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Analysis of Water Policy & Sustainable Development in Pakistan

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Economic output, jobs, household sustenance, and industrial expansion are all influenced by a country's water infrastructure and policy. Water is essential to all aspects of human existence, it is a highly contentious issue. Water policies will be examined in this study utilizing quantitative textual data analysis. To swiftly review massive amounts of data, researchers can use the text mining of these water rules to uncover interconnections and surface important connections between entities. Although inter-regional and inter-state water disputes are identified as a problem, the issue is not addressed in depth in the language of India's water plan. As a result of the importance of the Indus River, Pakistan's strategy in these areas is more cross-cutting and multi-disciplinary. According to the United Nations Sustainable Development Goals (SDGs), Pakistan has to improve its water policy in water-sensitive urban designs, natural-hazard risk management, and mapping of water sector growth. Both governments can benefit from each other's water policies due to these quantitative discoveries.

Keywords; Sustainable Development Goals, Water Policy, Household Risk Management.

Introduction

All that was needed to bring life to Earth was a simple connection of two hydrogen atoms to one oxygen atom. Increasing population, urbanization, industrialization, and shifts in consumer and production habits fuel the demand for this fundamental combination of atoms. Only 1% of the world's water is fit for human consumption, despite water covering 70% of the planet. According to the European Environment Agency (2012), knowledge, trustworthy data, and indicators that can illustrate the connection between water management and social and economic benefits as well as ecosystem services are essential for sustainable water management practices. Despite advances in technology that allow for safe drinking water, more than a billion people throughout the world are still without it [1][2][3]. Water is essential to our well-being, food supply, economy, environment, and politics. Water governance has become very intricate as a result of its complexity. Because of its glaciers, Pakistan is one of the world's 36 most water-constrained countries. As a result of rapid population growth, water availability per person has dropped dramatically, from 5,472 cubic meters in 1950 to just 900 cubic meters in 2018 [4]. To qualify as water-strained, a country must have an annual per-capita water supply of less than 1751m3. Indians have access to 1500 cubic meters of usable water per capita, making it another water-stressed country. About 74 percent of Pakistan's total renewable water resources are under pressure, according to the Food and Agriculture Organization (FAO).

Provincial opposition to a national water policy has stalled its formation and implementation for the past decade. Pakistan's first-ever National Water Policy was signed into law after a decade of negotiations and deliberations in 2018.

Pakistan and India signed the Indus Water Treaty fifty years ago. The agreement avoided water wars between the two countries. Due to a lack of realistic expectations upon signing the water agreement, Pakistan is still struggling with problems that impact its economy and social fabric. Climate change and severe droughts in Pakistan are restricting Pakistan's access to clean water[5]. We can reasonably expect and realize that water governance will be a big concern for Pakistan's essential needs and secure ecosystem in the future. There is a transboundary water issue between India and Pakistan, and climate change worsens water scarcity [6].In contrast to Pakistan, India has three separate approaches to water management. The original announcement of India's National Water Policy (NWP) dates back to 1987. The NWP was further revised in 2002 and 2012. All of these variables contributed to the changes: rapid urbanization, a growing population, water insecurity, governance issues, variations in water supply through time and space, and the availability of safe drinking water.

The allocation of water resources is a multi-faceted subject. There must be a unified approach to water allocation, taking into account hydrology and agronomy and economics and institutional considerations. There is a vast amount of literature on water issues from various perspectives and disciplines. For example, shifting water supplies, irrigation, and the economic worth of irrigated agricultural production[7][8].

There is a need to develop new tools and methods for analyzing huge volumes of textual data as part of the policy-making process. There are new approaches to study and software tools (Python, and Orange) being used by enterprises, governments, and universities in the burgeoning field of "text mining [9]."

Diverse viewpoints and assessments have been offered on water policy. India's water policy, for example[10][11]. The literature on water policy, on the other hand, lacks any type of quantitative analysis. A new subject of text analytics is being used in this study to try and assess Pakistani and Indian policy preferences in an attempt to close the policy gap. Textual analysis reveals the most important topics in both policies.

Methods and Materials

Data

This study focused on water policy in India and Pakistan. Pakistan's Ministry of Water Resources has published Pakistan's National Water Policy (2018). The most recent iteration of India's National Water Policy may be found in the Ministry of Water Resources, River Development, and Ganga Rejuvenation (2012). [12].

Methodology

Data extraction from unstructured textual data such as government documents, social media, books, newspapers, and emails can be done using text analytics. With the help of computer algorithms, we can search for patterns in large amounts of data, synthesize the findings, and draw conclusions. Using text analytics, facts, relationships, and claims can be consistently and objectively identified throughout a document. For descriptive and predictive analytics, data is merged into databases.

Many fields, including sentiment analysis [13][14], systematic reviews [15][16], computer science [17][18], and social sciences [19][20], are increasingly relying on text mining as a tool. Text mining has made advances in economics and finance [21][22][23]. Text mining has also been employed in anthropology, communication, political science, psychology, education, and sociology [24][25][26][27][28][29][30].

Cleansing and analysis of the data were completed. Policy papers were the primary focus of the project. tm, an R program, was used by researchers to prepare their articles for text analysis, [31]. There were 211 phrases such as "and," "or," "in," "for," and "stemming" that were eliminated to increase computational speed; (v) Stemming; An algorithm is used to eliminate the typical word for m English such as "es," "ed" and "s," as well as to create a Document Term Matrix (vi).

Results

Each word has a row, and each strip represents a single word. Using this, you can see how frequently and where certain terms appear in the policy document. The word 'water' appears to be well-spread throughout this article. However, the phrase 'water' is used more frequently in the middle of the document and isn't mentioned again until the end. There is a large gap in nearly every section between the words "manage" and "resource," there is a large gap in nearly every section.

The scatter plot shows the frequency distribution of the top ten most often occurring terms. However, although 'water' appears to be half as popular in Pakistani policy, the distribution is roughly comparable and indicates that the phrase is used throughout the country. Resources in the document show a similar tendency. The water policy frequently uses the phrases 'planning,' 'development,' 'use,' and management. In contrast, India's water policy refers to 'rivers,' whilst Pakistan's does not.

Data collection and database management are critical components of India's water strategy. In addition to emphasizing water's value as a resource, the study also looks at how much is wasted and how inefficiently it is being used. In addition to the above two characteristics, India places a high value on new water resources projects and the timely completion and execution of these projects. It is also important to note that India's water policy recognizes the river basin as an important institution for settling inter-State problems and increasing water efficiency.

When it comes to water policy, irrigation, agriculture, and the significance of the Indus River, Pakistan's approach differs significantly from India's. With one of the world's most extensive irrigation networks, the policy is focused on irrigation. Irrigation system maintenance, low irrigation efficiency, drainage as part of irrigation planning, and the role of the provincial government in Pakistan's agricultural sector. With no other water supply in

Pakistan, the country has focused on irrigation, with wastewater accounting for 26% of domestic vegetable production.

Under the 18th Constitutional Amendment, the provinces manage water distribution for agricultural, domestic, and industrial purposes. But despite water's economic importance and calls for more investments like the Bhasha Dam, the central government has delegated many tasks and authorities to the provinces. Pakistan's water strategy places a special emphasis on the agricultural sector. Agriculture, food security, hydroelectric infrastructure, and the role of universities and departments in agriculture are all addressed in this strategy.

International water restrictions, monsoon water flowing into the Indus, climate change, and quicker glacier melting are all contributing factors. Indus Basin Replacement Works (especially dams) and canal water diversion are other contributing factors. Another major consideration in Pakistan's water strategy is local autonomy. It covers everything from provincial master plans to the Provincial Irrigation and Drainage Authority (PIDA) and the Provincial Water Authority (PWA) and the creation of policies for water pricing, drinking water, quality, provincial agriculture, maintenance, and development costs. Although frequent discussions between Indian and Pakistani commissioners have taken place, the peaceful management of the Indus River system has yet to be fully explored. After India built the Baglehar Dam in 1999 and threatened to block Pakistan's rivers, Pakistan's government concentrated on the Indus water.

Both countries talk about climate change but Pakistan's water strategy is notable because it focuses on flooding, unpredictable monsoon rains, and frequent droughts as important concerns. According to the policy, there are significant impacts on water resources, food security, and the flow of water in the Indus system. Discussing extreme weather and the implications of climate change through storage is part of the discussion.

Conclusions

This study uses text analytics to examine the water policies of Pakistan and India. Pakistan's water plan is more comprehensive than India's, and it addresses a wide range of multi-sectoral issues. Managing water resources, development, and irrigation systems are at the heart of both agendas. With Pakistan's policies in comparison, the Indus Waters Treaty, provincial autonomy, agriculture, and the country's irrigation infrastructure are emphasized. Even while water and its economic impact are at the forefront of Indian policy, there is also a focus on database management, basin management, groundwater levels, and the importance and funding of water-related programs. Public trust theory is explicitly stated, yet the policy emphasizes the importance of water as considered an "economic advantage" on the other hand. While inter-regional and inter-state water disputes are seen as a concern, the approach supports industrial growth at the expense of farmers. There is no mention of cross-border data exchange or implementation in the policy, which emphasizes flood forecasting through real-time data collection systems and models. According to two Indian water experts, Pakistan's policy is more multi-sectoral in irrigation, agriculture, climate change, research and development, inland navigation, and the importance of the Indus River[32][33]. Energy, agriculture, and the construction of water reservoirs are all outlined in the report to help balance national emissions by increasing hydropower and lowering energy prices during the non-monsoon season. While India has a national approach to transboundary waterways, its strategy acknowledges the necessity for regional systems to address issues like hydro disasters caused by water release and halt at key moments. According to the United Nations Sustainable Development Goals (SDGs), Pakistan has to improve its water policy in water-sensitive urban designs, natural-hazard risk management, and mapping water sector growth[34]. At least 13 dams the size of the Kalabagh Dam are necessary from Pakistan's perspective [35]. It's dealing with a fundamental issue that policy isn't addressing: falling surface water flows and rapid groundwater depletion. Pakistan's

National Water Policy (N=0) completely disregards the function and importance of commerce in the expansion and export of water-intensive commodities like rice and cotton. In light of these quantitative conclusions, both governments can benefit from one another's water policy based on this core textual analysis.

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