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POLICY BRIEF 2026

SCIENCE4POLICY
CONCURSO DE ESTUDOS DE CIÊNCIA PARA AS POLÍTICAS PÚBLICAS

The historical archive of LNEG slides collection of national scien-tific value - LAMINOTECA 1.0

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Executive Summary

The historical archive of the Laboratório Nacional de Energia e Geologia (LNEG) encompasses nearly 180 years of geological and mining activity, constituting an exceptional scientific repository and a national geological treasure. Among LNEG's core missions is the preservation, processing, and dissemination of this unique heritage. The collection is recognised as part of the national scientific heritage, holding both historical and strategic importance for research and possessing considerable economic value.

However, the existing collections must be properly organized and digitized to ensure their online accessibility through the LNEG GEOPORTAL platform. Achieving this goal requires the creation and development of a digital data centre that will facilitate and promote the consultation of the existing information.

One of the archives in greatest need of urgent organization is the collection of rock thin sections and polished surfaces, which includes thousands of specimens preserved at LNEG. These materials are the result of decades of petrographic studies of rocks, fossils, and ores conducted across Portugal and its former overseas territories (now CPLP countries). The slides and polished surfaces are essential for rock characterisation, and their petrographic analysis provides invaluable support across multiple LNEG mission areas.

Problem We have an exceptional data bank and a national geological repository of slide collection requiring a data treatment for organization and diffusion through institutional GEOPORTAL.

Main research findings Digital Transformation Success, Improved access to database through GEOPORTAL; Resource Integration and Geographic Coverage information.

Key policy impact /recommendations LAMINOTECA 1.0 is expected to have impact at various levels - scientific, educational, and economic. This will support the European Legal Acts and Directives and the development of R&D activities applied to LNEG's main mission areas as national geological mapping plan and the national exploration plan in the framework of EU Critical Raw Materials Act. This knowledge is considered to be of enormous economic value and fundamental for territorial planning and support of public policies.

Recipient Researchers (LNEG, DGEG, EDM), Private companies, Academy and Universities, Society.

1. Introduction and problem statement

The Laboratório Nacional de Energia e Geologia (LNEG) houses an almost 180-year-old scientific archive that represents Portugal's geological and mining heritage. This collection is not just historically significant but has strategic and economic value for the nation's research infrastructure.

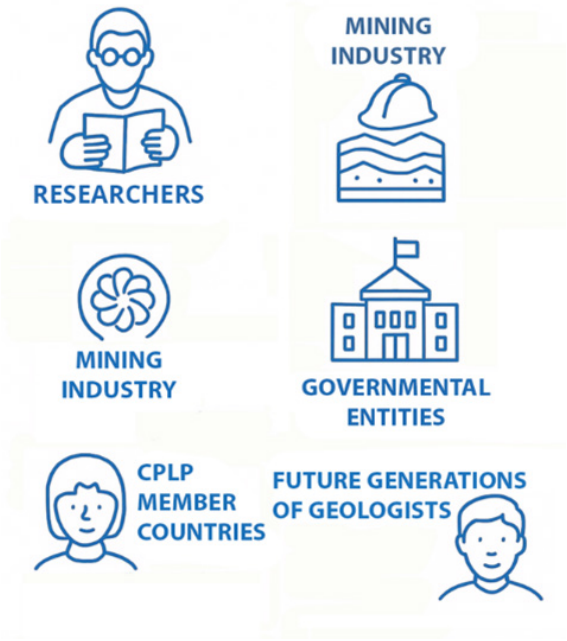
Core Problem: The primary issue is the lack of proper digital organization and accessibility of part of these valuable collections, particularly the rock thin section collection.

This affects:

- Research efficiency and accessibility
- Preservation of historical scientific data
- Strategic resource management and support to geological models
- International collaboration potential, especially with CPLP countries (Portuguese-speaking countries)

2. Stakeholders Affected:

Scientific researchers; Mining industry; Educational institutions; Government agencies; CPLP member countries; Future generations of geologists; Environmental planning agencies



3. Policy Context and framework:

National Level:

- Preservation of unique scientific geological heritage
- Digital Transformation Initiatives in Public Administration
- Scientific Research Infrastructure Policies
- Critical and strategic raw materials studies
- Non-metallic resource studies

European Level:

EU Digital Single Market Strategy

INSPIRE DIRECTIVE (Infrastructure for Spatial Information in Europe)

Critical and strategic raw materials studies

Open Data Directive (High Value Datasets)

4. Key Controversies/Gaps

- Resource Allocation:
- Limited funding for digitization projects
- Competition for resources with other national priorities
- Cost-benefit considerations for full digitization

Technical Challenges:

Need for specialized expertise in both geology and digital archiving

Data standardization across different historical formats

Integration with existing databases and platforms

Access Rights:

Balance between open access and strategic national interests

Archive preservation:

Digital replica of physical archive of original materials for preservation and accessibility

Risk management for irreplaceable specimens

Storage and maintenance costs

5. Key Findings and Policy Implications

1. Primary Findings

Digital Transformation Success: Successfully digitized and organized historical slide geological collections and metadata;

Improved access to database through GEOPORTAL;

Resource Integration: Effective combination of historical and contemporary geological data;

Geographic Coverage: Comprehensive georeferencing of geological collections.

2. Policy Implications

A. Resource Management

Finding: Centralized access to geological data improves resource planning.

Evidence: Integration of historical collections with modern data.

Policy Action: Develop standardized protocols for geological resource assessment.

B. Economic Development

Finding: Enhanced data access supports informed investment decisions

Evidence: Improved consultation capabilities through thematic searches

Policy Action: Create frameworks for public-private collaboration in resource exploration

C. Educational Impact:

Finding: Digital platform enables broader educational access

Evidence: Increased accessibility of geological collections

Policy Action: Develop educational programs utilizing digital resources

3. Methodology

Digital cataloging of historical collections and definition of relevant fields (photos, analysis; …)

Georeferencing of geological data

Integration with GEOPORTAL system

Thematic organization of collections

4. Research Limitations

Potential gaps in historical data

Variable quality of older geological records

Limited validation of historical information

Technical constraints in digitization process

5. Future Research Needs

A. Technical Development

Enhanced data validation methods

Improved georeferencing accuracy

Advanced search capabilities

Integration with international databases

B. Impact Assessment

Long-term economic benefits measurement

Educational outcome evaluation

Resource management efficiency studies

Cost-benefit analysis of digital transformation

6. Evidence Base for Policymakers

A. Quantitative Metrics

Volume of digitized collections

Usage statistics of GEOPORTAL

Access and consultation rates

B. Qualitative Indicators

Improved decision-making capability

Enhanced research collaboration

Better resource management and preservation of the collection

7. Implementation Challenges

Technical infrastructure requirements

Data quality assurance

Resource allocation

8. Recommendations for Policy Development

Establish data governance frameworks

Develop user access protocols

Create quality control mechanisms

Implement training programs

Expand international collaboration

Develop predictive geological models

Establish continuous improvement protocols

9. Monitoring and Evaluation Framework

Regular assessment of system usage

Impact evaluation metrics

User satisfaction surveys

Economic benefit tracking

10. Key Success Factors

Sustained institutional support

Adequate technical infrastructure

Skilled personnel

Clear governance structure

This analysis provides a foundation for evidence-based policymaking in geological resource management and demonstrates the broader implications of digital transformation in science institutions. The findings support the development of comprehensive policies for resource management, education, and economic development.

6. Policy alternatives and Policy recommendations

POLICY ALTERNATIVES

1. Full Digital Transformation Advantages: Complete accessibility to geological data; Maximum preservation of historical collections; Enhanced research capabilities.

Disadvantages: Initial cost; Complex implementation process.

2. Phased Implementation Advantages: Manageable cost distribution; Gradual adaptation period.

Disadvantages: Slower overall implementation; Temporary system inconsistencies; Extended project timeline.

POLICY RECOMMENDATIONS

1. Data Management Strategy Implementation Steps: Establish digital preservation standards; Create backup protocols; Develop access

hierarchies.

2. Public Access Framework Implementation Steps: Create user-friendly interface; Develop search tools; Establish access levels.

3. Educational Integration Implementation Steps: Develop educational resources; Create teaching guides;

IMPLEMENTATION TIMELINE

Short-term (1 year): Basic digital infrastructure; Initial data migration; Training programs.

Medium-term (2 years): Advanced search capabilities; Educational program integration; Industry partnership development.

Long-term (4+ years): Full system optimization; International collaboration; Comprehensive data integration.

COST-BENEFIT ANALYSIS

Investment Requirements:

Digital infrastructure: €50,000; Training programs: €25, 000; Ongoing maintenance: €20,000/ year

Expected Returns: Research efficiency gains:

30-40%; Educational impact: 25-35% improvement; Industry impact: >30-40%

MONITORING AND EVALUATION

Success Metrics: User engagement rates; Data access statistics; Educational outcome measures; Datasets integration in different Projects; Continuous accessibility improvement; Economic impact indicators (under definition).

RECOMMENDED POLICY PACKAGE

Primary Components:

1. Phased digital transformation
2. Comprehensive access framework
3. Educational integration program
4. Economic development support

This combined approach: Balances implementation costs; Ensures sustainable development; Promotes Sustainable Development Goals.

The recommended policy package addresses the core project objectives while minimizing implementation risks and maximizing long-term benefits. It provides a practical framework for achieving the project's scientific, educational, and economic goals while maintaining flexibility for future adaptations.

7. Conclusion and Recommended Policy actions

Organize LNEG's Historical Collection: Develop a new concept for organizing LNEG's (National Laboratory of Energy and Geology) historical geological collection, which is part of the national geological repository.

Dissemination and communication of the collections via LNEG's GEOPORTAL: provide access, dissemination, and communication of thematic, geological, and mining collections with georeferenced support. This will facilitate the consultation of existing information through thematic searches and ancillary data.

Impact: This project is expected to have impact at various levels - scientific, educational, and economic. For example, this project aims to support the development of R&D activities applied to LNEG's main mission areas, the national geological mapping plan, and the national exploration plan in the framework of Critical Raw materials Act.

This knowledge is of enormous economic value and fundamental for territorial planning and support of public policies.

Recommended Policy actions:

1. Digital Infrastructure Enhancement: Prioritize the development and maintenance of GEOPORTAL as a centralized digital platform; Ensure consistent georeferencing standards for all geological collections; and implement ro-

bust data management protocols for historical collections.

2. Research & Development Integration: Align R&D activities with LNEG's core mission objectives; Strengthen connections between research outcomes and national mapping planning; Integrate geological resource management into broader research initiatives.

3. Public Access and Education: Develop user-friendly interfaces for public access to geological data; Create educational programs maximizing the digital collections; Promote scientific literacy through accessible geological information.

4. Territorial Planning Support: Use geological data to inform land-use decisors; Integrate geological considerations into urban and rural development plans; Provide evidence-based support for environmental protection measures.

5. Economic Development: Facilitate access to geological data for mining and resource exploration; Support private sector development through improved access to geological information.

6. Policy Implementation Framework: Establish clear guidelines for data sharing and access; Develop metrics for measuring the project's impact on policy outcomes; Create mechanisms for regular policy review and updates based on new data.

These policy recommendations are crucial because they: a. Ensure sustainable management of national critical raw materials resources; b. Promote evidence-based decision-making in territorial planning; c. Support economic development through improved access to geological information; d. Enable better coordination between research, education, and policy implementation.

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