Social Networks of Institutions and Legal Processes: Case of Hydropower, Fish and Water Permits

Background

Hydropower dams obstruct fish migration and typically require regulatory measures to mitigate or compensate for the losses in fish stock. These measures are provisioned in **water permits** which in Finland have been historically de-facto permanent. Recently, the water permits of hydropower plants in three major Finnish rivers have been **subject to review** through application processes to alter these measures. This has presented a **conflict between** two vital interests: the restoration of river courses and **fish populations, and power production** and energy security.

This conflict is explored using a **social network model** to analyze the institutional setting of three **regulatory processes** aiming to alter water permits and the compensatory measures provisioned therein. This demonstration expands on the previous research on Institutional Grammar (IG), Network Analysis and Water Governance by bridging the gap between social network analysis and network theory.

Research Questions

- What is the legal framework and network of these processes.
- How do different stakeholder utilize it.

Methodological Aims

- Integrate network protocols and flows into social networks.
- Develop a workflow for large bodies of legal documents and network analysis.

Institutional Grammar and Networks

Institutional Grammar is a framework for analyzing the content and structure of institutional statements. The syntactic components institutional statements are:

Attribute: *Object*: Deontic Aim: Context Or else:

Actor doing the action the statement. Receiver of the action How strongly an action is forced Objective/action assigned to the actor Conditions for executing the statement A consequence for a possible violation

Networks can represent, for example, governance and legal **systems**. The basic components of a network and their meaning in our context are:

| lodes: | Entities and c |
|------------|-----------------|
| | institutions ar |
| dges: | Relationships |
| | interactions |
| Protocols: | Rules defining |
| | network form |
| lows: | Operationaliz |
| | legal argumer |

Method

- PDF-scraping and preprocessing
- Stakeholder tagging and NLP-processing
- Establishing legal framework
- Manual IG coding of institutional statements
- Arguments searched leveraging Natural Language Processing
- Network creation and remodeling



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A The full network resulting from the processing pipeline **C** The flow of a single legal argument in the network



Single actor's argument that the context (i.e., network protocol) is valid and actionable

Initial Results

- The processing pipeline results in a multimode network containing the application documents, actors and stakeholders, acts, institutional statements, and selected Institutional Grammar components.
- Despite the extensive application processes, the resulting network contains only a few institutional statements that mattered in the outcome of the permit process.
- Initial analysis related to the Water Act shows only a single IG Attribute in the network. This *Attribute* is the "Permit Authority" which is also present as an Actor in the network.
- The full network can be remodeled as a **multipartite network** by collapsing *Aim* and *Context* nodes into edges between *Attribute* and *Object* nodes. These edges will then have *Aim* and *Context* as edge properties representing **network protocols**.
- The multipartite network shows that different actors and stakeholder refer largely to the same acts and their sections.
- The network structure allows to follow the argumentation from the application texts to the institutional statements and vice versa.
- The argumentation and its outcome represent **operationalization** of the legal framework, or in other words, flow in the network.

Discussion and Conclusions

This conceptualization of a legal framework and permit processes as a network allows to model institutions both as they are and as they are operationalized. The model combines legal networks and governance into a singular social network for analysis and visualization purposes. Additionally, it allows the representation of network flows and protocols, which often are not included in social network studies.

The method does require familiarity with the institutional setting and the processes. Institutional Grammar coding does still require considerable manual effort, and this method does not yet fully capture complex institutional statements. Automated text search, however, helps to narrow down the relevant law corpus.

The use of Natural Language Processing greatly facilitates text search and data collection for building a network. We see this method and conceptualization applicable in other contexts where it is relevant to study how actors utilize institutions in a certain governance setting.







