



Text mining analysis of institutional fit of Lake Basin water governance



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ABSTRACT

The purpose of this work was to quantitatively determine the institutional fit of the existing and applicable water governance laws in the Songkhla Lake Basin (SLB) Thailand, using text mining analysis. The study found out that the current governance system is not fit for the purpose of the sustainability of the SLB. Data derived from text mining were able to show the weakness in the applicable/relevant water governance laws and such challenges in enforcement and compliance. Institutional priorities were identified and compared to management response to issues concerning SLB; this imbalance showed another challenge to fit. The results of this study further buttressed the need for institutional reforms towards an Adaptive Integrated Lake Basin Management (AILBM). The general assessment of degree of recognition and involvement of institutions, overlaps, gaps, institutional priorities and response to resource management show a clear picture of misfit of the water laws used to govern the SLB. To achieve institutional fit, future institutional reforms should be based on the principles of AILBM and the development of institutions that are capable of creating a singular coordinating and policy harmonization committee to clearly identify roles and responsibilities and delineate functions with appropriate management response to the socio-ecological system of the SLB.

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1. Introduction

Text Mining techniques involve the processes of information retrieval, extraction and data mining, which produce more structured analysis of textual knowledge. Data mining seeks to extract useful information from documents, but common usage emphasizes numeric data analysis. The application of text mining in institutional studies uses laws in a manner different to legal analysis that help answer questions about governance of ecosystems (Ekstrom and Young, 2009). This paper applied the use of text mining tool of content analysis as quantitative approach (Berelson, 1952; Feldman and Sanger, 2007) to determine institutional fit of water governance of Songkhla Lake Basin, Thailand. This is the first time text mining analysis is used in the measurement of institutional fit for lake basin governance. This work expands on the

pioneer works of Ekstrom and her team on the use of text mining to analyze ocean and coastal laws for the identification and measurement of gaps and overlaps for ecosystem-based management (Ekstrom, 2008a,b; Ekstrom and Young, 2009; Ekstrom et al., 2009; Ekstrom and Lau, 2008) to the determine institutional priorities, institutional response to resource management as well as institutional involvement in governance.

Institutions are the body of rules, regulations and processes that guide management actions and procedures (Ostrom, 1990; Scott, 2001; North, 1990; Folke et al., 2007; Pahl-Wostl, 2009; Young, 2002a,b). They form the core of lake basin management, and governance plays very important roles in the maintenance and enhancement of basins sustainability and resilience (ILEC, 2005). The issue of institutional fit with ecosystems has been the focus of many scholars (Ostrom, 1990; Scott, 2001; North, 1990; Young, 2002a,b,c; Folke et al., 2007; Pahl-Wostl, 2009). Institutions will be more effective when they match the biophysical domain in which they operate (Kalikoski et al., 2002; Ostrom, 2005; RCSE and ILEC, 2014). The problem of fit centres on the idea that governance systems need to reflect the structure, properties, and processes of

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the ecosystem within their scope (Ekstrom, 2008a,b; Estrom et al., 2009). Globally, lake basin's institutions are found in many bodies of legal references covering every aspect and often result in the problematic fragmentation of responsibilities, overlapping jurisdiction, inadequate facilities and funding as well as lack of compliance and enforcement (FAO, 1994; Ballatore and Muhamdiki, 2002). Therefore, realizing the goal of adaptive and integrative governance will also require quantitative institutional (legal provisions) evaluation.

This study aims to quantitatively assess lake basin institutions using the text mining tool to determine gaps, overlaps, institutional priorities, institutional involvement and recognition as well as institutional response to resource management in the Songkhla Lake Basin, Thailand. The main research question that this work seeks to address is 'how can text mining be used to quantitatively determine institutional fit of water governance of lake basin?' This paper is presented in the following format: firstly, it begins with the introduction, case study, methodology. Then the results/discussion and concludes with some reflections and recommendations.

2. Case study

2.1. Songkhla Lake Basin: a case study

Songkhla Lake Basin (SLB) is a unique ecosystem covering three provinces in Southern Thailand, namely Phattalung, Songkhla and Nakhon Si Thammarat. SLB is made up of 12 sub-basins, with an area of 8729 km², 7687 km² of lake land area and 1042 km² of lake Surface (ONEP, 2005). The Lake is the only natural as well as largest lagoon in Thailand (ONEP, 2011). This complex ecosystem is rich in biodiversity with multitude of flora and fauna species. They form a life supporting system, which provides a source of livelihood for the more than 1.7 million population (NSO, 2012). The major economic activities in the Basin include: rubber plantations, paddy rice farms, fruit tree orchards, fishing, aquaculture, husbandry and a high attractive tourism potential (Tanavud et al., 2000) Fig. 1.

The stakeholders of the SLB can be categorized into two major groups: local people (basin communities) and the experts groups (government officials, academia, development partners, industry staff and professionals). The local people of the lake basin communities and civil society organizations spread across the 12 sub-basins who possess substantive local knowledge about the SLB. The participation of these stakeholders was crucial to understanding the local water governance as well as issues around institutional fit from the local context. On the other hand, the professionals/experts stakeholder groups were the officials of the regional offices of the central government ministries/departments with direct or related responsibilities and interests for the formal governance of water and natural resources formal governance in the SLB. They also include the Provincial Administrative Organizations (PAOs), Municipality Administrative Organizations (MAOs), Tambon Administrative Organizations (TAOs) and the Songkhla Lake Basin Committee (SLBC). Others include the academic institutions, NGOs/CBOs, private sectors and local development organizations within the Lake Basin. Therefore, stakeholders (formal and informal) participation and involvement in this study were designed to explore the issues of 'social fit' (aspect of institutional fit) which is how well institutions align with human expectations and behavioural patterns (Stankey and Shindler, 2006; Wüstenhagen et al., 2007) and 'institutional acceptance', which measures how much individuals endorse a system of governance, as an indicator of 'social fit' (DeCaro and Stokes, 2013); which eventually contributes to the emergence and long-term maintenance of 'fit' in the more comprehensive sense of the term, that is political, social and economic. Decaro and Stokes (2013) identified institutional acceptance as an important aspect of institutional fit because of its centrality

to the concept of human agency (Brehm and Brehm, 1981; Ryan and Deci, 2006) and the causal relationship between public participation and human motivation (Frey et al., 2004; Moller et al., 2006).

The SLB is governed by centralized national water, environment and other related laws and regulations. There are more than 48 legislations dealing on issues of water resources management in Thailand (Shah and Sukhsri, 1999). The institutions for water are derived from written status, court judgments, and regulations of government agencies, customary laws, or the general principles of law and originate from internal and external sources (Administrative Court of Thailand, 2013). It is noticeable that the same law may regulate more than one single aspect of uses (Shah and Sukhsri, 1999). The legislation controlling the development and use of natural resources, such as land, forestry and minerals, were enacted many decades ago and the most important natural resources of all, (i.e. water), is not completely covered by any specific national act or statute (Shah and Sukhsri, 1999). There is, however, no umbrella legislation to link these laws and codes (UN-Water/WWAP, 2007).

SLB water governance is marked by a lack of sectoral integration, a strong adherence to command-and-control approaches, weak coordination mechanisms and fragmentation (Christensen and Boon-Long, 1994; Shah and Sukhsri, 1999; Molle, 2001; Neef, 2008; Kanjina, 2008). Wongbandit (1995) noted that most of the Thai legal provisions regulating water issues are widely regarded as outmoded and obsolete. The capacity of law enforcement is very low and many scholars had admitted that the record is very unimpressive (Flaherty et al., 1994; Christensen and Boon-long, 1994; Wongbandit, 1995; Kraisoraphong, 1995). The implication of inadequate institutional instrument is responsible for pushing the health of the SLB to its limit. There is confirmed evidence that fishery resources in the Lake are not well managed (Choonhapran et al., 1996; Mabuntham, 2002), untreated industrial and domestic wastewater resulting in water quality degradation (Ratanachai and Sutiwipakorn, 2006; TSPR, 2010) and inadequate solid waste management (Pornpinatepong, 2010). There are reported cases of over-extraction of freshwater from the lake and groundwater (Ratanachai and Sutiwipakorn, 2006), degradation and deforestation of the mangrove and peat swamp forests (ONEP, 2013; Uraiwong, 2013).

In a bid to rescue the SLB, several development plans have been initiated by the government and the first plan was undertaken in 1984 when an in-depth master plan was prepared. In 1999, an Environmental Management Project for Songkhla Lake Basin (EmSong) was undertaken resulting in the development of Environmental Action Programmes for the Lake Basin (EmSong, 1999). The EmSong project was a cooperation project between the Royal Danish Government and the Royal Thai Government implemented through the Danish Cooperation for Environment and Development (DANCED) and Office of Environment Policy and Planning (ONEP) in the Ministry of Science, Technology and Environment (now Ministry of Natural Resources and the Environment). The major outcome of the EmSong was the identification and selection of projects that can immediately move the development of the SLB towards sustainability. Also, in 2011, a review and amendment to the Development Master Plan of the Songkhla Lake Basin was also undertaken by the Faculty of Environmental Management, Prince of Songkhla University for the Office of Natural Resources and Environmental Policy and Planning of the Ministry of Natural Resources and Environment (ONEP, 2011, 2013). This review master plan observed that despite several plans, projects and efforts, the over-exploitation of the rich natural resources and environment for economic gains are still continuing in an alarming rate without reasonable efforts to properly conserve and rehabilitate the SLB resource systems. The report also presented the mechanism for future administration and

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