Geological Information System for Managing Geothermal Project in Geneva

Dr. Stéphanie FAVRE

Workshop on the role of big data and geospatial data in energy transition
Ninth International Forum on Energy for Sustainable Development, Kiev, Ukraine
14th of November 2018
WHY A GEOLOGICAL INFORMATION SYSTEM?

Energy situation in Geneva

Priority for Geneva

Les sources d'énergies à Genève:

- 50% Pétrole
- 27% Gaz naturel
- 15% Force hydraulique hors GE
- 6% Force hydraulique GE
- 2% Autres énergies renouvelables

GEothermie 2020, 2018
WHY A GEOLOGICAL INFORMATION SYSTEM?

GEothermie 2020 Program

1 – Prospection
2 – Exploration
3 – Exploitation

GEothermie 2020, 2018

Tribune de Genève, 2014

GEothermie 2020, 2018
WHY A GEOLOGICAL INFORMATION SYSTEM?

GEothermie 2020 Program

Objective: developing geothermal industry

Working groups

RESOURCES EVALUATION

ENVIRONMENT AND SUSTAINABILITY

ENERGY AND LAND PLANNING

DATA MANAGEMENT

Industrial Services of Geneva

Canton of Geneva

REPUBLIQUE ET CANTON DE GENEVE

Industrial Services of Geneva

Canton of Geneva
WHY A GEOLOGICAL INFORMATION SYSTEM?
Subsurface resources exploitation

- Geothermal Energy
- Water and mineral resources
  - Phreatic resources
  - Hydrocarbons
  - Salt and others minerals
- Space
  - Transport structures and pipelines for electricity, gaz and water supply
  - CO$_2$ and nuclear waste storage
  - Heat storage
WHY A GEOLOGICAL INFORMATION SYSTEM?

Thesis projects on data management

Geological classification and harmonizing regional data

Favre, S. (2018)
Data model and information system architecture

CONCEPTION OF A GEOLOGICAL INFORMATION SYSTEM FOR THE CANTON

GEO-DATA CONCEPT
HOW TO MANAGE GEOLOGICAL DATA?
Information system (IS) and interoperability

Assessment of the IS

RESEARCH QUESTIONS

What are the data types, formats and tools used?
What are the geological and broader domains of applications?
What are the legal framework in place?
What are the human and financial resources mobilized?

SURVEY THEMATICS

IT infrastructure
Geological data
IS applications
Policy and legal framework
Cross-border collaboration
Human and financial resources

CHALLENGES

TECHNICAL
SEMANTIC
LEGAL
HUMAN

INTEROPERABILITY

GEO DATA CONCEPT
HOW TO MANAGE GEOLOGICAL DATA?

Geological data management in EU

- **Heterogeneous data**
- **Low integration of 3D data**
- **Raw and interpreted geological data managed**
- **Data models not always used**
- **No unique technical solution**
HOW TO MANAGE GEOLOGICAL DATA?
Role of utilities in the Geneva context

Interoperability guide lines

- Development of data models for spatial and relational database
- Update of legal framework
- Organisation of work groups, workshops and new jobs opportunities
- Harmonisation of the regional stratigraphy

GEOTHERMIE 2020
GEODATA CONCEPT
HOW TO MANAGE GEOLOGICAL DATA?

Geological data journey

1. Data integration in database
2. Monitoring
3. Maps and models creation
4. Subsurface resources management
5. Projects planning
6. Projects implementation

GEOLOGICAL INFORMATION SYSTEM

GEothermie 2020, 2018

Favre, S. 2018
HOW TO MANAGE GEOLOGICAL DATA?

Geological data journey

- Data integration in database
- Maps and models creation
- Subsurface resources management
- Monitoring
- Projects implementation
- Projects planning

GEOLOGICAL INFORMATION SYSTEM

Clerc, N. 2017

SITG, 2018
HOW TO MANAGE GEOLOGICAL DATA?

Geological data journey

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- Projects implementation

GEOLOGICAL INFORMATION SYSTEM

Réfection de la route Suisse
Prise d'eau du lac future?
Prise d'eau du lac actuelle (SIG)
Prise d'eau du lac future?
Prise d'eau du lac future?
Mesures conservatoires
Forages exploratoires
Environnement
Système actuators
Prise d'eau du lac future?
Environnement
Système actuators
Prise d'eau du lac future?
Prise d'eau du lac future?

GEothermie 2020, 2018
HOW TO MANAGE GEOLOGICAL DATA?

Geological data journey

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GEOLOGICAL INFORMATION SYSTEM

Cuccodoro, S. 2018
HOW TO MANAGE GEOLOGICAL DATA?

Central role of the information system

Research and development

Sustainable development

Communication

Risks management

Resources evaluation

Territorial planning

Data integration in database

Maps and models creation

Subsurface resources management

Projects planning

Projects implementation

Monitoring

GEOLOGICAL INFORMATION SYSTEM

GEODATA CONCEPT
Take home messages

- **Geothermal energy development** implies an **interdisciplinary** work

- **Information systems** (IS) are essential tools to provide a **systemic approach**

- **Interoperability concept** can be seen as guidelines

- Importance to **share experiences** and to **fit with global strategies** (CH and EU)
Thank you!

REFERENCES

- GEothermie 2020, short movie: [https://www.youtube.com/watch?v=y4Xh6cleLiw](https://www.youtube.com/watch?v=y4Xh6cleLiw)
- Système d’Information du Territoire Genevois – SITG, [https://ge.ch/sitg/](https://ge.ch/sitg/)

Questions?

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