



THESE DE DOCTORAT (WATER RESOURCES SYSTEMS MANAGEMENT)

The Water, Energy and Food Nexus In Algeria

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Abstract
The world is experiencing a great change in the economy, environment, industry; all this is due to several factors such as demographic development, climate change, pollution, urbanization. The latter affect the availability natural resources such as water, energy... It becomes imperative to become aware of the extent of the current situation in the world and to face this problem which becomes a major issue for survival and maintenance of life on this planet.
Traditionally, resources are managed separately. But increasingly, there is a need for integrated approaches as it is realized that the resources are hyper-interlinked and problems cannot be solved alone. In this respect a more holistic and holistic vision is imperative to better understand all aspects of a sector.
Since the strong interdependencies between water, energy and later food were first identified, this topic has been gaining importance at the international level and for the business sector.
The nexus concept emerged since the 2011 Bonn conference and is introducing a fundamental shift from sectoral approaches to cross-sectoral, integrated and coherent solutions.
The objective of this research is to assess this nexus approach on an area in Algeria.
A participatory approach and the implication of key stakeholders should be adopted in the assessment process for better decision-making.
Key words: Nexus, water, energy, food, stakeholders, holistic vision.

INTRODUCTION

It is hard enough to manage water to imagine how difficult it is to try to combine water with other parameters like energy, food, land, environment and Algeria is part of so many countries that have always managed their resources separately without taking into account the interactivity and the complexity of relationships between its sectors. Given the water problem that persisted hard in the 80s to 90s, desalination was the best solution to mitigate this water crisis in Algeria. Algeria's experience in the field of seawater desalination has become important and considerable, given the large number of stations located in the country's coastal cities.
Despite the fact that desalination of seawater remains an effective choice to alleviate the water crisis, its energy consumption and the cost price of one cubic meter of produced water raise several questions and on the other hand, has the fact of satisfying the water needs with desalinated water left the rate of superficial water resources for irrigation? It is in this context that we will conduct our research, in order to find the ideal balance between water, energy and food, and analyze the interface that exists between these sectors using systems thinking that allows to study the whole system rather than parts.
The involvement of the stakeholders in this research will give another insight into the management methods of these different sources, and why not find solutions in this context.

PROBLEMATIC
How to apply systems thinking to evaluate the approach of WEF nexus on our case study?

CASE OF STUDY: SEAWATER DESALINATION PLANT (BENISAF WATER COMPANY)

We consider this desalination station as a system where we will list its strong and weak points:

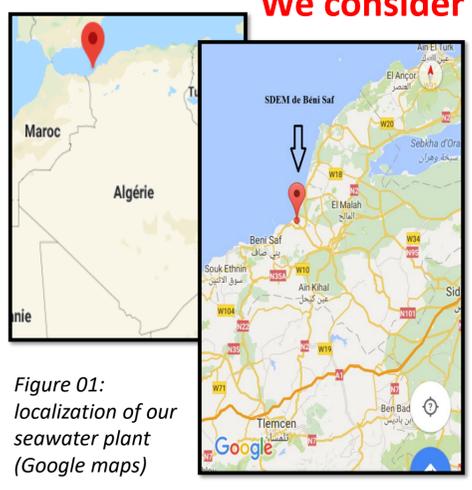


Figure 01: localization of our seawater plant (Google maps)

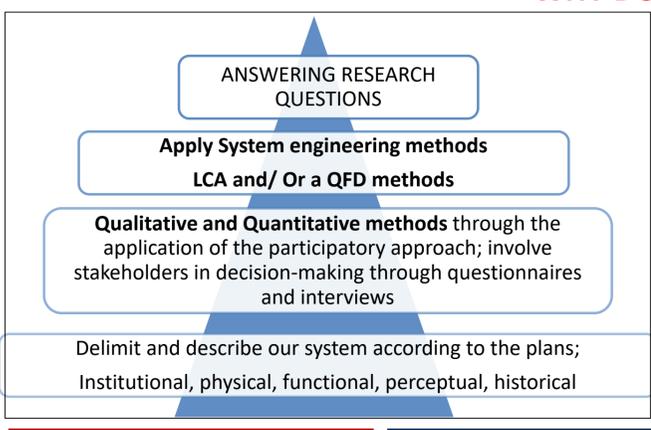
+++ System implemented in absolute urgency to alleviate a painful water shortage experienced by the western region of the country
+++ It Generates employment
+++ It's training opportunities for students
+++ It leaves the conventional resources for irrigation

*High energy cost
*Cost price of one cubic meter higher than that estimated
*Environmental impact
*Employee health and safety
*Satisfaction and perception of the population regarding desalination



Figure 02: physical limit of our system (Google Maps)

METHODOLOGY

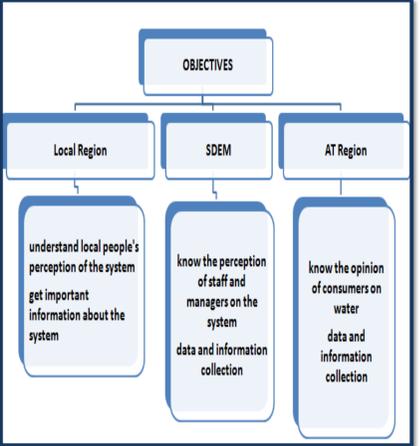
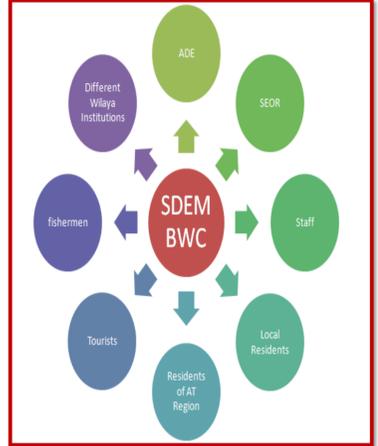


WHY DO WE NEED STAKEHOLDERS DIALOGUES ?

The involvement of the stakeholders in this research will give another insight into the management methods of these different sources, and why not find solutions in this context.
The overall objective of stakeholder dialogues is to build a shared understanding of: (Walking_ the nexus Talk, 2014)
• Current state of natural resources and ecosystems;
• Expected trends and drivers of resource uses and management;
• Goals and interests of different sectors/user groups in regard to water, energy and food;
• Key interactions of water, energy and food systems, including trade-offs and shares of different resource uses and ecosystem management;
• Opportunities for linking to ongoing decision-making processes.

WHY DO WE NEED SYSTEMS THINKING ?

The approach taken by the specialists consists in considering each element as an interdependent system, without studying the shared interface with other elements, but the application of the systemic approach in the study of our system makes it possible to better understand the complexity of all subsystems. (Bekkouche 2016)
Systems Thinking methods can offer valuable contributions to nexus research, which helps to capture the complexity of interrelations and interactions among water, energy and food systems (Tamee et al.2017)



WHAT NEXT ? / PERSPECTIVES

- Analyze the data obtained from the questionnaires
- Delimit the objectives and criteria of our system and translate them into indices to evaluate the system.
- Systemic analysis of the Water, Energy and Food nexus
- Study the perception of stakeholders regarding desalinated water

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Figure 03 : Identification of different stakeholders categories (author)