

## Public Opinions Towards Hydropower Development and Environmental Protection: Hydropower Stations in the Lancang River Basin.

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### Abstract

This article study aims at providing an effective method for the hydropower development enterprise and the local government to evade risks of offending online public opinion. The environmental effects of hydropower projects along international rivers have attracted the concern of people in many countries. Monitoring the public opinions towards the environmental effects of hydropower projects provides an extremely important way to broaden awareness of hydropower development enterprises and the local government by listening to the interests of the public demands. The data were collected through MetaSeeker. The data were online public opinions, from many sources from 2005 to 2014, using content analysis method in coding and processing the database. This paper showed features, life cycle, range, and perspectives of online public opinions; and, those opinions were depicted into aspects of tendency, popularity, inclination, and intensity.

**Keyword:** international Rivers, Lancang River, Hydropower Projects, Environmental Effects

### Introduction

There are more than a hundred international rivers in China, 41 of which are major international rivers. This number is only second to Russia and Argentina. Among them, the Southwest rivers, including the Lancang River, Yarlung Zangbo River, Salween River, and many others, are important hydropower development bases of China's Twelfth Five-Year Plan (12th FYP). At present, China's Lancang River Basin has initially formed an orderly development gradient. It is estimated that by 2020, eight hydropower stations, which are currently under construction or in preparation for the mainstream of the Lancang River in Yunnan Province, would be completed one after another. The environmental impacts of hydropower development are likely to cause widespread concerns, both inside and outside China (Haiwei et al., 2014). China's hydropower construction in the Lancang River has raised questions from downstream countries about the environmental risks of water distribution, migration in fishes, and ecological maintenance, leading to a controversy between the upstream country and many downstream countries. In short, the offending public opinion on environmental protection has become an essential factor in hydropower development decisions. Development teams such as enterprises and local governments must pay full attention to environmental protection, carefully consider the concern of

downstream countries, increase the openness and transparency of decision making, and arrange proper environmental protection. Therefore, this article is conducted based on the environmental assessment of water conservancy and hydropower projects, using web crawler and text mining technologies to construct a method to monitor public opinion towards hydropower development and environmental protection in international rivers. This article adopts hydropower stations in the Lancang river basin as samples. The data were analyzed through the multi-dimensional characteristics of online public opinions. The data were also provided for hydropower developers, builders, operation managers, and local governments to grasp, prevent and avoid conflicting public opinion on hydropower development and environmental protection.

## Analysis

### 1. Literature Review

Environmental protection for water conservancy and hydropower projects Western countries pioneered environmental impact assessment (EIA) work since the 1960s; the United States first established an environmental impact assessment system in the 1970s. This makes major developed countries attach great importance to environmental quality assessment and environmental impact assessment. The procedures of environmental impact assessment are project establishment, a survey, an environmental impact forecast, environmental impact assessment, and protection measures and countermeasures (Zhongmin Xu, 2000)

Since the 1980s, the United States and Canada have begun to use planning management to research environmental impact assessment, mainly incorporating environmental impact into regional economic development planning, making it an integrated regional economic development, also called "Environmental planning" (Lee et al., 1999). Wilson and Thompson (1992) proposed the concept of Strategic Environmental Assessment (SEA). The core concepts are: (1) considering issues from an overall perspective; (2) verifying strategic environmental assessment to determine environmental impacts; (3) considering alternatives from a systematic perspective; and, (4) continuously scrutinizing the concept of sustainable development. According to the environmental impact assessment (EIA), geographic information, remote sensing, ecological economics, and landscape ecology are widely used. Lee (1999) used GIS technology to carry out landscape evaluation on a regional scale and concluded that the quality of the ecological landscape is closely related to ecological value. Smith (1999) used remote sensing, institutional and mathematical statistics to carry out an environmental impact assessment. Heggem (2000) carried out a landscape ecological evaluation on the Tensas River Valley. On the whole, research in Western countries mainly focused on the use of related technologies to carry out the trend analysis of environmental impact assessment, henceforth called "EIA".

China began studying the environmental impact of hydropower projects in the late 1970s. By the end of the 1990s, China's EIA began to be in line with international standards. In 1992, the Chinese river basin was promulgated to evaluate the environmental impact of hydropower projects in terms of time and space

(Dongzheng, 2006). The EIA law on Mainland China was announced in 2002, raising the height of the legal level. In 2011, the National Development and Reform Commission and the Ministry of Environmental Protection jointly issued the interim measures for the river hydropower planning reports and environmental impact reports. In 2012, the Ministry of Environmental Protection issued a notice on strengthening the environmental protection of hydropower construction. In 2014, the Ministry of Environmental Protection and the Bureau of Energy jointly issued the notice on the implementation of ecological and environmental protection measures, which further strengthened the strict implementation of ecological and environmental protection measures. On the whole, the environmental protection of China's hydropower projects has developed rapidly. A large number of large- and medium- sized projects have successively carried out EIA on- field testing and standardization of environmental assessments (Sznajd-Weron & Sznajd, 2001)

### 1.1 Public opinion from different online websites

1) Related studies about public opinion from the Internet Studies from the western about online public opinion focused mainly on two areas: (1) the generation and propagation of online public opinion (Ellison et al., 2007), and (2) monitoring and analysis of the online public opinions. In 1993, Elisabeth Noelle-Neumann elaborated on the concept of online public opinion in her work by analyzing the relationship between online public opinion and psychology and proposed the silent spiral theory. Kam C. Wong (2006) analyzed the relationship between policies, social media, and the public; and further examined the influence of the three mentioned on social public behavior (Yijin Chen et al., 2011). The research on online public opinion in China started later and mainly focused on five aspects: (1) the connotation and extension of online public opinion; (2) the generation and propagation mechanism of online public opinion; (3) the characteristics of communication and social impact of online public opinion; (4) the main sources used for disseminating online public opinion; and, (5) the monitoring and early warning indicating system of online public opinion (Wang Qing, 2011)

2) Current research on indicators to monitor online public opinion Wang Qing pointed out that building a public opinion monitoring indicator and early warning indicator system that met with the principles of science, reliability, system, and operability is fundamental for public opinion monitoring. Yuan Dai and Fei Yao (2008) constructed a comprehensive public opinion index that included public opinion circulation, public opinion element, and public opinion trend indicators to quantify the future trend of public opinion. Runxi Zeng (2010) used the analytic hierarchy process to construct an online public opinion indicator that includes three types of factors and phenomena: warning sources, warning signs, and warning conditions. Jianbin Jin (2007) described the index system of online public opinion from seven dimensions, including triggering factors, communication costs, duration, growth rate, post distribution, topic saliency, and opinion distribution. Yiwen Zhang (2010) established a public opinion monitoring system to measure and evaluate the popularity of unconventional emergencies, and later clarified the influence of different indicators, to examine the deep-seated influence of public opinion fluctuations.

Yi Fang (2010) used the I-space model to analyze and study the dissemination process and root causes of online public opinion, constructing five public opinions: publisher indicators, public opinion element indicators, audience indicators, communication indicators, and regional harmony indicators. Xinjie Chen (2012) added the means of communication, the detail of the content, and the degree of audio-visualization to count the status of each indicator item and comprehensively analyze the relationship between each element. Fang Jie and Gong Liqun (2013) analyzed the evolution process of public opinion in microblog and constructed microblog monitoring indicators from the perspective of stakeholders such as topics, information, audiences, and communication tools. The indicating system was constructed from four dimensions: popularity, intensity, thought inclination, and longevity. Different researchers had different analyses and understanding of the development and evolution process of public opinion, but they have the same understanding of the dissemination process, diffusion, development, and extinction of public opinion information (Runxi Zeng and Xiaolin Xu, 2010). The existing online public opinion monitoring has the following shortcomings: (1) there is little to no research on this topic. Previous studies were mostly analyzed from the perspective of journalism and communication; (2) the previous studies mostly monitored public sentiment in a general scope; and, (3) the previous research focused on the construction of an indicating system; only a relatively few experimental studies are carried out. There are a few experimental studies conducted to study the characteristics of communication such as the development trend of public opinion or the frequency of keywords.

## 2. Research Design

2.1 Analysis of the characteristics of online users The online users are different in public opinions. The public opinion on environmental protection of hydropower development can be divided into three categories according to different departments:

(1) The examination and approval procedures mainly consisted of the National Development and Reform Commission (NDRC) and the Ministry of Environmental Protection. In the process of hydropower development, they must be approved by the NDRC, the Ministry of Environmental Protection, and other departments.

(2) Hydropower development enterprises were mostly under the Huaneng Lancangjiang Company. The development of hydropower stations in the Lancang River Basin was mainly completed by the Huaneng Lancang River Company. At present, 14 hydropower stations in Yunnan Province are all invested and developed by Huaneng Lancangjiang Company.

(3) Local governments that provide policy and resource support were mainly responsible for each resettlement area. The hydropower development in the upper reaches of the Lancang River in Yunnan Province involves 6 prefectures and 11 counties in Yunnan Province.

### 2.2 Types of public opinions towards environmental protection

(1) Public opinions issued by the government were mainly news or announcements related to environmental impacts such as the approval of hydropower projects, agriculture, forestry, fishery, and other relevant authorities, and the environmental impact assessment of environmental protection.

(2) The public opinions released by enterprises related to hydropower development were mainly related to positive information about environmental protection measures and resettlement of hydropower enterprises in the process of environmental protection during hydropower construction.

(3) The public opinions released by local governments mainly included the local government's policies and supports for hydropower construction, resettlement, ecological and environmental protection, and other related news.

(4) The public opinions issued by non-governmental organizations mainly aimed at much environmental-related information: fish reproduction, changes in lives of immigrants, protection of rare animals and plants, protection of cultural relics, and ecosystem maintenance. (5) Public opinions on ecological impacts and environmental impacts related to the production and lives of immigrants released by local people.

### **3. Data collection**

1) This article used the "advanced search" function in Baidu News and typed in the names of 16 hydropower stations to search for public opinions on environmental protection. The authors used web crawler technology to capture all the data from January 1, 2005 to January 1, 2015 through MetaSeeker software.

2) The authors manually analyzed the captured news one by one, including 3,473 public opinions about hydropower stations and 187 about environmental protection. Other words such as "Involved Power Station", "Number of Power Station News", "Involved Area", "Engineering Stage", "Scope of Influence", and "Emotional Tendency" were filled in to find more information.

### **4. Data categorization**

1) Each public opinion towards environmental protection had its own different released time. The year of each release was a fixed interval variable and was directly coded according to the quantity.

2) The classification codes of websites were as follows: 1 for central key websites, 2 for government websites, 3 for mainstream websites, 4 for energy industry websites, 5 for financial industry websites, 6 for environmental protection websites, other industry websites were coded 7, Yunnan local websites were 8, other local websites were 9, external communication websites were 10, NGO websites were 11, and other websites were 12.

3) The types of other hydropower stations found in public opinions were coded in chronological order from upstream to downstream.

4) The construction period codes for hydropower stations were as follows: the pre-construction period code was 1, the main construction period was 2, the operation period was 3, and the completed phase was 4.

5) Types of regions found in public opinions were coded by names of counties (autonomous county/district).

6) The environmental impact areas can be divided into five categories: construction areas, resettlement areas, submerged areas, upstream areas, and downstream areas. The codes of each were as follows: the code of construction areas was 1, the resettlement areas was 2, the submerged area was 3, the code of the upstream areas was 4, and the code of the downstream areas was 5.

7) Attitude types of public opinion are divided into negative attitude, neutral attitude, and positive attitude, and the codes were 1, 2, and 3, respectively.

8) The quantity of reposting public opinion was an important indicator for judging the attention of public opinion. Therefore, the quantity was a constant ratio variable and was directly coded according to its amount.

9) This article extracted keywords from studies from environmental protection databases. Therefore, this article selected 5 keywords with negative meanings and relatively high word frequency, namely: stability, land acquisition, poverty, social conflicts, and riots.

### **5. Data processing results**

A chart of public opinion on environmental protection by year is drawn. It can be seen that the total amount of public opinions towards environmental protection was relatively small, with an annual average of only 18.7 items. The number of public opinions related to 16 hydropower stations had never exceeded 50 each year. This also reflected that people pay relatively little attention to the environmental impact of hydropower development. The number of affected immigrants was also relatively small. In 2005, there was only one public opinion related to environmental protection, and it grew rapidly after 2009. The rapid increase of public opinions also reflected China's environmental protection policies, and people were more concerned about the environmental impacts of hydropower development.

### **6. Public opinions towards hydropower stations from different aspects**

1) This article drew the top 15 online sources related to hydropower development and environmental protection. Among these websites, Xinhuanet and People's Daily Online are central key websites, while NetEase, Phoenix, Sina, Tencent, and Sohu are mainstream websites. Hexun.com is a financial-related website, and Yunnan Daily and Pu'er Daily are local websites. Yunlong Government Network is a government website. China Net is an external communication website, China Electric Power News Net and Polaris Power Net are electric power industry websites, and 21CN is an Internet industry website.

2) Considering each hydropower station, there were 38 public opinion reports on the environmental protection of Nuozhadu Hydropower Station. It is found that the construction period of Nuozhadu Hydropower Station was from April 2004 to June 2014. Besides, there are relatively more public opinions on environmental protection related to Xiaowan Hydropower Station, Miaowei Hydropower Station,

Gongguoqiao Hydropower Station, and Jinghong Hydropower Station.

3) During each constructing stage of the projects, the number of public opinions at the construction stage is the largest, accounting for the largest proportion of 42%. It might be because the construction period of hydropower stations is relatively long, generally 6-8 years. Therefore, the public opinions at the construction and the pre-construction stages accounted for the largest proportion. The public opinions found during the operation period accounted for second place, at 36%.

4) In terms of places, it is found that public opinions from 11 counties where hydropower stations were located accounts for the most. In contrast, there are only 13 public opinions from Changning County, Weishan County, Yangbi County, Yongping County, Zhenkang County, Yongde County, and Jinggu County, accounting for 5%. In the downstream areas, there are 16 public opinions, accounting for 6%. 41 public opinions from Yunlong County is the highest.

5) The environmental impacts, in terms of areas, are relatively balanced. The public opinions towards resettlement area are the largest (26%), followed by downstream region areas (22%), construction areas (18%), and the inundated area has the smallest proportion. (16%).

This paper conducts a cross-analysis of the environmental impact of hydropower construction and different stages of hydropower stations. In the pre-construction stage, the environmental impact on the resettlement area is greatest (48.3%), involving land acquisition, resettlement relocation, resettlement, compensation, and other environment-related issues. In the construction phase, the environmental impact on the construction area is relatively large (43.0%). Because in the construction phase, the impact on the environment mainly involves damages, wasted water, dust, mechanical noise, domestic garbage, etc. The main scope of the latter is the construction area. The environmental impact on the environment of the inundation is also at a high level (32.4%). This is mainly because the water storage in the reservoir will inundate a large area of land, vegetation, etc., causing problems in ecosystem maintenance, geological changes, and sediment changes.

The public opinions without bias accounted for the largest proportion (54.5%) because news reports are based on a fair and objective attitude. Also, China's news media websites are mainly managed by propaganda departments at all levels. The hydropower industry is a pillar industry in Yunnan Province and an important force in stimulating the local economy. Negative reports on the environmental impact of hydropower development will hinder the progress of hydropower development and hinder the economy. Public opinion reports with a negative attitude accounted for only 9.7%; and, 78% of the negative public opinion reports involve resettlement issues. It can be seen that reports on resettlement issues are the largest part of the negative public opinion on the environmental impact of hydropower development.

## **7. A cross-analysis of public opinions towards the environmental protection of hydropower construction**

1) The top ten negative public opinions mainly involve resettlement issues and environmental protection procedures. Resettlement issues accounted for 60%, and environmental protection procedures of

hydropower construction accounted for 40%. The average number of the top ten negative public opinion reports is 10.2, far exceeding the average number of reports of all public opinion reports by 2.9.

2) In this paper, 30 high-frequency words are selected and their frequencies are counted. The 30 keywords with the highest word frequency are roughly divided into immigration, ecology, environmental issues, stakeholders, and names of hydropower stations. From the frequency of keywords, it can still be seen that resettlement is an important issue for the government and hydropower development enterprises. This article counts the number of times that the 30 most frequent keywords appear together at the same time, and builds a 30\*30 co-word matrix. It is found that the word "government" is rather collocated with the word "migration" than "Huaneng Lancang River". After adding 5 keywords with negative meanings and relatively high word frequency (stability, land acquisition, poverty, social conflicts, insurrection), this paper constructs a 35\*35 co-word matrix and uses UCINET to visualize the development of Lancang River hydropower. It is found that these five negative keywords have a small contact density. It can be seen that "land acquisition", "social conflicts", and "insurrection" mostly collocate with the "Miaowei Hydropower Station".

## Conclusion

This paper constructs a theoretical framework of public opinion monitoring for international rivers' hydropower development and environmental protection from four dimensions: the amount of public opinion, public opinion enthusiasm, public opinion inclination, and public opinion intensity. The characteristics of public opinions towards environmental protection include life cycle, coverage, emotional tendency, and momentous events are analyzed in-depth and in detail. It is pointed out that the monitoring of public opinions towards hydropower development and environmental protection must place importance on the cross-border impacts of hydropower construction. At the same time, the public opinions towards hydropower development in international rivers and environmental protection mainly present the following characteristics: 1) the total amount of public opinion on environmental protection was relatively small, but since 2009, public opinion on environmental protection has increased significantly. People are paying more attention to the environmental impact in the process of hydropower development. 2) the environmental impacts of hydropower projects in different construction stages are different. Different areas have received effects in different constructing stages. 3) Reports on resettlement issues are the largest component of negative public opinion. The NGO websites such as China Dialogue pays special attention to the livelihood of immigrants in the development of international rivers. 4) the top ten public opinions with negative attitudes accounted for 60% of resettlement issues. From the aspect of keyword frequency, the topics of public opinion on environmental protection include immigration and related issues, ecological and environmental issues, and cross-border issues. The four hydropower stations on the lower reaches of the Lancang River are geographically closer to the border, and

their "cross-border impact" has also attracted more attention from the "Mekong" countries in the lower reaches of China.

Lastly, a large amount of negative public opinions has been deleted due to sensitive issues. It is, thus, difficult to collect enough negative public opinions in this article. According to the different constructing stages of hydropower projects, the theoretical framework should be adjusted accordingly. However, while conducting a study on public opinions towards environmental protection of hydropower development, negative public opinions should be collected, to have a more comprehensive and grasp of the current status of the public opinion of hydropower development.

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