



## Towards a Viable Model for Water Management in boutique Hotels in Tulum

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Recepcion Date: August 2, 2024

Recepcion Date: November 10, 2024

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## **Towards a viable model for water management in boutique hotels in Tulum**

### **Abstract:**

Water is a strategic and scarce resource for the tourism industry, especially in mature, seasonal destinations and areas with water scarcity. Therefore, efficient management of this resource is essential for the sustainability of the tourism sector. The Tulum municipality is a destination facing water scarcity challenges. One of the tourism sectors facing the most pressure to achieve sustainability is accommodation. The management of water, energy, and solid waste presents significant challenges. Recent research highlights that water consumption varies according to the hotel's category. Boutique hotels, due to their size and focus on the guest experience, have a great opportunity to implement water management practices, reducing consumption and improving efficiency. Besides the benefits in operational costs, these practices enhance customer satisfaction and the hotel's sustainable image. Thus, this research focuses on efficient water management in boutique hotels in Tulum through the Systemic Paradigm, generating synthesis with sustainable and resilient models aligned with the Sustainable Development Goals (SDGs) associated with water and responsible consumption. This is fundamental for sustainability in the tourism sector.

**Keywords:** Q25 - water management, L83 - boutique hotels, Systemic Paradigm

## **Hacia un modelo viable de gestión del agua en los hoteles boutique de Tulum**

### **Resumen**

El agua es un recurso estratégico y escaso para la industria turística, especialmente en destinos maduros, estacionales y zonas con escasez hídrica, por lo que su gestión eficiente es primordial para la sostenibilidad del sector turístico; el municipio de Tulum es un destino que enfrenta dicho desafío. Uno de los servicios turísticos con mayor presión para lograr la sostenibilidad son los de hospedaje, por lo que la gestión del agua, energía y residuos sólidos, son grandes retos que presentan. Investigaciones recientes destacan que el consumo de agua varía según la categoría del hotel; por ello, los hoteles boutique, debido a su tamaño y enfoque en la experiencia del huésped, tienen una gran oportunidad de implementar prácticas de gestión del agua reduciendo el consumo y mejorando la eficiencia, además de los beneficios en costos operativos, mejora la satisfacción del cliente y su imagen sostenible. Por ello, esta investigación se enfoca en la gestión eficiente del agua en hoteles boutique de Tulum mediante el Paradigma Sistémico para generar síntesis con los modelos sostenibles, resilientes y alineados con los Objetivos de Desarrollo Sostenible (ODS) asociados al agua y su consumo responsable, siendo esto fundamental para la sostenibilidad en el sector turístico.

**Palabras Claves.** Q25 - gestión de agua, L83 - hoteles boutique, B59 - Paradigma Sistémico.

## **Para um modelo viável de gestão da água em hotéis boutique em Tulum**

### **Resumo:**

A água é um recurso estratégico e escasso para a indústria do turismo, especialmente em destinos maduros, sazonais e áreas com escassez de água. Por conseguinte, a gestão eficiente deste recurso é essencial para a sustentabilidade do sector do turismo. O município de Tulum é um destino que enfrenta desafios de escassez de água. Um dos sectores do turismo que enfrenta maior pressão para alcançar a sustentabilidade é o do alojamento. A gestão da água, da energia e dos resíduos sólidos apresenta desafios significativos. Estudos recentes revelam que o consumo de água varia consoante a categoria do hotel. Os hotéis boutique, devido à sua dimensão e ao seu enfoque na experiência do hóspede, têm uma grande oportunidade de implementar práticas de gestão da água, reduzindo o consumo e melhorando a eficiência. Para além dos benefícios nos custos operacionais, estas práticas aumentam a satisfação do cliente e a imagem sustentável do hotel. Assim, esta pesquisa tem como foco a gestão eficiente da água em hotéis boutique em Tulum por meio do Paradigma Sistémico, gerando síntese com modelos sustentáveis e resilientes alinhados aos Objetivos de Desenvolvimento Sustentável (ODS) associados à água e ao consumo responsável. Isso é fundamental para a sustentabilidade no setor de turismo.

**Palavras-chave:** Q25 - gestão da água, L83 - hotéis boutique, Paradigma Sistémico

## 1. INTRODUCTION

Efficient water management is a crucial aspect for the sustainability of the tourism sector, especially in destinations such as Tulum that face water challenges. In this sense, as Elkhwesky (2022) points out, the hotel industry is currently trending towards the implementation of business strategies that favor environmental performance and thus obtain a “green image”.

Tourism requires a significant increase in the demand for fresh water to cover the needs of drinking water, hygiene, activities such as swimming pools and spas, and the irrigation of green areas, which consequently also represents an important challenge for water sustainability, especially in water-stressed regions such as Tulum. This is why among the most common environmental practices implemented in the hotel industry involve water conservation and reuse, among other environmental practices (Díaz-Farina et al., 2022).

In this sense, considering the boutique hotels that, due to their very nature, represent market offerings defined by different levels of quality, individuality, novel experiences, expressiveness and style-oriented layout (Parolin and Boeing, 2019; Strannegard and Strannegard, 2012), they allow implementing various strategies to reduce their water footprint and align with the Sustainable Development Goals (SDGs). Such measures not only reduce water consumption and mitigate the negative impacts on communities, the environment and natural resources, but can also generate significant economic savings for the facilities.

This research focuses on developing a systemic model for integrated water management in boutique hotels in Tulum, through the diagnosis of current management, the identification of actors, components and interrelationships of the system, the definition of the basis of relevant systems, the integration of these systems into a viable model and its contrast with reality for its enrichment with feasible changes.

## 2. LITERATURE REVIEW

To study the background, a consultation of the articles of the last three years was made, focused on the related topics: Water consumption and its impact on hotels, Water resources in Mexico and Systemic Approach, such consultations have the purpose of developing a critical discourse between the characteristics of the research with the theoretical and conceptual supports.

The General Systems Theory (GST) is considered as an integrating discipline of natural and social sciences that encompasses living and non-living systems through isomorphic principles, but which in turn leaves internal interactions intact, thus embracing their complexity and studying the system as a whole (Van Gigh, 2012), several authors use this paradigm to respond to current socio-environmental problems.

As a result, authors such as García-Buades, et al. (2022) emphasize that, in recent years, the findings of the study on the effects of excessive tourism on residents' perceptions and the moderating role of contextual factors suggest key management tools for achieving more sustainable destinations.

In addition, some authors such as Becerra-Vicario et al; (2022), highlight a key area of interest for researchers in the gap generated by strategic actions aimed at increasing sustainability and the obstacles to its implementation and in which these academic contributions are not conclusive since they have found both positive and negative relationships, however, the same contributions have been directed towards social innovation in this sector, this being a factor that favors the undermining of this gap.

On the other hand, several authors such as Diaz-Farina et al. (2022), Hewa-Heenipellage et al, (2022), relate the dimension of the impacts generated by hospitality services and the planning of mitigation strategies on the aforementioned situations, in addition to correlating the behavior of guest profiles with improvement strategies and generating real cost savings for the

organizations, all of which together lead these organizations to improve their performance in terms of sustainability in the five main pillars: economic, governance, social, ethical and environmental.

On the other hand, some global and Mexican organizations have evaluated, studied and analyzed the causes of the deterioration, status and trends of ecosystem services, resulting in a water crisis present in the world and in various states of the Mexican country (UNESCO, 2023) (CONABIO, 2019), (SEMARNAT, 2023). The municipality of Tulum presents the same scenario in relation to water resource, so, consequently, tourism activities and specifically hotel activity have sought ways to generate their own methods of obtaining this resource (FUND FOR COMMUNICATION AND ENVIRONMENTAL EDUCATION, 2017).

Due to the above and based on the definition of Water Resources Management proposed by the World Bank, it refers to it as the process of planning, development and administration of such resources, both in terms of quantity and quality, and in all water uses (World Bank, 2022). Under this premise Gabarda-Mallorquí et al. (2022), Huggins et al., (2023), Santos et al., (2023), among others, mention the need to analyze the connections between the state of exploitation of the sources of water resources, with the economic and human activities of a destination, to result in an efficient and effective distribution and preservation of this resource.

In this sense, since tourism and its water management within boutique hotels in the municipality of Tulum is treated as a complex social system, which depends on its parts and the interactions between them to function; as defined by Van Gigch (2012), we will rely on the science of control and communication to achieve a self-regulating and balanced system, which refers to the first order cybernetics proposed by Wiener (2017), however, to achieve a viable system, we will study such organizations, using a Viable System Model, based on the Organizational Cybernetics proposed by Stafford Beer, which postulates changing the traditional

managerial thinking, interrelating functions, roles and areas of an organization, in order to achieve a system that is able to exist independently but can change according to the requirements of the environment (Jackson, 2016).

## Development

Tulum is considered a seasonal tourist destination that currently faces serious challenges of water scarcity, on the other hand, water management within boutique hotels in Tulum is a questionable practice. In addition, the tourism boom in the region has significantly increased the demand for water, putting at risk the availability of this vital resource for the sustainable development of the area. For this reason, the research is based on the General Systems Theory (GST), predecessor of the Systemic Paradigm, which offers a holistic and transdisciplinary approach to understand the complexity of water management in tourism.

Traditional science, according to Campbell (1952), Chalmers (2006) and Kerlinger (1973), has sought to explain, classify and predict the phenomenon under study, generally relying on three paradigms: positivist, interpretive and critical (Tejeida, 2005). These paradigms guide the researcher in the development of theory in research (Lorenzo, 2006).

In relation to this, unlike the paradigms, the Systemic Paradigm emanates from Systemics, a young science that includes a variety of approaches and concepts about its nature, formality, applicability and scope. It is constituted by concepts, theories, models and methodologies, but which in turn has its own method (Systemic Paradigm), which gives support to the other disciplines, i.e., it is a metadiscipline (Tejeida et al., 2016). This means that the main characteristic of the Systemic Paradigm is that it is supported by the use of positivist and interpretive paradigms; trying to reach a dialectical synthesis, considering them not as opposites but as complementary; so the result is not only limited to trying to explain and understand the phenomenon, but to generate changes to improve the system and transform reality (Tejeida et al., 2016).

It is important to point out that the Systemic Paradigm, in the modern age, has its origins in the development of the General Systems Theory (GST); This theory was enunciated and defined by Ludwing von Bertalanffy (1947), who considered it within what he called global theories. He created this theory after observing how the theoretical problems in the biosocial sciences were faced by mechanistic schemes of isolable causal pathways and meristic treatments (division into parts) were insufficient, Therefore, he considered approaching these problems with a more holistic vision, thus introducing in his writings the idea of seeing organisms as a system and declaring that the laws of the systems manifest themselves as analogies, that is, that formally identical laws are applied to totally different phenomena (Bertalanffy, 2004).

Thus, GST can be understood as a common language that connects knowledge from diverse areas in interdisciplinary communication and The Systemic Paradigm represents the scientific approach that provides a universal method to interpret a research problem. The aim of this is to establish general principles applicable to the study of all types of existing systems at all levels and in all disciplines (Skyttner, 2001).

In view of the above, authors such as Briones-Juárez et, al. (2009), mention that the Systemic Paradigm provides the transdisciplinary treatment required for the study of dynamic entities or systems that are not integrated with homogeneous elements and in which the laws that constitute traditional denaturalized mathematics cannot be applied. Tourism, considered a dynamic entity, requires methodologies that address its complexity, so the Systemic Paradigm provides new elements and tools for theoretical and praxeological approaches.

In addition, several authors such as Vargas (2013), Miguélez (2011), Grün et al., (2008), affirm that Systems Thinking is a tool that allows us to face and solve problems that involve great complexity, such as those related to the organizations of human beings. Since, as mentioned by Vargas (2013), such systems

can be seen from multiple parts, without leaving aside their internal dynamics constituted by the set of actions that result in a complex set of relationships and interrelationships motivated particularly so that such actions and relationships have a meaning in each of the dimensions of that system and thus deduce the meaning of such actions and the relationships that occur within the context. According to Morin (2000), the complexity of a system is neither determinant, linear nor stable, in addition to the fact that they are open systems that are always in a process of change, sometimes requiring autonomy and sometimes dependence, which is why they are far from equilibrium.

### 3. METHODOLOGY

To develop the Systemic Paradigm and interpret the interrelationships between the various actors and components of the system, the Total Systems Intervention Methodology is used, which, through the context-problem matrix proposed by Jackson (1991), allows us to identify that the object of study is a complex system since there are a considerable number of elements and interrelationships; The closer and more numerous the relationship between its components, the more complex the system will be (Francois, 2004); with respect to the participants, this is adjusted to the pluralistic one, since all those involved, even with different interests and objectives, there is a common objective present in all the participants; likewise, the relationship of its participants in the unitary one is considered, since they share interests, beliefs and values, so that in order to make a decision, all individuals must participate. Being the Complex-Pluralistic-Unitary System. With the above, the most accurate to occupy, according to the System of

Figure 1. Context problem matrix

System		Participants		
		Unitary	Pluralistic	Coercive
System	Simple	Simple Unitary	Simple Pluralistic	Simple Coercive
	Complex	Complex Unitary	Complex Pluralistic	Complex Coercive

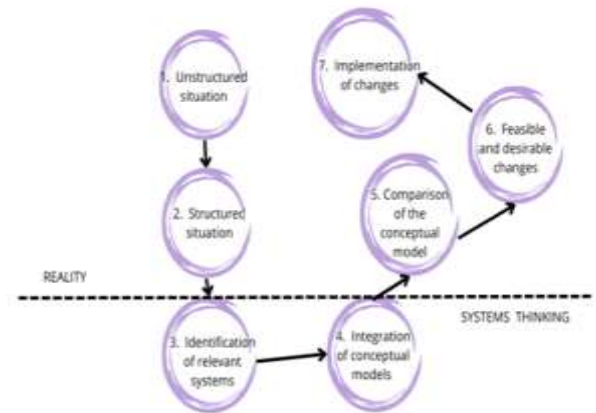
System		Participants		
		Unitary	Pluralistic	Coercive
System	Simple	Hard Systems Thinking	Soft Systems	Emancipatory Systems
	Complex	Systems Dynamics	Pluralistic Complex	Postmodern Systems
		Complexity Theory	Organizational Cybernetics	

Source: Jackson (2002)

Systems Methodologies; is the Soft Systems Thinking (Checkland, 2001) and Organizational Cybernetics (Perez Rios et al., 2008), as shown in Figure 1.

The Soft Systems Methodology (MSS), consists of 7 stages, as shown in Figure 2 and Figure 3: 1) Investigation of the unstructured situation, 2) Structuring of the situation, 3) Identification of relevant systems, 4) Construction of conceptual models, 5) Comparison of models, 6) Definition of feasible and desirable changes, and 7) Implementation of changes. Such a methodology, as Checkland (1999) plans, is useful for interpreting unstructured problem situations or soft problems of high social content based on formal systems thinking.

Figure 3. MMS Methodology Model



Source: own elaboration based on Checkland (2000)

Figure 2. System of System Methodology

Status	Description
1. Unstructured situation	In this phase, the current problematic situation, the stakeholders involved, and their vision are investigated
2. Structured situation	A diagram is constructed with information gathered from the situation showing the processes and relationships with an observer's point of view.
3. Identification of relevant systems	Tentative construction of a definition to improve the problematic situation, generating a root definition for each system. The construction of these root definitions is based on six factors whose initials form the acronym CATWOE (client, actors, transformations, worldview, owner and environment).
4. Integration of conceptual models	From the definition, a conceptual model is built representing the activities necessary to carry out the system.
5. Comparison of the conceptual model	The constructed conceptual model is compared with what exists in the structured problem situation.
6. Feasible and desirable changes	Possible changes are defined as those that must be desirable and feasible.
7. Implementation of changes	The actions to carry out the changes suggested in the previous stage are defined.

Source: own elaboration based on Checkland (2000)

The Soft Systems Methodology (SSM) is complemented by the Viable System Model (VSM) of Organizational Cybernetics, which offers a powerful systemic model for integrated water management in boutique hotels in Tulum.

Authors such as Garcia-Baudes et al. (2022) state that the factors that imply achieving optimal resource management in a tourist destination are: 1. the effects of tourism on the quality of life of residents, 2. the efforts of local governments to control the impacts of tourism, 3. the impacts associated with tourism as a result of the decisions of local governments, 4. the development of initiatives by tourism companies to attract responsible and friendly tourists, and 5. the promotion of tourism products in seasons beyond the mass tourism seasons.

On the other hand, it is relevant to point out that the destinations that consume the most water are coastal destinations due to the activities inherent to their nature (swimming pools, showers after visiting the beach, etc.) (Ruiz, et al., 2018). Based on this, authors such as Santos et al., (2023), refer that, in order to create an integral evaluation of the water resource, it is important to do so from an interdisciplinary perspective that amalgamates knowledge from various domains such as environmental, social, political and technological sciences, as well as to evaluate the complex factors that shape water resource management strategies. Complementing the above, Huggins (2023), highlights

the importance of optimizing groundwater management, since land use around the areas where water is obtained is increasingly intensifying, and the author also highlights the potential of human activities in the same territory and the importance of the dependence of certain ecosystems that depend on groundwater and that this consequently affects the downstream land areas, thus changing the amounts of water obtained and its distribution. That is why Dalin et al. (2017), states that the sustainability of groundwater use represents the water security of people and food supply chains at various scales ranging from local to global; for this reason, there is currently a great interest worldwide in interpreting the connections between the state of exploitation of an aquifer with the economic and human activities that occur on its surface and thus be possible to understand this relationship in order to create new avenues for sustainable groundwater management (Gleeson et al., 2020a; Gleeson et al., 2020b; Huggins et al., 2023).

The Viable System Model (VSM) is a systemic diagnostic and design tool based on organizational cybernetics, which will allow us to: 1) Identify the parts of an organization that are paramount to its viability, 2) Pinpoint structural deficiencies and any existing parts that are not involved with the viability of the organization, 3). Maximize the autonomy of the actors operating the organization, 4) Ensure an integrated and balanced, synergistic and close relationship and functioning of the parts, and 5) Design the planning systems in which strategies must be developed in the context of a changing environmental setting (Beer, 1985). Thus, for the fulfillment of the aforementioned, organizations must go through the existence of functions or subsystems that the MSV identifies as essential in 5 systems that Stafford Beer proposes: System 1: It is responsible for producing and delivering to the environment (market, etc.) the goods or services that the organization produces. From here, the rest of the systems have as mission that this system fulfills its purpose, System 2: It is in charge of coordinating the operations of the system, System 3 and 3\*: Responsible for monitoring and verification to optimize the functioning of system 1, composed of the different

operational units, System 4: Its main function is to monitor the evolution of the organization's environment, taking care of the outside and the future of the organization.

#### 4. RESULTS AND DISCUSSIONS

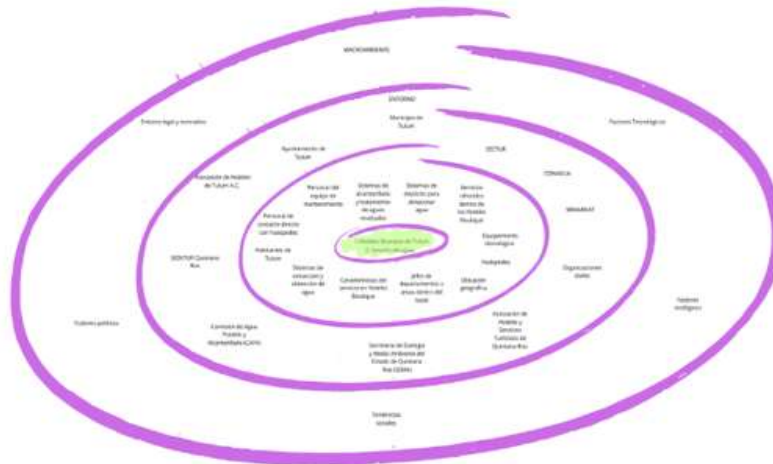
Within the development of stage 1 of the MSS, the system under study is defined, with the expectation that the integration of MSS and the MSV will allow the identification of structural deficiencies and the parts of the hotel organization that are essential for sustainable water management. It is also expected that the model will help maximize the autonomy of the actors involved and ensure an integrated relationship and functioning of the parts of the system. Figure 4 shows the elements that comprise the system, as well as its environment and macro-environment.

In reference to figure 4, it refers to the boutique hotels in Tulum and water management as the key systems from which we will start to identify the elements and actors that are directly linked to the activities carried out by the systems, thus considering the geographical location of the municipality of Tulum, in addition to all the systems for obtaining, storing and distributing water within the municipality, as well as the services, characteristics and personnel that differentiate a boutique hotel, in addition to the participation of guests and inhabitants.

Regarding the environment, this is made up of all the elements that have a direct relationship with the system and that hinder its viability and therefore the system must face. Here we can find local, state and municipal governmental organizations, as well as civil associations.

Finally, the macro-environment is made up of certain elements that have an indirect impact on the system, limiting or allowing the ideal development of its activities and which are elements that have jurisdiction. These elements include technological factors, social trends, legal environment, political factors and ecological factors.

**Figure 4.** Vision of the system and its environment



Source: own elaboration

We continue with the study of the problem situation, which constitutes the generation of the rich vision of the system and its interaction with the environment, thus identifying the interrelationships between the elements mentioned in the previous figure. These elements will be represented by icons as shown in figure 5.

**Figure 5.** Iconographic representation of the actors that influence the system.



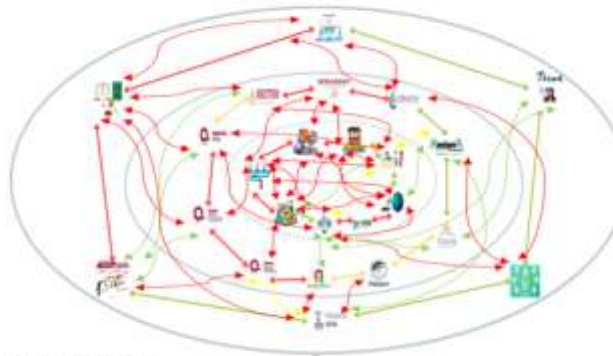
Source: own elaboration.

Within the table, elements and interrelationships are established that represent the degree of conflict between each one of them, using the red traffic light, which represents the highest degree of conflict, yellow intermediate degree and green without conflict. Figure 6 shows the representation of the scheme of the rich



vision of the system and its environment, as well as the interrelationships mentioned above.

**Figure 6.** Rich vision and its environment



Source: own elaboration.

In reference to the graphic representation of the previous table, within the relationships of the inner circle, we can identify the presence of conflict, so that structural deficiency is observed due to the inefficient organization by the managers/owners of the hotels and in relation to the services offered to the guests and that directly affect the community. It can also be observed that, within the environment, there are those elements that are not part of the system, but that directly affect it, being closely linked to its activity and influencing its viability. In this environment, the main conflicts identified correspond to inefficient governance and governability on the part of the local, state and national governments, thus affecting water management in the municipality. Regarding the macro-environment, composed of elements with weak impact on the system, the need to enforce the laws and regulations can be appreciated, and thus far these relations are deficient, which shows that in relation to this there is not an optimal application.

When unifying the three levels, the lack of linkage between government, compliance with laws and regulations by the hotel sector, and also, the absence of technological equipment, can be appreciated.

## 5. CONCLUSIONS

Integrated water management in boutique hotels in Tulum requires a systemic approach that considers the complexity of the interrelationships between different

actors, such as society, business, environment, government and academia. The Systemic Viable Model developed in this research can serve as an effective tool to boost competitiveness in hotels and improve the sustainability of the tourism sector in destinations with water scarcity.

It is important to mention that MSS, thus far, have been carried out based on phenomenology and hermeneutics to define the system and diagnose the current situation of the problem.

Seeking the construction of a systemic model for water management in boutique hotels in Tulum aims to improve the way in which tourism copes with the emerging contexts to which the sector is exposed, which is why it is proposed to study these contexts through organizational cybernetics with the use of MSV, thus creating the basis for future studies that deepen its feasibility and create the basis for a paradigm shift that can increase the academic heritage of tourism.

## Acknowledgments

This research is supported by the Instituto Politécnico Nacional through projects SIP20242464 and SIP2024241727 by the Secretaría de Investigación y Posgrado and the Consejo Nacional de Humanidades, Ciencias y Tecnologías de México.

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