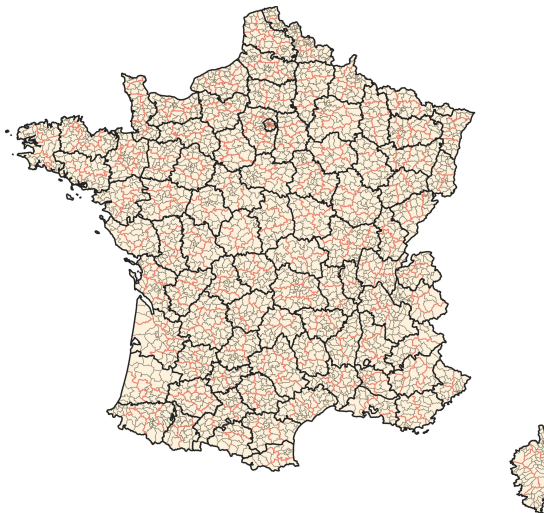
# General Administrative Constituencies

Number of cantons and pseudo-cantons



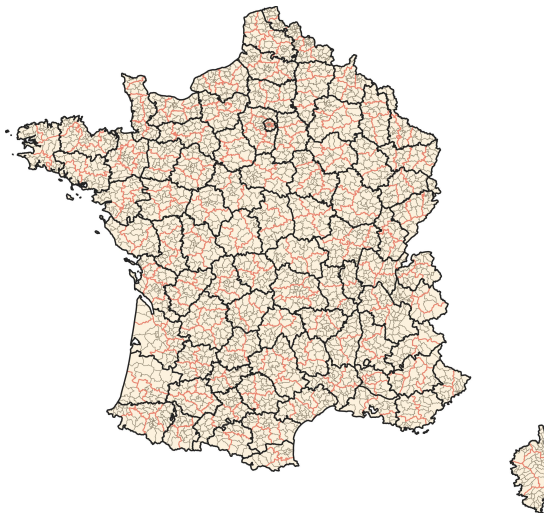
# General Administrative Constituencies

General administrative constituencies in 1870



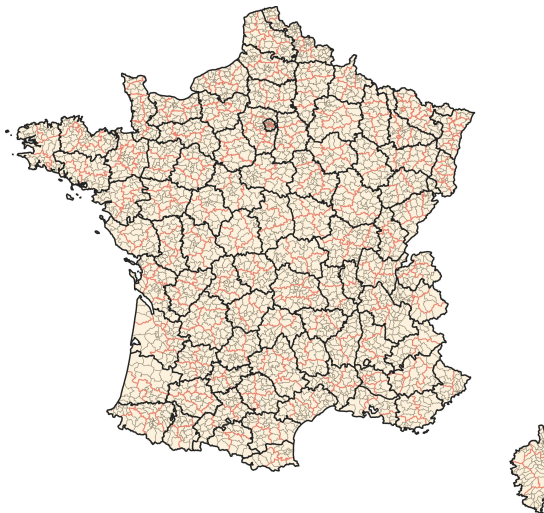
# General Administrative Constituencies

General administrative constituencies in 1871



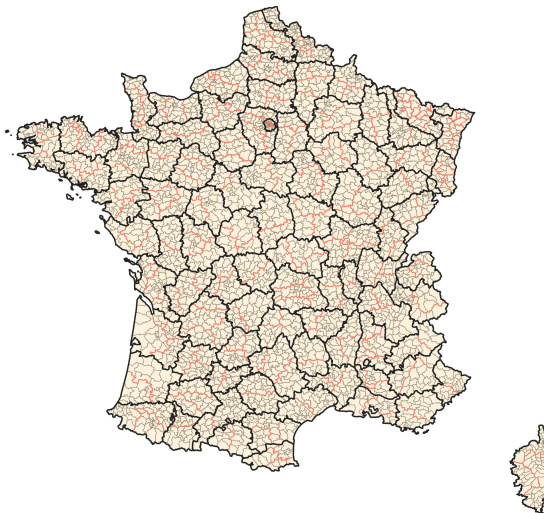
# General Administrative Constituencies

General administrative constituencies in 1919



# General Administrative Constituencies

General administrative constituencies in 1926



# Military Constituencies

- 1870–1873:
  - Army corps subdivided into military divisions.
  - Follow départements.



# Military Constituencies

- 1870–1873:
  - Army corps subdivided into military divisions.
  - Follow départements.
- 1874–1940:
  - Military regions subdivided into subdivisions of military regions.
  - Follow arrondissements and cantons (except PLM).
  - After 1920s: nesting subdivisions into départements.

# Military Constituencies

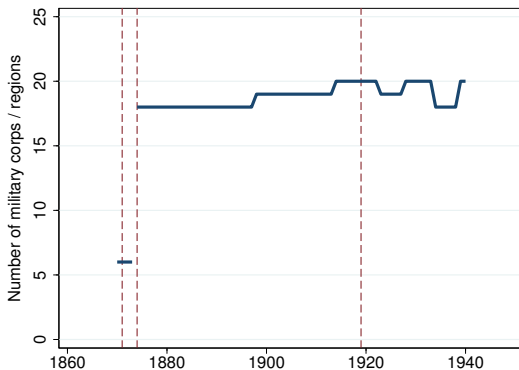
- Construction for 1870–1873:
  - Match with département nomenclatures and shapefiles.

# Military Constituencies

- Construction for 1870–1873:
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- Construction for 1874–1940:
  - Match cantons 1874 nomenclature to each military constituency.
  - Update annually with changes in cantons and (35) military reforms.
  - Necessary creation of pseudo-military constituencies.

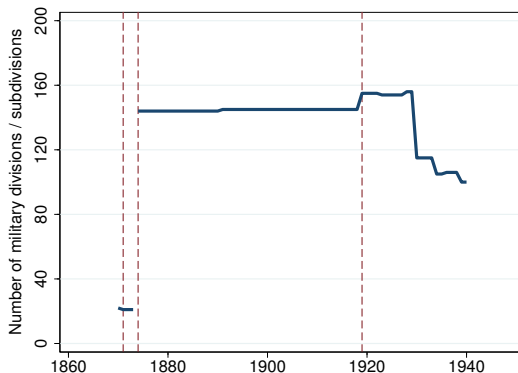
# Military Constituencies

Number of military corps and regions



# Military Constituencies

Number of military divisions and subdivisions



# Military Constituencies

Military constituencies in 1870



# Military Constituencies

Military constituencies in 1874



# Military Constituencies

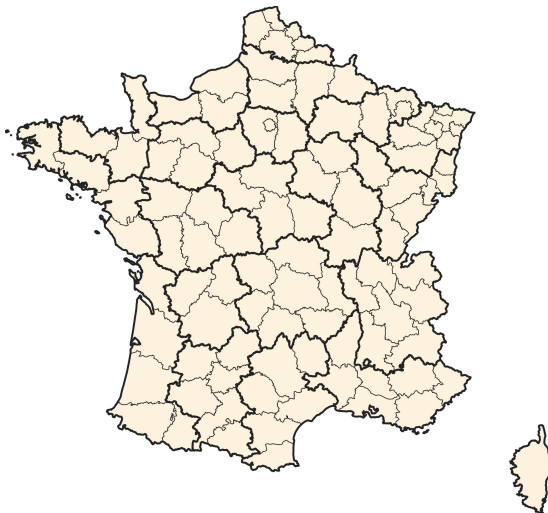
Military constituencies in 1919





# Military Constituencies

Military constituencies in 1940



# Judicial and Penitentiary Constituencies

- Five nested levels:
  - ① Justices de paix (and tribunaux de simple police): cantons.
  - ② Tribunaux de première instance (and tribunaux correctionnels):
    - 1870–1926: arrondissement based.
    - Reform 1926: suppression of 228 courts.
    - Reform 1929: all but 6 courts reinstated.
  - ③ Cours d'assise: département based.
  - ④ Cours d'appel: groups of départements.
  - ⑤ Unique Cour de Cassation.

# Judicial and Penitentiary Constituencies

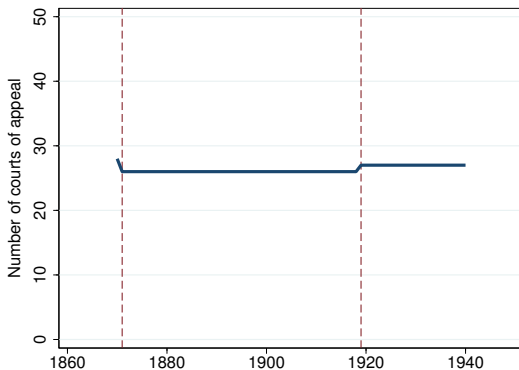
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- Penitentiary constituencies: groups of départements.

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  - ④ Cours d'appel: groups of départements.
  - ⑤ Unique Cour de Cassation.
- Penitentiary constituencies: groups of départements.
- Same method: match with general constituencies and update annually with reforms.

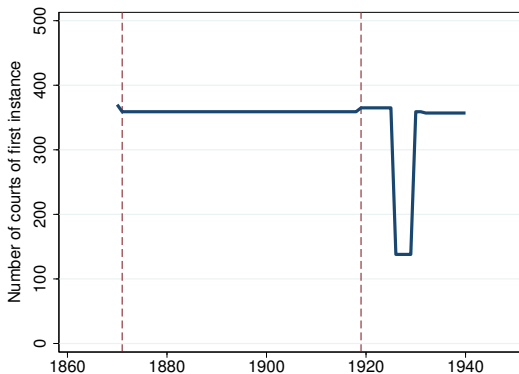
# Judicial Constituencies

Number of courts of appeal



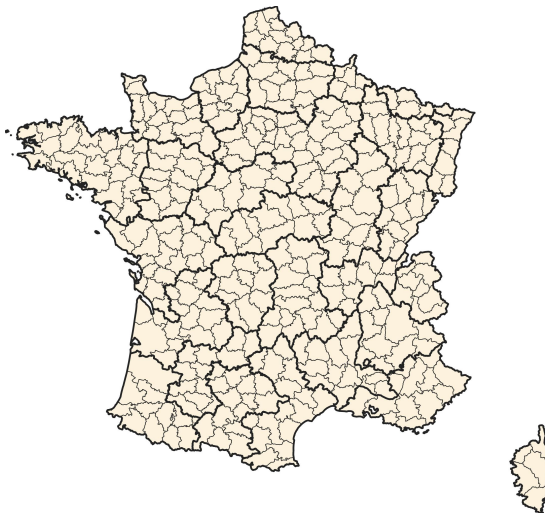
# Judicial Constituencies

Number of courts of first instance



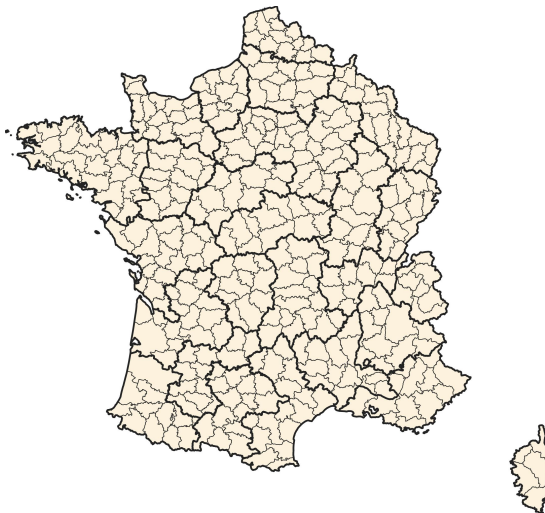
# Judicial Constituencies

Judicial constituencies in 1870



# Judicial Constituencies

Judicial constituencies in 1871





# Judicial Constituencies

Judicial constituencies in 1926



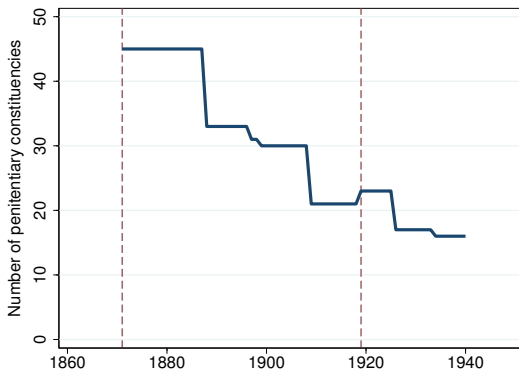
# Judicial Constituencies

Judicial constituencies in 1940



# Penitentiary Constituencies

Number of penitentiary constituencies



# Penitentiary Constituencies

Penitentiary constituencies in 1871



# Penitentiary Constituencies

Penitentiary constituencies in 1888



# Penitentiary Constituencies

Penitentiary constituencies in 1909



# Penitentiary Constituencies

Penitentiary constituencies in 1940



# Electoral Constituencies

- Electoral system:
  - Single-member district (one député per circonscription).
  - Except elections 1871, 1885, 1919, 1924 (block-list).



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- Electoral geography:
  - Generally follows arrondissements.
  - Major redistricting, after electoral system change:
    - Basis for Third-Republic: 1875.
    - Redistricting of 1889 based on 1875.
    - Redistricting of 1927 based on pre-1926 reform arrondissements.
  - General principles:
    - One député per arrondissement.
    - Each 100k inhabitants entitled one additional député.
    - Modification if number of députés change due to population.

# Electoral Constituencies

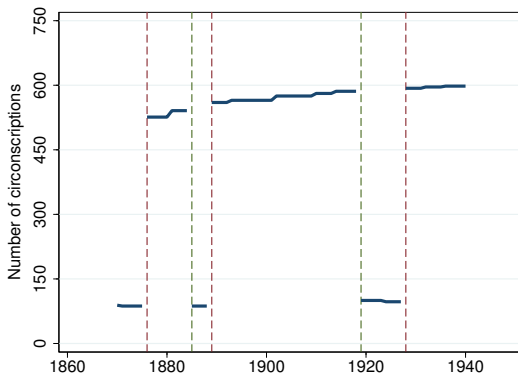
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  - Block-list elections: generally follow départements.

# Electoral Constituencies

- Match Gaudillère's (1995) *Atlas Historique des Circonscriptions Electorales Françaises* with TRF-GIS canton-level annual nomenclatures.
- Verify Gaudillère with (13) redistricting reforms.
- Expand configurations from one election to the next, taking territorial changes into account.
- Creation of pseudo-constituencies when needed for shapefiles.

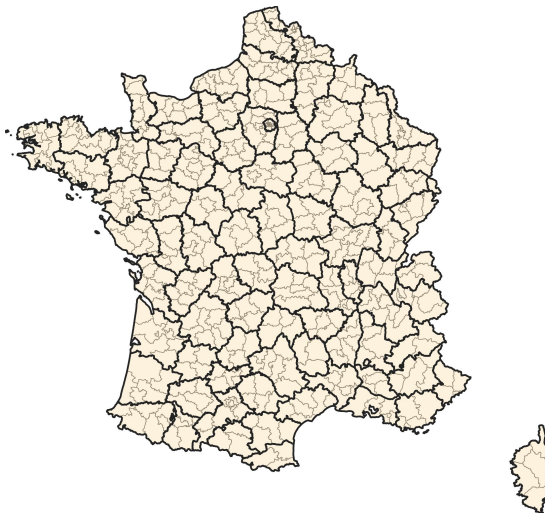
# Electoral Constituencies

Number of electoral constituencies



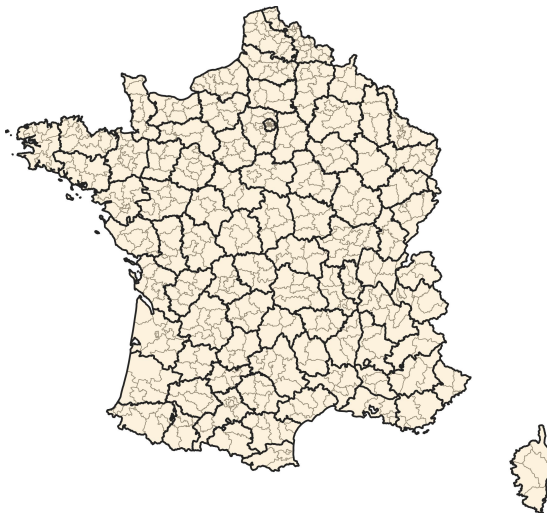
# Electoral Constituencies

Electoral constituencies in 1876



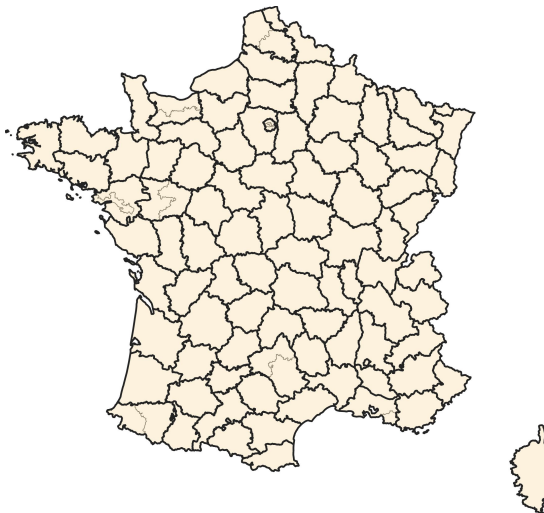
# Electoral Constituencies

Electoral constituencies in 1889



# Electoral Constituencies

Electoral constituencies in 1919



# Electoral Constituencies

Electoral constituencies in 1928





# Other Special Constituencies

- Academic constituencies (academies).
- Labor inspection constituencies (1892–1940).
- Ecclesiastical constituencies (dioceses).

# Data Records

# Départements

- Nomenclatures:
  - Identifier (Meurthe 1870 is 99 as in CRH database).
  - Name (capitalized, proper).
  - Indicator for enclaves or islands.
  - Prefecture INSEE identifier.
  - Prefecture name (capitalized, proper).
  - Indicator for prefecture current commune.
  - Prefecture coordinates (Lambert-93).
- Shapefiles: same variables.

# Arrondissements

- Nomenclatures:
  - Identifier (COG 2011, ascending order if disappeared).
  - Name (contemporaneous toponymy).
  - Subprefecture INSEE identifier.
  - Subprefecture name (contemporaneous toponymy).
  - Indicator for subprefecture common to multiple arrondissements.
  - Indicator for subprefecture located outside arrondissement.
  - Indicator for subprefecture current commune.
  - Subprefecture coordinates (Lambert-93).
- Shapefiles: same variables.

# Cantons

- Nomenclatures
  - Identifier (COG 2011, COG 1954 if disappeared, ascending order).
  - Name (contemporaneous toponymy).
  - Canton communal composition (follows INSEE's COG conventions).
  - Bureau centralisateur INSEE identifier.
  - Bureau centralisateur name (contemporaneous toponymy).
  - Indicator for bureau centralisateur common to multiple cantons.
  - Indicator for bureau centralisateur current commune.
  - Bureau centralisateur coordinates (Lambert-93).
- Shapefiles: same variables but
  - Pseudo-cantons assigned codes  $> 80$  (INSEE's COG conventions).
  - Pseudo-canton name: aggregating commune.
  - Cross-walks available.

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  - Pseudo-canton name: aggregating commune.
  - Cross-walks available.
- Same logic for special constituencies.

# Annual Commune-Level Nomenclatures

- 69 variables.
- Commune identifiers: INSEE (post-1946), HAC.
- Contemporaneous toponymy.
- Constituencies (or pseudo) belonged to.
- Indicators for constituencies chef-lieu.
- Total population (from HAC) with interpolation flags.
- Indicator for sieges of commercial and labor courts.
- Paris: both city and arrondissements.

# Technical Validation



# Technical Validation: TRF-GIS Nomenclatures

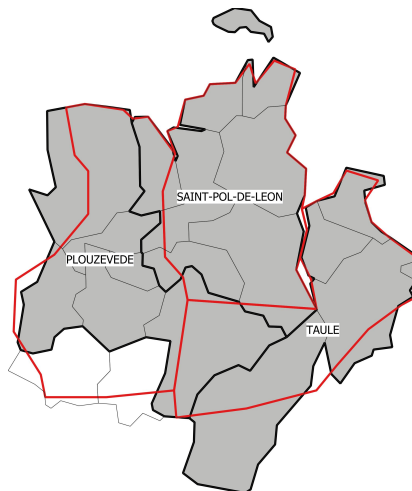
- Information from secondary sources verified against primary administrative sources (175).
- Main primary sources: *JO*, *BL*, *Code Pénitentiaire*, *Bulletin Administratif de l'Instruction Publique*, *Acta Apostolicae Sedis*.
- Also verified against statistical publications of relevant administrations (*Compte Rendu sur le Recrutement de l'Armée*, *Compte Général de l'Administration de la Justice...*, *Statistique Pénitentiaire*, *Tableau des Elections à la Chambre des Députés*).
- 231 errors in HAC corrected.

# Technical Validation: TRF-GIS Shapefiles

- GEOFLA vs BD CARTO: freely accessible, light manipulation, but less precise (still, fine for regional extent).
- GEOFLA vs ADMIN-EXPRESS: older geography available.
- Advantages over manual vectorization of georeference maps:
  - Historical maps with national extents not precise at boundaries (and unknown projections).
  - Historical maps not produced annually.
  - Little maps for special constituencies.
  - Manual vectorization time consuming and error prone.
- Positive comparison with existing shapefiles (LARHRA: cantons 1884 and 1925).

# Technical Validation: TRF-GIS Shapefiles

Comparison TRF-GIS and LARHRA cantons 1884



Thick red lines: LARHRA; thick black lines: TRF-GIS; thin black lines: GEOFLA 2011. No territorial changes to communes

# FAIR Data in Practice

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[Wilkinson et al. \(2016\)](#)
- Many elements managed by repository.
- Harvard Dataverse: 13k files, 6 BG.

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- Some FAIR elements of the TRF-GIS:
  - Rich metadata (DDI, Dublin Core, DataCite).
  - Controlled vocabulary for keywords (LCSH).
  - PID for each data file (DOI).
  - Open and persistent formats (.csv, .txt, .dta, shapefiles).
  - Compatibility with current standards (INSEE COG, IGN GEOFLA).
  - Appropriate licensing (CC-BY 4.0).
  - Versioning.