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# Water Governance in Egypt: Challenges and Opportunities

Which factors influence Egypt's water governance and how could it improve the effectiveness of its water governance system?

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# Abstract

While water is becoming an increasingly scarce resource, the demand for it is simultaneously growing, impacting water availability in some regions of the world. While some countries have the potential to increase their water supply with financial means, Egypt finds itself in a situation in which the country has to utilize its available resources the most effective way in order to meet its water needs. Egypt is located in one of the most water stressed regions of the world, where the issue of water scarcity is combined by severe climate change impacts which exert pressure on the country's water resource management and governance system. Therefore, this Thesis aims to examine the actions of the Government of Egypt in the domain of water and identify the factors that influence its water governance system. Another purpose of this research is to provide propositions with regards to improving the effectiveness of Egypt's water governance system.

In order to research water governance in Egypt, a theoretical framework on resource governance theory, good governance, global governance, effective water governance and water management have been introduced. This has enabled the thorough analysis of Egypt's water governance system in terms of the multiplicity of actors, their cross-level interactions and in consideration of different modes of governance, for instance bureaucratic hierarchies and distributed governance systems. Serving as the framework for the analysis, the GWP's IWRM guidelines' dimensions of the enabling environment and institutional arrangements were utilized to establish how integrated and effective Egypt's water governance system is.

Throughout the analysis, it was found that while water policy efforts are in place and planned for, their implementation is restricted by the lack of financial incentives and the inadequacy of national laws. Egypt introduced the NWRP which can be considered a very comprehensive national plan attentive to a wide range of components of the country's water resources system, the different water user sectors and related stakeholders. This denotes that Egypt has adopted a rather participatory approach and partially opened up to decentralization, yet, water governance processes still predominantly occur on a national level among the different Ministries. Consequently, Egypt needs to improve its institutional framework and assign more responsibilities to both state and non-state actors operating on lower administrative levels to enhance the effectiveness of its governance system and the implementation of policies. Furthermore, the importance of the private sector has been recognized due to their technological advancements and effective management practices, however further reforms are needed to attract and facilitate the involvement of companies in the water sector.

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# Introduction:

"Water is mankind's most valuable resource" (Andelman, 2010) - it is the essence of life, indispensable for human survival and a driving force of sustainable development. Water enables life on Earth, yet we are currently living in a world where clean water has become increasingly scarce. Even though water can be found on more than 70% of Earth's surface, only approximately 2.5% is fit to drink, from which around 1% is available, while the rest can be found frozen in snowfields or kept in glaciers thus, making it difficult to access (nationalgeographic.com). Consequently, water, as an especially scarce commodity, with limited availability on Earth is vital to be used with a conscious behavior and managed in an appropriate and effective manner. According to statistics, 2.2 billion people do not have access to safely managed drinking water, more than 4.2 billion people are short on safely managed sanitation, and 3 billion lack basic hand washing facilities (WHO, 2019). Notably, various factors of geography, climate, political strategies, regulations, engineering and territorial conflicts play a role, so that some parts of the world might seem to be rich in freshwaters, while others are more water-stressed. A few countries seem to have the sufficient financial and natural resources to increase their water supply too, while others only have the alternative to make better use of their resources which are available (UN, 2018, p. 12).

However, it is important to adopt a human right based approach to water, based on the UN's principle of *Leaving No One Behind* according to which safe drinking water and sanitation are basic human rights (UNESCO, 2019, p. 1). The lack of access to water, sanitation and hygiene can have detrimental effects on one's healthy livelihoods, dignity and prosperity, and on top of all, can mean a huge threat to the fulfillment of other human rights. Water is also indispensable for a country's sustainable development, appropriate usage and management of the resource can contribute to reduce social and economic inequalities, poverty, generate economic growth and environmental sustainability (Ibid.). Having recognized that both social and economic development is dependent on the sustainable management of water resources, in 2015, the United Nations introduced a Sustainable Development Goal on water and sanitation to the global political agenda (UN, 2018, p. 10). Sustainable Development Goal 6 seeks to "ensure safe drinking water and sanitation for all, focusing on the sustainable management of water resources, wastewater and ecosystems, and acknowledging the importance of an enabling environment" (sdg6data.org). SDG6 is of especial importance nowadays since global

conditions such as climate change and pollution fuel the water crisis, it can only be overcome by joint efforts of effective water resource management.

Water scarcity is expected to worsen as population and the demand for water grow as well as the effects of climate change intensify (UN, 2021, pp. 12-13). As being one of the main driving forces of the increasing water demand, population growth and high population density impact the amount of water available per person and cause people to migrate to more marginal regions and into cities which are already struggling to meet water demands (PAI, 2011). Population growth also brings about food security issues putting a burden on the agriculture sector which already accounts for 70% of the world's water use, and 95% of water use in agriculture-based countries (Ibid.). Industrial production also relies on water necessary for processing, cooling and waste disposal and with the current rate of population growth rapid industrialization requires more water to meet the needs (Ibid.). This exerts not only pressure on the availability of water resources but also triggers worsening climate conditions and environmental degradation (Ibid.). The water crisis is also exacerbated by the effects of climate change because "climate and the terrestrial water cycle have a very close and complex relationship" (UNESCO, 2020, p. 16). For example, a rainfall deficit can reduce soil moisture, river flow and groundwater recharge as well as extreme events of floods and droughts can cause damage to main infrastructure and services impacting water availability and sanitation in some regions (Ibid.).

It is predicted that the Mediterranean is one the regions where drastic changes in climate are anticipated having also a great impact on water resources (Sanchez-Plaza et al., 2019, p. 1). Such projections are based on "annual average temperature increases that are higher than those of the rest of the world" (Ibid.). Other indications of these projections consider annual rainfall and its seasonal distribution and variability as important factors, along with the occurrence of extreme events such as droughts and floods (Ibid.). The effects of climate change on water resources is expected to be enormous in the Mediterreanean, more specifically it would raise further issues about water availability which is already considered a subject of concern in some countries, for example in Egypt. Egypt being a poor developing country with a hot desert climate and very limited rainfall, is located in North Africa, in the MENA region. The MENA (Middle East and North African) region is considered the most water stressed region in the world given that the average water availability is estimated to be around 736 m3 per person per year, while the total renewable water resources for the world amounts to the average of 7,453 $m^3$ per person per year (UNESCO, 2019, p. 129). Egypt being closely connected to both the Mediterranean and MENA region makes the country especially vulnerable to both climate

change impacts and water scarcity which combined can result in increased water shortages and supply issues. In Egypt, 95% of the country's total water supply comes from the Nile, 3.5% belongs to annual rainfall and 1.5% is resourced from groundwater (Elsaeed, 2011, p. 338). Egypt's water supply being heavily dependent on the Nile, can bring about further issues owing to the fact that the flow of the river is extremely sensitive to rainfall and variations to temperature, affecting evaporation and evapotranspiration. For example, temperature rise can have the potential to decrease the levels of water flows in some of the Nile's sub-basins (Ibid.). Another aspect that needs to be taken into account is population growth and density in Egypt. The majority of Egyptian population is highly concentrated along the narrow valley of the Nile, and with the extension of inhabited areas, wastewater disposal is simultaneously increasing (Bedawy, 2014 & Elsaeed, 2011). This means that the quality of water is progressively deteriorating in such areas. It is further remarked that besides population growth and the processes of urbanization and industrialization "the consequences of a higher standard of living, the increased use of chemicals in agriculture, the absence of actual control on the disposal of hazardous waste materials development as well as the lack of environmental public awareness" play also a significant role in the decline and deterioration of Egypt's water resources (Bedawy, 2014, p. 109). Furthermore, Egypt can't seem to keep up with the increasing demand, since the country's total available fresh water is 58 billion m3, which is a 19 billion m3 less than the country's annual water demand (Elsaeed, 2011, p. 338). Correspondingly, water resource management is of strategic priority in Egypt which incited both international attention and national efforts to improve effectiveness in Egypt.

## Problem Formulation

Given the climate uncertainties, fashion of population growth, increasing urbanization and industrialization, and the lack of environmental public awareness (Bedawy, 2014, p. 109), Egypt is an interesting case to study in terms of its water management and governance system. As the introduction revealed, Egypt is located in the most water-stressed region of the world and assuming that the current trends of population increase and the impacts of climate change would persist if not worsen, Egypt needs to find an alternative to meet its water needs. Considering Egypt's poor socio-economic situation and lower level of development (Ibid., p. 108), while some countries have sufficient financial and natural resources, Egypt is in no situation to increase its water supply. Therefore, in order to meet water needs, the country has

to make better use of its available resources, possibly, by improving the efficiency of its water governance system. The purpose of this Thesis thus, becomes to identify the factors that affect Egypt's water governance system, and at the same time, to examine the water-related practices and actions of the Government of Egypt that have been carried out to enhance the effectiveness of its water governance system. Ultimately, with this approach, propositions can be made to find a solution uniquely fitted for the case of Egypt. This problem formulation inspired the following research question this Thesis intends to answer:

*Which factors influence Egypt's water governance and how could it improve the effectiveness of its water governance system?*

# Theoretical Framework

The following chapter presents the theories and theoretical concepts that will be used in the analysis. First and foremost, the theory on global governance and resource governance in the domain of water will be introduced with the aim to establish what effective water governance entails. Furthermore, the concept of water management and will be clarified, and afterwards the different approaches and strategies towards water management will be discussed with particular emphasis on the approach of Integrated Water Resource Management.

## Resource Governance Theory

The concept of governance has been present since 1990 and has diverse meanings attached to it. Not uncommonly, it has been wrongly and interchangeably used with the word 'government', so as if a public policy issue emerged which was deep-rooted in governance, it was unintentionally justified as a problem of government (Graham et al., 2003, p. 2). In a broader sense, governance refers to the decision-making by a government (GWP, n. d.), while the UNESCAP (2009) extends the concept as defining it by "the process of decision-making and the process by which decisions are implemented (or not implemented)". Graham et al.

(2003), define governance as "the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say" (p. ii). In other words, governance concerns power relations and accountability by revealing who has the power to decide, who is influential and most importantly who can be held accountable for governmental mistakes. Jiménez et al. (2020) argue that there have been some recent trends in the emergence of 'new governance' which is more collaborative, market-based and focuses on society as a whole. In line with that, it is expected that these new modes of governance can substantially act in a more democratic manner and enhance the problem-solving performance of both local communities and society while being multilevel and market-based (Blühdorn & Deflorian, 2019). Contemporary discourses call for governance approaches which are focused on building resilience and adaptability (Chaffin et al., 2014), especially in climate sensitive sectors such as water management (Pahl-Wostl et al. 2007). Similarly, Folke et al. (2005) argues that there is a constant need to adapt and shape, as for instance in a highly adaptable socio-ecological system, actors are more capable of reorganizing the system and deal with complexities in a situation of change and disturbance.

Governance is a prerequisite for achieving effective and sustainable water management and development (Jiménez et al, 2020, p. 2). It is due to the fact that the current water crisis is increasingly attributed to the lack of efficiency, effectiveness and adaptability of governance regimes which are not only detrimental to water management but can prevent countries from any sort of development (Pahl-Wostl, 2009, p. 354). Governmental failures and incapacity can also be explained by events "when governments lack the jurisdiction, capability, or interest to deal with a problem of public concern" (Graham et al., 2003). Evidently, governmental failures are manifold and they are of concern to both developing and more industrialized nations. Developing countries are more susceptible to struggle with issues of corruption and the absence of civil society when it comes to governance (Pahl-Wostl, 2009, p. 354). On the other hand, industrialized countries are more likely to experience over-regulation, sectoral fragmentation and the attachment of greater importance to economic benefits rather than environmental considerations (Ibid.). In both contexts, the same question arises about how to govern and manage resources so that the fundamental functions of the governance regime remain sustainable and resilient to disturbances of societal and environmental changes.

Governance should be about reaching desired conditions and outcomes. Graham et al. define good governance as "a mode or model of governance that leads to social, environmental and economic results sought by citizens" (p. 6). Given that in different contexts, societies assess outcomes differently, some argue that good governance also varies from country to country, making it difficult to propose a universal set of good governance principles (Graham et al., p. 7). Nevertheless, based on the UNDP's works, Graham et al. (2003) has prepared a list with characteristics of good governance. However, it needs to be emphasized that the 5 good governance principles "represent an ideal that no society has fully attained or realized" (Ibid.), this means that development is a journey rather than a destination and depending on the stage and nature of development, countries may require different governance methods in which these principles should be reflected.

- In good governance, legitimacy and voice matters implying a democratic and human rights perspective in which women and men are encouraged to equally participate in decision-making. It is also consensus-oriented, meaning that good governance also mediates differing interests of groups with the aim to reach consensus on decisions reflecting what is in the best interest of society (Graham et al., p. 8).
- Good governance is characterized by strategic vision which refers to the long-term perspective of the leaders and the public towards human development while taking into account the historical, cultural and social complexities (Ibid.).
- In terms of performance, the responsiveness of institutions and processes while aiming to serve all stakeholders is highly regarded. Good governance should also reflect effectiveness and efficiency for which an indicator can be if results are produced by governing institutions and processes which satisfy the demands while utilizing the resources the best way possible (Ibid.).
- Furthermore, in good governance, the decision-makers including the government, civil society, and private sector should act as accountable to the ones affected by a given policy or decision. Accountability can be meant in two ways: "Its political purpose is to check the might of the political executive – it is a mechanism for minimizing abuse of power. Its operational purpose is to help ensure that governments operate effectively and efficiently." (Schacter, 2000 cited in Graham et al., 2003, p. 21). Undeniably, combating corruption has been associated with improving governance. At this point, it

is crucial that governmental institutions and processes are based on transparency - the free flow of information- which enables all stakeholders to monitor and understand outcomes in depth (Graham et al. 2003, p. 8).

- The fifth principle of good governance draws upon the idea of fairness. Firstly, equity among men and women should be achieved to ensure that they have equal opportunities to improve their welfare. Secondly, the concept of rule of law should also be considered under the notion of fairness since it plays a role in upholding the rights of individuals, regulating and restraining the power of bureaucracies, and ensures that legal frameworks are clear, stable and have a moral basis (Ibid., p. 24).

In absence of such conditions, when governance regimes cannot fulfill their roles, Rogers & Hall (2013) argues that the term poor governance applies. Poor governance induces "increased political and social risk, institutional failure and rigidity and a deterioration in the capacity to cope with shared problems" (Ibid., p. 9). Poor governance poses an obstacle to development and tends to enlarge social and economic inequalities, by exposing the poor to higher risk of vulnerability and to the inability to adapt to changes (Ibid.). As a consequence, markets become weaker and distorted hindering growth and employment opportunities. In response to emerging from poor governance, it is contended that structural and institutional reforms can be of help inclusive of measures such as "creating accountability in the use of public funds, building national capacity for better policy formulation, implementation, and enforcement mechanisms" (Ibid.). In addition to that, embracing inclusiveness and accountability in decision-making and implementation processes where the roles of civil society and private sector are clearly defined, as well as the division of labor among the actors, sharing of responsibility and balancing power relations can be what turns poor governance into good governance (Ibid., p. 10).

When addressing resource governance, scientific evidence suggests that there is an instant need to adapt a global perspective (Pahl-Wostl et al, 2008, p. 419). In general terms, global governance refers to "the exercise of authority across national borders as well as consented norms and rules beyond the nation state, both of them justified with reference to common goods or transnational problems" (Zürn, 2018, p. 4). This definition recognizes the plurality of governance actors, inclusive of both international and transnational institutions which in

essence are responsible for global governance. Global governance also entails both agreed norms and the exercise of authority (Zürn, 2018, p. 4). These elements of rules and norms should be consented to by all which shed light on the 'publicness', in other words, the public justification within global governance. Furthermore, with reference to the purpose of global governance in realizing shared goals, it should be acknowledged that "a certain choice of governance always includes a choice against another form of governance" (Ibid., p. 5). This reflects the inferiority of interests and beliefs of some actors to others which brings power and hierarchy among the actors into discussion. In addition, Zürn (2018) further noted that global governance interactions are not necessarily applicable to the entire globe, because some parts of the world do not partake in any form of international arrangements (p. 5).

In the domain of water, the basic argument is that "water is a major global public good" and that global governance theories especially in the environmental sector should comprehend the rapidly evolving context of the 21st century which resources are extremely sensitive to (Pahl-Wostl et al., 2008, p. 420). Among these key issues are that our modern world fosters competitiveness while experiencing resource scarcity and far-reaching environmental change. Traditionally, when it comes to resource governance, researchers and policymakers tend to focus on scales of the local, national and river basin, inadvertently omitting the global and multidisciplinary dimension which is essentially needed to capture the complexity of current governance processes and challenges (Ibid.). In resource governance, many express the need to interpret *local* rights, needs and stakeholders when effectively addressing governance challenges (Pahl-Wostl et al, 2008, p. 421). This idea is in accordance with notions of decentralization and subsidiarity, since water problems appear to be local, they should naturally be dealt with on a local level. Another philosophy supports *national* water governance according to which water is a national resource "that should be governed for the benefit of national economy and society: domestic interest comes first" (Ibid.). The third perspective holds that water governance should take place on *basin* level. The main argument derives from notions of efficiency and hydrological system approach that resource-related conflicts and issues can be best taken care of within the natural boundary of the system (Ibid.). A relatively new yet prominent view explores the '*global*' in resource governance attributed to the presence of multilateralism in international politics and that local, national and basin levels are interconnected within the global water system (Ibid.).

To further underline the need for a global perspective in resource governance, one needs to mention that "the hydrological system is a global system, and exchange processes occur at the global level over relevant time periods" (Pahl-Wostl et al., 2008, p. 421). It can be well exemplified with the instance of climate change, since climate causes and effects relations have the potential to exceed vast distances, thus they need to be dealt with globally. Furthermore, in certain situations of global environmental changes and socioeconomic phenomena, the local, national or basin governance regimes are unable to provide outreach efforts. Sometimes these environmental changes and socioeconomic phenomena, experienced locally, are deep-rooted in global dynamics such as in cases of erosion, urbanization, eutrophication, biodiversity loss (Ibid.).

Having argued that there is a need for resource governance which appreciates a global perspective, it should also be emphasized that global arrangements should also be explored through cross-level interactions (Pahl-Wostl et al., 2008, p. 422). Resource governance, especially the domain of water, possesses a multi-level nature, and "global mechanisms must be incorporated in ways that are complementary to instruments applied at other levels" (Ibid.). This means the adoption of a denser system of multilevel governance, where the interplay of levels across global to local is also taken into account.

The concept of water governance emerged simultaneously with the evolution of resource management approaches. Pahl-Wostl (2009) distinguishes between the two concepts because water management is defined in terms of "the activities of analysing and monitoring, developing and implementing measures to keep the state of a resource within desirable bounds, [...] [while] resource governance' takes into account the different actors and networks that help formulate and implement environmental policy and/or policy instruments" (p. 355). In this sense, governance reflects how complex such regulatory processes are by reckoning all actors involved and the way they interact with one another. Correspondingly to that, the GWP provides a definition of similar kind: "Water governance refers to the range of political, social, economic and administrative systems that are in place to regulate development and management of water resources and provisions of water services at different levels of society (Global Water Partnership, 2002)''.

Whilst acknowledging the complexity and the all-encompassing nature of water governance, analyzing such multi-level systems might be found rather challenging. Pahl-Wostl (2009) writes that the notion of government as a sole decision-making entity which exercises its sovereign power and authority over the people and groups of society, has become obsolete compared to notion of multi-level and polycentric modes of governance where multiple actors from diverse institutional backgrounds have a contribution to the development and implementation of a policy (Pahl-Wostl, 2009, p. 356). At this stage, it is important to note the importance of non-state, private corporate actors and social networks who are involved in the formulation and implementation of a development policy, or indirectly participate as by creating policy instruments to achieve certain objectives that accompany the prevailing governmental processes (Rhodes, 1997 cited in Pahl-Wostl, 2009, p. 356). Fundamentally, governance requires the coordination and guidance of actors involved for this reason, steering processes are initiated with the aim to control their behavior and ensure that such institutions and policy tools are in line with each other creating synergies. Therefore, governance is featured by elements of "self-organization, emergence and diverse leadership" (Pahl-Wostl, p. 356).

Given the compound nature of governance which embraces multiple dimensions of social, economic, administrative, political, Pahl-Wostl (2009) conceptualized a theory on how to deal with such complexity in a more systematic manner and introduced four aspects that can help analyze and explain the characteristics of environmental governance regimes. They are as follows:

1, Institutions and the relationship and relative importance of formal and informal institutions

Institutions are not necessarily organizations or physical structures, but they are considered similarly to institutional analyses in social sciences "to denote rules governing the behaviour of actors" (Pahl-Wostl, 2009, p. 356). Formal and informal indicates the kinds of development, implementation, communication processes initiated by the institutions. Formal institutions are embedded into regulatory frameworks and laws which means that they can be legally enforced thus, they are closely connected to the "official channels of governmental bureaucracies" (Pahl-Wostl, p. 356). In contrast to that, informal institutions are made up of socially shared rules in forms of social and cultural norms and practices, hence they are enforced as part of social

channels rather than legally (Ibid.). As remarked, what is crucial for a governance regime is "the relative strength of formal and informal institutions" which is determined by the compatibility of goals among formal and informal institutions as well depends upon how effective the formal institutions are (Ibid.). One of the key factors that one needs to consider when assessing the degree of effectiveness of formal institutions is the corruption index. The goals of formal and informal institutions can either be harmonious or conflicting. In case the formal institutions are characterized by effectiveness and the goals of both formal and informal institutions are in correspondence with each other, the chances are higher that the governance regime itself is more efficient and effective overall. On the other hand, as Pahl-Wostl (2009) explains governance regimes can fail, in case they are described as corrupt, intransparent in their decision-making and the "dominance of established power structures" which all can be attributed to ineffective formal institutions, and the conflicting goals among formal and informal institutions. To point out, this relates well to a few instances in some of the developing countries, where there is a substantial gap in between theory and practice since strong environmental laws do exist, but they are not implemented or poorly implemented in reality (Pahl-Wostl, 2009). This can also give solid grounds to recognize the role of informality and distinguish between the institutions with the purpose to understand how and why governance regimes can fail and what are the driving forces, and sometimes the barriers for the change.

Following Scott's (2001) idea, the institutions could be further divided into three categories: regulative, normative, cultural-cognitive which all imply different change dynamics. Regulative institutions can be considered formal with possession of legal structures, usually their rules and code of conduct is laid down in handbooks. Normative institutions can be associated with informal structures where societal norms and standards determine what a good practice is; they shed light on value structures (Scott, 2001). Compared to regulative institutions, change is not dependent upon formal agreements and negotiations but is rather "more gradual and emergent" (Scott, 2001 cited in Pahl-Wostl, 2009). Lastly, cultural-cognitive institutions are connected to mental models and paradigms which "strongly influence system understanding, how boundaries are delineated, the search space for problems and solutions are determined", it is also enacted via shared social and cultural practices (Pahl-Wostl, 2007).

2, Actor networks with emphasis on the role and interactions of state and non-state actors

Holton (1998) writes that the influence and power of the nation state has shown a declining tendency over the past few decades. In environmental resource management, participatory approaches have gained popularity and credibility (Pahl-Wostl et al. 2007) owing to the increasing globalization and the strengthening role of civil society. As argued by Newig et al. (2005), the participation of interested public and broader public is a key to knowledge generation and functions as means to manage informational uncertainty (p. 340). Therefore, by involving non-state actors in policy development and implementation, the respective authority can benefit from their (local) knowledge, gain insight into the social system in which context the certain policy will be circulating, as well as by allowing the participation of non-state actors, the authorities can learn about their acceptance or potential resistance of the proposed measures (Newig et al., 2005, p. 340). In other words, the participation of all stakeholders gives states access to all sorts of knowledge and reduces uncertainties in the implementation period.

On another note, it is also important to stress that the roles of non-state actors are not only diverse but have also become blurred and intertwined in government regimes (Pahl-Wostl, 2009, p. 357). Since actors have been able to participate increasingly in the policy development and implementation processes, they have also been involved in designing the institutions which are otherwise expected to be responsible to control their behaviors and actions (Ibid.). This means that the differences between the informal and formal institutions are gradually decreasing because now "compliance to formal rules is not only enforced by sanctions as the rational actor paradigm would suggest but by embedding formal rules in actors' values and norms" (Pahl-Wostl, 2009, p. 357). In simpler terms, similarly to the nature of informal institutions, now formal institutions' rules would also comprise socially shared norms and values to a certain extent. Pahl-Wostl (2008) further explains that the involvement of actors in the design of formal institutions can bring about growing compliance and effectiveness, although it might be at the detriment of efficiency because participatory processes require enormous amounts of resources (p. 357).

3, Multi-level interactions across administrative boundaries and vertical integration

The ways different levels interact has always been at the center of discussion in international relations and development studies, however, a major development in resource governance was

the notion of polycentric systems with multiple decision-making centers (Pahl-Wostl, p. 357). Polycentric governance systems are "complex, modular systems where differently sized governance units with different purpose, organization, and spatial location interact to form together a largely self-organized governance regime" (Ibid.). Evidently, these types of governance systems enjoy many different levels of freedom. According to Pahl-Wostl (2009) when addressing the multi-level dimension in polycentric systems the "decision making authority is distributed in a nested hierarchy and does not reside at one single level, neither top (only highest level government enforcing decisions), nor medium (only states/provinces enforce decisions beneficial for their region without considering others), nor individuals with complete freedom to act or being connected in a market structure only" (p. 357).

It is assumed that polycentric systems possess the prominent ability to adapt easily in a situation of change and in case of facing sudden failure in the system, they are less likely to be affected in their integrity (Pahl-Wostl, p. 357). This conception is deep-rooted in adaptive systems theory, in which it is further asserted that complex adaptive systems prevail in non-equilibrium environments where many elements interact with each other in view of certain rules (Ibid.). Such rules of interaction are susceptible to change if found necessary and that gives the opportunity to adapt and self-organize (Ibid.). In similar fashion, theoretical ecologists also emphasize the parallel that exists in between diversity and maintaining integrity in ecological systems (Pahl-Wostl, 2009).

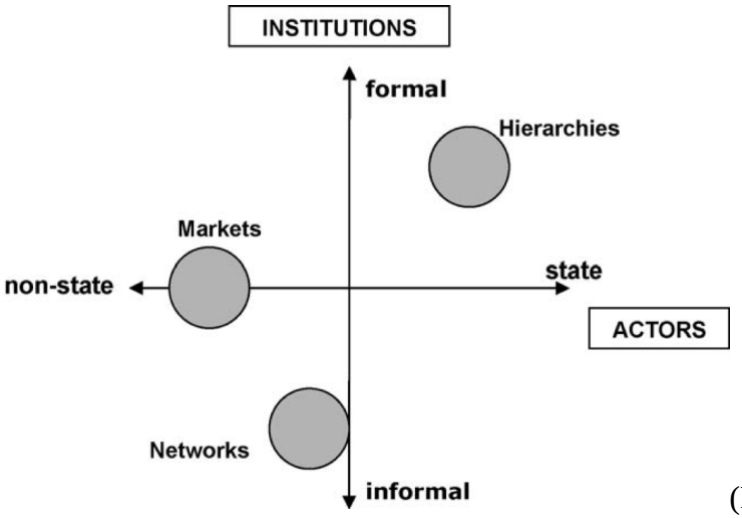
In the context of water governance, due to the particular complexity of regimes, problems of fit in between administrative and biophysical boundaries emerged along with establishment of new institutions. As otherwise explained, newly established institutions locally experience problem of horizontal and vertical interplay with "those organized at traditional administrative boundaries (e.g. spatial planning, agriculture) prove to be a barrier for implementing integrated management approaches and may lead to overly complex structures (Borowski et al., 2008 cited in Pahl-Wostl, 2009)". Therefore, it is pivotal that levels are well connected and their vertical coordination improves. As per the theory, this can be achieved if:

1. "Actors from one level (e.g. the national level) participate in decision processes at another level (e.g. the European level or basin level). Actors may thus become actively involved in the production of the rules that influence them.

2. Institutions (formal and informal) produced at one level influence processes at another level. Flow of authority may be both top-down and bottom-up.
3. Knowledge produced at one level influences processes at another level" (Ibid., p. 358).

4, Governance modes—bureaucratic hierarchies, markets, networks

A way to categorize governance modes is to distinguish between bureaucratic hierarchies, markets and networks (Thompson et al., 1991 cited in Pahl-Wostl, 2009).




(Pahl-Wostl, 2009, p. 358)

As presented by the diagram, these modes of governance are different based on the extent to which they are formal or informal as well as the roles of state versus non-state actors should also be taken into account when making a distinction among them. For instance, bureaucratic hierarchies are formal structures since their regulatory processes are embedded in formal institutions as well as state actors play the dominant role (Ibid.). On the other hand, markets are composed of both informal and formal structures with non-state actors playing the role. When it comes to the networks, informal structures prevail and both non-state and state actors participate in its processes (Ibid.). Argued by Dedeurwaerdere (2005), network approaches to sustainable development initiatives foster social learning and change which derives from informality and high flexibility. In line with that, networks have recently been at the center of attention owing to the fact that "they may be very flexible in terms of membership, role and power of actors and connections" (Pahl-Wostl, p. 358). They foster learning because they provide access to diverse knowledge and interpretation, on the other hand they might have a

closed membership since they are not representative, thus, their legitimacy of solving public issues is heatedly discussed. Evidently, it can be hard to hold them accountable for failures in governance (Ibid.).

Considerations emerge about which mode of governance is the most appropriate as by promoting a balance in permanence and change and how they coexist and interact with each other. In this regard, it is argued that the absence of change limits the ability to adapt to circumstances in events of change and disturbance, while the absence of permanence and predictability lead to difficulties in developing expectations, coordinating collective action and improving routines and practices (Pahl-Wostl, p. 358). In this sense, instead of the dominance of one mode of governance, the prevalence of a more diverse governance system can bring about more advantages including high adaptability which in essence contributes to a more sustainable resource governance (Ibid.).

## Effective Water Governance

Often brought to attention, "the current water crisis is mainly a crisis of governance, much more than a crisis of water shortage or water pollution per se" (GWP.org). The unsustainable management of environmental resources that have been previously linked to the problem of resource base has now been increasingly explained with governance failures (Pahl-Wostl et al. 2007). Therefore, making water governance effective has become one of the highest priorities on the agenda.

Hamdy & Choukr-Allah (2012) explains that while there exist some universal suggestions about how to improve water governance, it essentially needs to be personalized from country to country while incorporating the benefits and lessons learned from case studies (p. 266). When theorizing effective water governance, four dimensions need to be considered: the social, economic, environmental and political. The social dimension reflects how equitable water resource use is, whereas the economic term refers to the efficient use of water and the role water plays in a country's economic development (Ibid.). The political dimension emphasizes democracy and points towards providing access to the stakeholders to participate,

influence and monitor political processes and the results (Ibid.). Last but not least, the environmental one concerns the sustainability of water use, the integrity of ecosystems as well as recognizes the role water governance has in maintaining a sound environment (Ibid.).

As suggested, the way towards effective water management is to learn from previous experience (Rogers & Hall, 2003), and as of now Hamdy & Choukr-Allah (2012) argue that we mostly experience failures and gaps originating "mainly from the multiplicity of actors in the water sector that demonstrate clearly the interaction between territorial and central level of government is not always coherent" (p. 270). The OECD (2009) elaborated on some of the above-mentioned coordination gaps that need to be addressed in order to achieve effective water governance. In administrative terms, it is said that there is a mismatch between hydrological boundaries and administrative boundaries (OECD, 2009). In terms of information, problems of asymmetries arise in case the different authorities in possession of information are responsible for the policy-making and implementation, thus their knowledge base needs to be harmonized (Ibid.). Furthermore, the issue of policy gap requires a solution which is associated with the "sectoral fragmentation of water-related tasks amongst government ministries and agencies which hinders integrated policy development" (Ibid.). Unstable or insufficient funding can also be found problematic and challenge the implementation of water responsibilities which could substantially pose a threat to effective water governance (Ibid.). In addition, it is further pointed out that "local water management actors have insufficient capacity to effectively apply water policy in terms of scientific and technical competences, size and quality of infrastructure" (OECD, 2009) this serves as the capacity gap in effective water governance. The wide range of gaps reflect that water governance and management is both complex and dynamic and that effectiveness can only be realized if changes take place in how societies, private and political systems operate in concert with each other (Hamdy & Choukr-Allah, 2012, p. 271).

In addressing water governance dynamics, one needs to recognize that power and politics and the issues they might bring shape water policies and implementation (Hamdy & Choukr-Allah, 2012, pp. 271-272). For improving water governance, it is crucial to "facilitate dynamic interaction dialogues and partnerships amongst governments, civil societies and private sector" (Ibid., p. 268). Dialogues and strategic partnerships are powerful tools in effective water governance, they both need to be interpreted as long-term commitments aimed at the

reformation of the water domain. It is explained that this long-term process is directed to alter the relationship between the stakeholders and the state by laying the foundation for a progressive, effective and prosperous dialogue and networking at local and national scales (Hamdy & Choukr-Allah, p. 271, UNDP, 2016). In this sense, processes of dialogue and networking can have the potential to accelerate and build extensive support for water reform, common understanding, ensure funding, trust and effective coordination among the key players when it comes to the implementation (Ibid.).

Another aspect to effective water governance is building knowledge and capacity development. Technical skills, building knowledge and capacities will persevere to be critical because in a sector as complex and dynamic as water, it is principal that capacities and skills are well developed to respond effectively to conditions of uncertainties, change and trade-offs (Hamdy & Choukr-Allah, p. 273). Besides capacity and knowledge generation, their respective application in reality could also raise questions since the new institutions, established due to decentralization, have to fulfill new roles and tasks assigned requiring not only themselves but also central agencies to be subjected to capacity building (Ibid.).

Rogers & Halls (2003) argues that a key problem governance systems have to eliminate is corruption. When facing corruption, a solution may be distributed governance with aspects of open competition, more accountable public administrations and processes that should be in place (Rogers & Hall, 2003, p. 13). Other measures aimed at reducing corruption can be "reduced public sector intervention in the economy, reform of public administration, liberalisation and reduced bureaucracy and fair pay for workers" (Ibid.), notably, these can be used without turning to the resorts of law. Since governance systems are increasingly filled with informal institutions, where the rules are socially and culturally enforced, this can result in the proliferation of rules which can undermine the rule of law. Therefore, it is crucial to have an enabling environment in which a coherent legal framework with strong and autonomous regulatory regime prevails and sets the policies and legislation enhancing effective water governance (Rogers & Hall, 2003, Hamdy & Choukr-Allah, 2012).

As noted, governments are often entangled in contradictory roles and responsibilities, once they become providers of water services and as the guaranteed source of accountability for those services (Rogers & Hall, 2003, p. 14). In other terms, local governments can sometimes be weak and simultaneously, the civil society would be lacking legal foundations.

Therefore, institutional reforms can be a key element to tackle problems of the sort, as affecting both the government and social institutions. In this case, governments would be enabled to reassign some of their tasks and functions to other responsible entities and at the same time, it would mean a more democratic system to organisations of the civil society (Ibid.). In essence, this could imply a transition "towards a society with a limited but strong government and a politicised (and voluntary) civil society; thus moving from top-down bureaucracies to constitutionally ordered, democratically self-governing associations" (Ibid.).

## Water Management Approaches and IWRM

Edalat & Abdi (2018) define the concept of water management as "the activities aimed at planning, developing, distributing and operating water resources, surface water, drainage and sewage" (p. 11). One could also differentiate between water management and water resource management, with the first focusing on the control and operation of water systems, while the latter refers to the distribution, development and planning of water resources for particular purposes such as drinking water, water for irrigation and agriculture for wastewater. Water management approaches have been present and extensively applied over the past years, including, but not limited to, the approaches of water supply management (WSM), water demand management (WDM) and integrated water resource management (IWRM).

Chronologically, WSM is one of the oldest of these forms of strategies, it originates from the 19th century and was originally used to target waterborne pathogens causing epidemics (Edalat & Abdi, 2018, p. 11). Afterwards, in the 20th century, the purpose of WSM changed to tackle the problem of water scarcity by utilizing new water resources, as stated by Bithas & Stofors (2006) technological advancements and economic growth enabled the transferability of water even from remote locations (p. 48). It should be noted that even though the transfer of water proved to be expensive and that the excessive water use came at the cost of the over-exploitation of the new resources, the socio-economic advantages were still greater allowing the prevalence of supply policy (Ibid.). Simultaneously, the demand for water has also increased, stimulated by factors of population growth and increased economic activities. Technology has played a dominant role in confronting the water scarcity issue, and as argued this supply-oriented approach has "a strong engineering tradition formed on controlling

environmental problems with technical solutions and despite the many criticisms in recent years a lot of water planners and managers still remain focused on technical solutions and supply development" (Pahl-Wostl et al., 2008). On the other hand, critiques of the WSM approach revolve around the unsustainable use of water, as well as the significant amount of waste of high-quality water and consequently, worsening environmental conditions and degradation (Edalat & Abdi, p. 12).

From the second half of the 20th century, a more demand-based management approach has gained popularity in contrast to the supply-oriented strategy (Edalat & Abdi, 2018, p. 13). Due to the deteriorating environmental conditions and water scarcity issues, more countries have looked to more sustainable practices of using water such as "campaigns promoting water and energy savings, waste recycling, use of public transportation, and other eco-friendly behaviour [...] eco-labelling, tax incentives, and subsidisation policies" (Martínez-Espiñeira et al., 2014, p. 175). However, creating a balance between water supply and demand has proved to be rather challenging due to the scarcity of the resource combined with the competing uses of water (in agriculture, industrial, commercial, residential use etc.) and in response it was found that "reducing the demand for water is the best source of "new" water" (Brandes & Brooks 2007 cited in Edalat & Abdi, 2018, p. 13). In other words, instead of exploiting and discovering new water sources, Water Demand Management (WDM) emphasizes harnessing what is available and using it in a more productive manner. Therefore, WDM turned to prospects of water conservation and demand reduction, with applicable methods of water loss control, water-saving technologies, water pricing, water-meter, wastewater reuse and intermittent water supply (Edalat & Abdi, p. 13).

From the 1970s/80s, the drive to incorporate sustainability in water management intensified, and accordingly many in the profession began to look for a 'new' paradigm that could solve the unprecedented water issues the world was facing (Edalat & Abdi, 2018, p. 17; Biswas, 2009, p. 249). By the 1990s, the Integrated Water Resource Management approach emerged and is based on the principle of promoting sustainable ways of utilizing water, protecting the resources and most importantly in consideration of coordinated planning among the stakeholders (Edalat & Abdi, p. 17). Biswas (2009) argues that one of the principal reasons for the emergence of IWRM is that professionals have come to the realization that water issues appear to be "multi-dimensional, multisectoral, and multi-regional and filled with multi-

interests, multi-agendas, and multi-causes, and which can be resolved only through a proper multi-institutional and multi-stakeholder coordination" (p. 249). Consequently, coordination among the numerous stakeholders has become increasingly recognized as a critical feature of water management.

While there is little consensus regarding the definition of IWRM, the Global Water Partnership (GWP)'s has defined the approach as "a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (gwp.org). This definition appears to be both vague and all-encompassing, raising questions such as: who promotes and by what kind of processes? what can the related resources be? and what parameters are to be considered when it comes to maximization? (Biswas, 2009). Offering a more functional definition, the United States Agency for International Development (USAID) argues that "IWRM is a participatory planning and implementation process, based on sound science, which brings together stakeholders to determine how to meet society's long-term needs for water and coastal resources while maintaining essential ecological services and economic benefits" (USAID, n.d.).

Combining these two definitions, it becomes clearer that IWRM is both a coordinated and participatory development process. It is participatory because it involves the participation of many stakeholders and their coordination in light of the same goal. It is implied that the goal is to achieve economic and social welfare, equity and at the same time, sustain the ecosystem. The approach is still based on science and technology that can be used to provide solutions and measure success. In addition, Xie (2006) further highlights that it should be a democratic process through proper governance and participation (p. 4) as once all stakeholders are taken into consideration, the process implies a democratic nature.

IWRM is based on the key concepts of *Integration, Decentralization, Participation,* and *Economic* and *Financial sustainability*.

*Integration* is a very significant component of the approach, which connects economic goals of development with social welfare and equity, and the protection of ecosystems. As mentioned before, influenced by the failure of previous sectoral water management techniques,

this holistic approach calls for the integration of all sectors related to water (Xie, p. 6). For instance, acknowledging the multifaceted nature of water, it is essential to effectively coordinate and manage horizontal sectors related to the water and water supply sector such as energy generation, irrigation and agriculture, food industry, industrial purposes, waste etc. (Ibid.). Apart from horizontal sectoral integration, some also attach great importance to vertical integration meaning "to coordinate efforts between local, regional, national, and international water user groups and institutions" (Ibid.).

*Decentralization* is about the allocation of authority and responsibility of water management to the lowest appropriate administrative level. According to Xie (2006), this implies subsidiarity, with the water management decisions made at basin and sub-basin level and the national government maintaining a rather regulatory and support role, more focus can be laid on solving specific local issues (pp. 5-7). It is further argued that in case of governmental failure to provide sustainable water supply, the private sector should be enabled to contribute with its technological expertise and efficient management practices (Ibid, p. 7).

As formally introduced, the IWRM approach is *participatory* as sustainable and effective water management depends on the participation of all stakeholders to assume a role in management decisions including the public and disadvantaged groups. It aims to strengthen community based organizations and as remarked, capacity building and support to the full and effective participation of all groups affected by water can bring the realization of social welfare and equity one step closer (Xie, p. 7).

*Economic and financial sustainability* is vital to sustainable water use and delivering services, naturally while being social and environmental conscious. It is argued that special attention must be paid to the economic value of water in nowadays context characterized by increasing cost of water supply and other inefficiencies in the water sector (Xie, p. 7). Additionally, regulatory practices and policies should clearly define water use rights and "create markets for these rights to be traded, allowing water to be used by those sectors for which it has the greatest value" (Ibid.). Financial sustainability is equally crucial and in order to achieve that the charges, the water users pay, should be able to cover at least the operations and maintenance costs of water delivery. This way, service providers are given a chance for full cost recovery and ensuring that the water needs of the public are met (Ibid.).

In conclusion of this theoretical chapter on water governance and management, the multiplicity of state and non-state actors must be stressed along with the role of informal and formal institutions in water governance structures. It is further important to note that the mode of

governance (hierarchical and/or distributed governance) defines water governance practices in terms of the levels at which governance occurs, the dominance of central and/or decentral management and hence, the kind of institutions and actors that take water decisions. This framework enables the analysis of Egypt's water governance system from a national, local and basin point of view. Global governance theory extends this analysis to a global scale as global processes and transnational actors can too shape national resource governance practices. Finally, theoretical consideration about water management, especially integrated approaches highlight the need for the stakeholder participation and coordination, that is especially relevant when looking at the involvement of Egyptian stakeholders and their cross-level interactions in the water sector.

# Methodology

The following section aims to elaborate on the methodological framework including my theoretical choices and the selection of data and sources used for this paper. Here, the methodological implications of the previously introduced IWRM approach will be discussed which will be used as a framework for the analysis.

## Theoretical choices

To perform the analysis, a theoretical framework was established on water governance and management by taking into account several theoretical approaches including resource governance, good governance, global governance, effective water governance theory and water management. The basic idea that underlies this choice is that the current water crisis is increasingly attributed to governance failures rather than to the resource base (GWP.org), thus by the application of theoretical considerations of good and poor governance (Rogers & Hall, 2013), effective water governance (Hamdy & Choukr-Allah, 2012) and water management approaches (Xie, 2006; Edalat & Abdi, 2018) can shed light on the performance of Egypt's water governance system. Global governance comes into play once it is acknowledged that water is a major public good and that global processes and transnational actors can shape national and local practices (Zürn, 2018; Pahl-Wostl et al., 2008). With respect to the analysis of relevant governance actors and governance modes, Pahl-Wostl (2009) *A conceptual*

*framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes* served to be useful to understand the actions and structures of resource governance regimes, like Egypt.

## Choices of data and sources

For this Thesis, both qualitative and quantitative data was utilized for different purposes. First of all, quantitative data presents numerical information about the world such as statistics (Punch, 2014, p. 84). Quantitative data was used with the purpose to establish arguments as well as measure and reflect the magnitude of water crisis and situation of Egypt. In spite of the importance of quantitative information, this Thesis relies more predominantly on qualitative data due to the nature of this research and problem formulation which can only be answered through the analysis of empirical materials. Qualitative data is referred to as empirical information, this mostly means words in social science research (Ibid., p. 86). In the analysis and introduction section a wide range of qualitative materials such as official documents, organization reports, national reports, governmental websites, and media sources were increasingly used.

One of the most important material this Thesis relies on are policy documents for instance, the National Water Resources Plan of Egypt that served as an integral part of the analysis. It is important to highlight that this study finds documents produced by Egyptian Government especially relevant but the need to complement nationally produced data with information from international organizations such as OECD, EU, WB reports, is recognized to avoid leading and potential biases.

Furthermore, additional sources include scholarly journals and academic articles which helped establish the theoretical and methodological elements. In relation to the method of analysis, the GWP's framework on IWRM, information was retrieved directly from the organization's website with the purpose to maintain its authenticity.

## Framework Analysis

The Global Water Partnership's Integrated Water Research Management approach was adapted as the main analytical framework for this Thesis with the objective to critically assess the water related actions of Egypt's governance system in terms of both planning and implementation. Arguably, this framework fits well for such purposes given the flexibility of the approach which

is based on the researcher's needs providing a wide range of tools and instruments for selection which need to be addressed in water management (GWP, n. d.). The approach has a special dual application formula as it contains both theoretical and methodological considerations with regards to resource governance and management practices. The methodological implications include the tools for assessment and program evaluation, while in terms of theories, IWRM is composed of a wide range of principles (presented prior as Dublin principles), guidelines and key concepts that can help establish what ideal water governance and management look like (GWP, n.d.). Besides the functional reasons, other motives for choosing this unique holistic approach, derives from its popularity and credibility from being internationally acknowledged by numerous international organisations, including the UN as well as its member states (Biswas, p. 251).

The IWRM framework consist of three major dimensions: the enabling environment, institutional arrangements, management instruments which can also be further divided into several sub-categories (GWP, n.d.). Bearing in mind the flexibility of this approach and purpose of this Thesis to identify the factors that affect Egypt's water governance and hence to establish how its water governance system can be improved, only the first two dimensions, the enabling environment and institutional arrangements will be focused on.

**Enabling environment:** should establish the rights and assets of all stakeholders including individuals, organizations of both the public and private sector, women and men, the poor as well as the ones better off, meanwhile it should maintain environmental quality (GWP, n.d.). National, provincial, and local policies and legislation represent 'the rules of the game' which should enable a sustainable balance between economic, social development and environmental demands for water. The purpose of the enabling environment is to provide a base of foundations determining the priorities and objectives of water governance which can essentially help governance structures reach desirable outcomes. The enabling environment involves the following:

**(i) policies**: define the objectives for water use, protection and conservation and they also have an influence in shaping water demand. Policies constitute the framework within which water resources are controlled and thus, they provide the basis where an IWRM approach can be developed (GWP, n.d.). To be integrated, water resource policies should be consistent with national economy policies and any other related sectoral policies (Ibid.). It is underlined "Policy formulation is a core role of governments", by means of policies, governments are able

to determine the limits and direct activities of all stakeholders, including the government itself (GWP, n.d.). The government can either take up on a provider role or regulate and support other service providers (Ibid.).

**(ii) legislative frameworks:** "translate water policy into laws" (Xie, p. 8). Local and national legislation specify domestic use, ownership of water, permits, water use rights with the extension to international treaties when water is shared by multiple nations and neighboring countries (Ibid. & GWP, n.d.). Most essentially, the legal framework includes the definition of the rights and obligations of all stakeholders (both private and public water users) "and provides the prescriptive parameters for resource development and management to promote the public interest" (GWP). This means that it is a powerful IWRM tool that helps maintain the integrity of a certain regime and at the same time allows for modifications if such would seem necessary due to new circumstances and change in the needs (Ibid.). Appropriate legal frameworks should be completely transparent, adaptable and capable of developing gradually with the aim of responding to the changing conditions (Ibid.). Water laws should embrace a human rights perspective and in line with that, acknowledge access to water and sanitation to be human rights.

**(iii) financing and investment structures:** play a role in the allocation of financial resources to satisfy water needs. "Water, which might appear as a gift from nature, actually needs huge human investment in order to serve the varied and growing global demand on this resource" (GWP, n.d.). In this sense, securing financing and incentives is considered a key enabling factor towards an efficient, effective, sustainable and equitable water resource management. Investments are crucial to preserve, manage and develop water as a scarce resource, support service delivery and provide public goods for instance drought preparedness and flood control (Xie, p. 8). They are also needed for the establishment of water infrastructure including both soft (IT, administration, research, monitoring and evaluation) and hard (pumps, dams, pipelines, distribution systems, hydropower base). Investments and other financial resources can stem from various sources, for instance, water user fees, governmental investments, external aid organisations, commercial loans etc. (Ibid.). It is remarked that the majority of water projects and water investment plans are financed by the public sector (Ibid.) but in some cases private domains and joint public-private partnerships may be donors too (Xie, p.8).

**Institutional arrangements:** It is acknowledged that governance (specifically poor governance) is a main contributor to the current water crisis (GWP, n.d.). Water governance is considered in the scope of social, economic, political and administrative institutions which are all equally essential to be in place for a sustainable way of developing and managing water resources. Within this dimension of IWRM, the analysis outlines good governance, when all institutional actors are involved operating jointly to reach their shared goals (Ibid.). Good water governance depends upon a clear legal framework, extensive and all-encompassing water policies, enforceable regulations, capable institutions which are also accountable, execution and citizen-based responsible mechanisms with consideration of the links and connections present among the entities (Ibid.). Institutional governance can be further categorized into 4 institutional roles that should be fulfilled for water governance systems to accomplish sound IWRM practices:

**(i) creating an organizational framework**: calls for the scrutiny of institutions that manage water resources. Such organisations should be developed to facilitate a shift from top-down centralized approach to decentralized and participatory management (GWP, n.d.; Xie, p. 8). The rights and responsibilities of these organizations should be clearly allocated and distinguished as well as integration and coordination among them should be allowed from local to global level (Ibid.). Regulatory and compliance powers assume roles of policy making and enforcement because they are also responsible for the way people and institutions manage water resources. They are required to "be transparent in their decision-making processes; engage and promote stakeholders' involvement; show accountability and non-arbitrariness; and be open to internal or external demands for institutional upgrade and reform" (GWP, n.d.).

**(ii) water supply and sanitation services:** Institutions should be assigned to deliver water supply and sanitation services. "Service providers are responsible for establishing, maintaining, and upgrading the water supply system, which typically involves for: collection, treatment, distribution, quality control, sewage, and reuse of water" (GWP, n. d.). These service providers can be private, public or cooperatively owned and managed.

**(iii) coordination and facilitation bodies and instruments:** referred to as 'mediators' are responsible for articulating and harmonizing the actions and processes initiated by numerous

entities involved in water management on regional, national or international level (GWP, n.d.). The effectiveness of institutional arrangements is not only dependent upon "the extent to which its political, social, and administrative systems carry out their respective roles" (Ibid.), in principle even if these administrative systems are well-functioning individually, water management may still be deficient. Thus, a well-functioning administrative system requires solid components just as much as it needs articulating mechanisms to harmonize and match these individual components (Ibid.). Coordination and facilitation bodies are the key to orient a variety of actors and stakeholders with conflicting interests towards shared objectives, in this sense, they can also be seen as instruments for participatory processes and conflict prevention (Ibid.).

**(iv) capacity building:** at individual, institutional and societal levels is an integral part of developing effective water governance structures. It is referred to as a twofold process: "(1) it is about understanding the obstacles that prevent the people, the organisations, or any other elements of an institutional framework from fully realizing their development goals; and (2) it is also concerned with finding the applicable mechanisms in overcoming these challenges and ultimately achieving better and more sustainable results" (GWP, n.d.). Capacity building can be tangible and intangible. Tangible capacity building efforts include training, workshops handbooks, training manuals, and implanting new technologies. On the other hand, intangible capacity building takes forms in information sharing networks, the willingness to self-reflect and other auto-evaluative practices which are in essence difficult to grasp or measure (Ibid.). Any form or capacity building should be a continuous process rather than a one-time intervention, it should be targeted to all parties involved in water governance and management.

# Analysis

Egypt is located in one of the world's most water stressed regions, and due to its close connection to the Mediterranean, it is more vulnerable to enhanced climate change impacts that can place an even bigger pressure on the country's water resources (UNESCO, 2019, p. 129; Sanchez-Plaza et al., 2019, p. 1). Egypt is struggling to satisfy its water needs, while the country's annual water demand is 77 billion m3, only 58 billion m3 freshwater is available in the country (Elsaeed, 2011, p. 338). Whereas some countries have the financial potential to increase their water supplies, considering Egypt's socio-economic situation and level of

development, a solution could be to adapt more sustainable and effective water management and governance practices in order to meet its water needs (UN, 2018, p. 12). Correspondingly, water resource management is of strategic priority in Egypt. In the following section, the Government of Egypt's water related actions and practices will be analyzed by using the GWP's IWRM framework to establish which factors affect the country's water governance system and how effectiveness could be improved within the sector.

## Enabling environment

The first dimension of the IWRM approach focuses on the role of government to create an enabling environment, inclusive of policies, legislative framework and financial incentives, appropriate to achieve effective water governance structures. It is important that balance is maintained between economic, social development and environmental demands, and that the rights and assets of all stakeholders are established (GWP, n.d.). The enabling environment sets the 'rules of the game', and provides a basis for determining the priorities and objectives of water governance.

In the Arab Republic of Egypt, the Ministry of Water Resources and Irrigation (hereafter MWRI) is in charge of managing the water resources, principally, the waters of the Nile. MWRI is also involved in managing irrigation projects in Egypt, for instance the Aswan Dam and Al-Salam Canal (mwri.gov.eg - The Ministry of Water Resources and Irrigation). The governmental agency has existed in its current form since 1999, yet its history dates back to 1836 when the Public Works Department of the School Office was established throughout the reign of Mohammad Al Pasha with the purpose to concentrate on irrigation matters of public works (Ibid.). Irrigation water distribution has a historical importance, owing to the fact that irrigation allowed greater control over agricultural practices, thus it has been increasingly associated with social and economic developments (Bedawy, 2014, p. 112). In line with that, similar to other developing countries, the agriculture sector is the main consumer of water in Egypt, followed by industrial and residential uses (Ibid.). The management of water resources and ensuring that sound water supply is available for the citizens is the task of the MWRI which makes the ministry one of the most influential players in defining the country's priorities and objectives when it comes to water.

**(i)Policies**

In consideration of GWP's IWRM framework, appropriate policies are an integral part of creating an environment which supports effective, efficient and sustainable water governance (GWP, n.d.). An appropriate policy framework defines the objectives for water use while protecting and conserving the scarce resource and they also have an influence in shaping water demand (Ibid.). Thus, it is crucial to adopt a historical perspective to look at how policies evolved and have aimed to address water issues in Egypt.

Review of water resource policies and plans:
In 1929, Egypt and the United Kingdom, on behalf of Sudan, concluded an agreement to ratify the historical Nile water rights for each country, for Egypt 48 billion cubic meters while for Sudan 4 billion cubic meters were assigned (Allam, 2007, p. 206). Benefitting from the extra storage of water, in 1933, the Government of Egypt (GOE) implemented a water policy targeted at the cultivation of Lower Egypt, transformation of basin irrigation to permanent irrigation as well as the establishment of public open drains in permanent irrigation areas (Ibid.). Arguably, this marks the beginning of water planning in Egypt, since a water policy was formulated to use the additional capacity of water. By the 1950s, the importance of corresponding sectors in water allocation grew, for instance, the Ministry of Agriculture became an influential actor due to the land reform. Events of further significance include the approval of the High Aswan Dam project and an agreement between Sudan and Egypt that took place with the purpose to optimize the water use of the Nile as a follow-up on their initial agreement from 1929 (Ibid.). Consequently, the quota for both Egypt and Sudan had been raised enabling them each to utilize their water shares for increasing their cultivation area.

In 1974/75 the first water policy was revised, it is due to the fact that the previously approved project on the construction of High Aswan Dam generated the need to store additional water (Bedawy, p. 110). In 1975, the Ministry of Irrigation developed a policy on rebalancing the water status through the rationalization of crop applications facilitated by further research and field experiments (Ibid.). This focused on meeting the additional water demands by reusing drainage water, expansion of groundwater utilization particularly in the Delta of the Nile as well as the optimization of rainfall water use in the northern coast region (Ibid.). Shortly, Egypt's National Water Master Plan (NWMP) was begun to be prepared by the Ministry of Irrigation with the assistance of the German Development Bank (KFW) and UNDP. NWMP

was a collection of plans directed to satisfy the increased water demand for the course of 20 years. As a continuation to create a more specific plan integrating all water uses, the Ministry of Irrigation formulated the Arab Republic of Egypt Master Plan for Water Resources Development and Use with the support of the UNDP and the International Bank for Reconstruction and Development (IBRD)(Ibid.). This master plan was considered the first step towards improved planning in the domain of water, given that technological advancements and scientific techniques contributed to new planning tools which enabled greater precision to predict the development and use of water resources (Ibid.). By the beginning of 1980s, the new policy revealed that Egypt is short on water essential to meet its future water demands. It was seen that expanding the country's agricultural horizon would provide a solution, thus, by 1994 the Ministry of Water Resources and Irrigation and the General Authority for Land Reclamation launched multiple projects aimed at improving surface irrigation practices, maximizing the reuse of drainage water, treated wastewater recycling, optimizing the use of groundwater (Bedawy, 2017, p. 111; Allam, 2007, p. 206). In October 1997, MWRI drafted a plan namely, the 'Water Resources Strategy of Egypt Until 2017' which assessed the projected balance between water demand and use in 2017 from three different scenarios (Ibid.). In 2003, the MWRI initiated a program based on the above draft to improve environmental and water resource management with special focus laid on decentralization and integration of water resources (Bedawy, p. 111). Notably, this served as the basis for Egypt's present-day plan, referred as 'National Water Resources Plan 2017'.

The National Water Resources Plan (NWRP) demonstrates how Egypt aims to safeguard its water resources in terms of both water quality and quantity and how the country will utilize its available resources the best way possible from a socio-economic and environmental perspective (EU SWIM, 2014, p. 16; MWRI, 2005). For instance, environmental considerations include that water is a finite and vulnerable resource, while socio-economic perspectives hold that water is valuable because both social and economic development depends on it (MWRI, p. xvii). Furthermore, in the NWRP, the social aspect of water is recognized in terms of health and the general well-being of people. The plan is oriented towards a human right based approach, addressing inequality issues in water distribution and emphasizing the need to make water equally available and accessible for every member of the society (Ibid.). NWRP provides an update of previous Egyptian policies and plans with the intention to guide both public and private actors to improve water governance and management through measures of integration and decentralization (MWRI, p. xvii). The plan has three

pillars defining the policy which are the measures aimed at developing additional water resources, measures for better use of existing water resources and further indications regarding how the health and environment will be sustained and protected at the same time (EU SWIM, 2014, p. 17). It further lays out the projects that will operate simultaneously as parts of the policy for instance: the Nile Protection Program, Share Protection Program, National Drainage Program and Great Dams Rehabilitation Program (Ibid.).

The strategy is attentive to all components of Egypt's water resources system and all functions and uses of water (MWRI, p. v). This means that the NWRP takes into account policy areas of ministries other than the MWRI and aims to guide the actions of other water stakeholders. Regarding Egypt's water resources system, the Nile is considered to be the biggest supplier making up 95% of the country's water supply (Elsaeed, 2011, p. 338) the rest is resourced from groundwater and rainfall in the Nile Valley (MWRI, p. 2-4). Due to Egypt's high dependence on the Nile, the river has mainly been the place of intervention where structures of dams and barrages control the water flow and prevent flood hazards while the canal systems play a part in water distribution and delivery (Ibid., p. 2-5. Furthermore, the role of drainage system and network is addressed and defined with relation to the collection and transport of drainage water from agriculture and the effluents from the industry and residential use. The drainage system comprises field drains, collector drains, and main drains which either transfer the water back to the Nile or it flows back to the sea or coastal and inland lakes (p. 2-6). The drainage system is described as a system based on gravity flow except for some pumping stations in the Northern Delta that enable the raising of water level to optimum. These pumping stations are also planned to overcome the shortage of irrigation water, because "reuse pumping stations pump drainage water into irrigation canals where it mixes with freshwater for further downstream use" (Ibid.).

Even though groundwater accounts for only 1.5 % of Egypt's total water supply (Elsaeed, 2011, p. 338), in terms of quantity this implies a moderate contribution, but for people residing in the desert areas, that is the sole source of water (MWRI, p. 2-11). Evidently, there has been a recent trend to develop groundwater resources, as also touched upon in Egypt's policy. It is mentioned that the quality of groundwater is considered fairly good, although pollution has disabled the drinkability of around 20% shallow groundwater bodies (MWRI, p. 2-17). Especially, in the Nile Valley and Delta where there is high population density, the groundwater sources are highly exposed to pollution.

Based on the above, it can be assessed that the NWRP is a comprehensive plan since Egypt's entire water resource system is taken into consideration, the Nile playing the primary

role, along with the means of water distribution and groundwater sources that need to be included in Egypt's water management processes. Egypt's plan shows traits of horizontal integration too given that the different water sectors are recognized to be dependent upon each other. As Xie's (2006) theory explained, acknowledging the multifaceted nature of water is a prerequisite to effectively coordinate and manage horizontal sectors related to water and water supply (p. 6). These water-related sectors are all stakeholders expected to increasingly interact and assume a clear role in management decisions for attaining shared goals (Xie, p. 7). In the case of Egypt's NWRP, it is identified that the Ministry of Water Resources and Irrigation is not the only influential actor shaping water decisions (MWRI, p. 2-50). Even though MWRI is the central governmental organization fulfilling strategic and operational duties for water it cooperates with other ministries such as the Ministry of Planning, Ministry of Agriculture and Land Reclamation, Ministry of Industry, Ministry of Environment, Ministry of Health and Population, Ministry of Transportation, Ministry of Housing, Utilities and New Communities as well as Ministry of Local Development (Ibid., p. 3-2). The influence of these ministries on national water resources shows that Egypt's plan has taken a perspective in which water management and governance is an integrated and participatory process with multi-stakeholder activities. Argued by Biswas (2009), since water issues appear to be multi-dimensional they can only be resolved through multi-institutional and multi-stakeholder involvement and coordination in decision making processes (p. 249). The fact that Egyptian ministries related to water jointly shape water policies through their integrated actions can evidently bring about a higher capacity to solve matters in the water sector.

As recognized, the most pressing water problem Egypt is facing ever since the 1970s is that water demand has always exceeded the available resource base (Allam, 2007, p. 207). Certainly, rapid population growth is one of the biggest driving forces of the increasing water demand that Egypt is facing on multiple development fronts, such as economic, social, environmental (MWRI, p. xviii & p. 2-23). Accordingly, water management and governance entails social aspects, therefore, social policies including factors such as population growth, infant mortality, fertility rate, life expectancy rate, population density influence the water agenda and vice versa. Egypt's population density is one of the highest in the world, as 97% of the population resides in the Nile Valley and Nile Delta making up only 4% of its total area which results in an average population density of 1435 persons per km2 (MWRI, p. 2-24). Being aware of the threat social issues pose to the country's development, Egypt has adopted a Family Planning Programme directed to reduce fertility and hence the overall population growth (Ibid., p. 2-25). Executed by the Ministry of Health and Population, this policy also

stressed the necessity to “improve population characteristics within the context of overall socio-economic development” (Ibid.). Regardless of the fact that the formulation of this family planning policy is not deep-rooted in water resource problems, but rather concerns the country's general development, the correlation that exists between water issues and social issues still needs to be pinpointed. According to the GWP’s framework, appropriate policies should connect water policies with other related sectoral policies (GWP, n. d.).

In Egypt, not only social but industrial, agricultural policies also aligned with the country’s water resource needs and plans (MWRI, p. 3-3). Egypt’s industrial policy focuses on creating new cities and industrial zones outside of the Nile Valley and Delta thus, in line with this objective, Borg Al-Arab and Al Sadat industrial areas have been completed and contracts have been signed for the establishment of Ismailia and Asafraa Industrial Industrial Areas (MWRI, p. 2-40). Evidently, such industrial policies play a role in overcoming the challenges of population density along the Nile Valley and Delta, where due to the high concentration of population, wastewater disposal is simultaneously increasing and the quality of water is deteriorating (Bedawy, 2014 & Elsaeed, 2011). In terms of agricultural policies, development reforms target property rights on land, agricultural institutions, pesticide management, horticulture, cotton, sugar and rice production, animal husbandry (MWRI, pp. 2-32-36). Similarly to most of the developing countries, the agriculture sector is the biggest consumer of water in Egypt (Bedawy, 2014, p. 112). In theoretical terms, it is explained by Xie (2006) that policies and regulatory practices should allow water to be used by those sectors for which it is the most valuable (p. 7), in Egypt’s case agriculture. Accordingly, it is found that agricultural reforms are characterized by privatization and liberalization more than any other domains of the economy (p. 2-32). Effective water governance theory states that policies should facilitate interaction dialogues and partnership among actors including the private sector (Hamdy & Choukr-Allah, 2012, p. 268) and should allow the private sector to contribute with technological expertise and efficient management practices (Xie, 2006, p. 7). Arguably, this is planned for in Egypt, since reflected by the NWRP, agriculture -the sector to which water means the most- enables privatization with the aim to benefit from the increased job opportunities, investments and exports (MWRI, p. 2-32).

Undoubtedly, it is reasonable to say that the web of policies and the alignment of social, industrial and agricultural policies favors the country’s water agenda because if policies are in line with each other, synergies are created (Pahl-Wostl, 2009, p. 356) which means that their combined effects, produced by common efforts, are relatively greater than the sum of their separate effects. This undermines the notion of government as a sole decision-making entity

and instead, implies a more multi-level and polycentric modes of governance where multiple actors from diverse institutional backgrounds have a contribution to the development and implementation of a policy (Pahl-Wostl, 2009, p. 356). Thus, it can be argued that to some extent Egypt has turned to a more polycentric mode of governance when decided to plan a more stakeholder inclusive, participatory approach and at the same time, the country is still bound to certain amount of permanence as MWRI has remained the prevailing body with most responsibilities towards water resource policies. This, on the other hand, does not necessarily mean that Egypt is poorly planning its water resources. Pahl-Wostl (2009) explained that traits of polycentric systems possess the prominent ability to adapt and self-organize in a situation of change and facing sudden failure, so the system remains intact (p. 357). In addition, systems promoting permanence have the advantage of predictability and in events of change and disturbance developing expectations and coordinating collective action becomes easier (Ibid., p. 358). Consequently, instead of the dominance of one mode of governance, Egypt showing moderate characteristics of a more diverse governance system can be assessed as more ideal.

Following effective water governance theory, the four dimensions of water need to be considered: social, economic, environmental and political (Hamdy & Choukr-Allah, 2012, p. 266). The political dimension of water in Egypt, referring to democracy and providing access through policy channels for stakeholders' participation in water resource management, has already been discussed previously. Consequently, it is important to look at further the different values water represents in Egypt. Water resource management and development is recognized as an absolute strategic priority for socio-economic development in Egypt (MWRI, 2005, p. xvii). It is clearly visible that MWRI stresses the ecological and environmental dimension of water as referring to it as a limited resource that needs to be protected. Hamdy and Choukr-Allah (2012) notes that effective water governance practices develop and manage water resources while maintaining a sound environment and the integrity of ecosystems (p. 266). In Egypt, the pollution of water is recognized as a major problem which threatens water quality and public health issues (MWRI, p. xviii). Therefore, priority is given to measures aimed at preventing pollution and environmental degradation by eliminating harmful substances from products and the relocation of certain industries, in the domain of agriculture more environmentally friendly methods serve as a solution (MWRI, p. xix). Some of these preventative measures further include the introduction of financial incentives to promote clean industrial products as well as the PROPER Program (Program for Pollution Control Evaluation and Rating) that seeks to start public disclosure with the purpose to generate pressure on compliance with laws (Ibid., p. 5-26). The emphasis here is on the agricultural and industrial

sectors since population growth combined with related industrial and agricultural activities are the main driving factors of environmental degradation. If preventative measures are not sufficient to reduce the magnitude of pollution, the strategy on treatment becomes the alternative option focusing on municipal sewage and wastewater. It is stressed that treatment requires sustainable funding, operation and maintenance and different approaches with regards to urban and rural areas in Egypt (Ibid., p. 5-29). On the other hand, empirical data suggest that in spite of the fact that water policies are keen on focusing on water availability, conserving water quality and quantity while sustaining the environment, in reality environmental degradation and pollution are still apparent (Mohamed et al., 2013). The MWRI justifies this gap as "major constraints that hamper the effective solution of the pollution problem relate to institutional difficulties and the lack of funds" (p. 4-38).

Good water governance is deep-rooted in a strategic vision which refers to the long- term perspective of policy makers towards human development while considering the social dimensions of water (Graham et al., 2003, p. 8). Social values of water concern how equitable water resource use is (Hamdy & Choukr-Allah, 2012, p. 266). In line with that, Egypt's NWRP acknowledges that access to water supplies should be more equitable for the entire society (MWRI, p. 4-33). Equity issues among the farmers have especially emerged within the irrigation sector, where "the present distribution of irrigation water is sub-optimal, resulting in inequalities between regions and within regions" (Ibid.). These, however, are increasingly attributed to water operational problems, system capacities, insufficient maintenance of canals and leakage etc. (Ibid.). In response to that, the government has sought to promote development policies to increase equity in water distribution amongst the farmers, one of which is the Irrigation Improvement Project. The IIP is an ambitious programme under the implementation of MWRI, aimed at improving irrigation efficiencies and equal water distribution among the farmers (p. 4-20). Another aspect of water equity that needs to be born in mind is the one related to gender. In the context of irrigation, statistics show that men are generally considered the most influential actors who can best represent water related interests and needs of the household at community level in Egypt (MWRI, p. 2-49). However, this is underlined by an assumption ignorant of the factor that women are also important water users when it comes to watering livestock, irrigating the homestead or for domestic purposes. As a result of their differential tasks and responsibilities, men and women can have differing opinions and preferences about water use (Ibid., p. 6-27). In Egypt, surveys further suggest that men are more interested in solving water quantity issues, while women have greater concerns about water quality degradation which can all be explained by their different uses of water (Ibid.).

Evidently, when making water decisions, it is crucial that one is well informed about the interest as well as the expected benefits and technical and financial consequences affecting both sides. According to Xie's theory (2006) social structures and inequalities can have an influence on water management and vice versa. Thus, in order to be effective, sustainable and equitable, water governance and management approaches need to be attentive to all water user groups even if that implies biases given that the capacity of more disadvantaged user groups need to be enhanced through pro-poor development policies (Xie, 2006, p. 5). In Egypt's policy, the need to promote such disadvantaged groups is recognized and steps has been taken to empower women's participation in water management, the policy consists of the following elements:

- the establishment of specific channels to inform and communicate with women about water resource issues, uses and consequences
- the creation of space for both women and men to express their respective views on water use issues and discuss problems related to water quality and quantity
- the promotion of opportunities for women who would like to actively and responsibly participate in discussion and problem solving with regards to water resource management (MWRI, p. 6-27).

As seen, policies in Egypt drew upon the idea of fairness which is a requisite for good water governance (Graham et al. 2003, p. 24). Egypt's NWRP establishes equal rights and assets for all water user groups which contributes to creating a proper enabling environment, which is defined as good practice according to the GWP's integrated water research management framework (GWP, n.d.).

Besides being social and environmental conscious, economic and financial sustainability is equally vital to sustainable water management (Xie, 2006, p. 7). Water has an economic value which refers to how efficient water use is (Hamdy & Choukr-Allah, 2012, p. 266). In order to lessen the gap between water demand and the supply available in Egypt, the easiest solution would be to increase its supply (MWRI, p. 4-15). However, having recognized that from a hydrological point of view, the Nile has a lot of potential but political, administrative and economic conditions prevent its development, instead of increasing its water supply, Egypt needs to improve water use efficiency (Ibid.). Development policies regarding efficiency have mainly targeted the agricultural sector and the best example for that is the previously mentioned Irrigation Improvement Project (IIP). On the other hand, when drawing upon the situation of drinking water and sanitation companies can shed light on the economic and financial dimension of water. Given that water management is strongly centralized in Egypt, the

companies responsible for drinking water and sanitation are delimited by the state to fix tariffs for their water services (SWIM EU, 2014, p. 27). Ultimately, it is the state that approves the rate in consideration of a range of socioeconomic and political criteria (Ibid.). This, however, in the majority of cases, results in low prices which do not sufficiently cover the service and operation cost of these supplier organizations (Ibid.). This case being in Egypt, contradicts the basic idea that water should be of economic value and financially sustainable (Xie, 2006, p. 7) since service providers are not given the chance for full cost recovery, instead it causes companies to be dependent on the state. States entangled in both regulatory and provider roles can be a sign of weak governance (Rogers & Hall, 2003, p. 14), as without sufficient financial state contribution, it becomes difficult to meet the water needs of the public (Xie, 2006, p. 7).

**(ii) Legislative frameworks**

Legislative framework translates policies into laws by specifying domestic use, ownership, permits and water rights of all stakeholders (Xie, 2006, p. 8). Legislation is a powerful tool in the hands of governments because it provides the prescriptive parameters for resource development and management to promote the public interest (GWP, n.d.)

Having recognized that water management needs the support of an adequate legal framework aspects of water distribution, operational management and maintenance of irrigation and drainage system, water quality, quantity and financing in Egypt depend much on the following laws:

- Law 12 (1984), "Concerning the Issue of the Law on Irrigation and Drainage"
- Law 213 (1994), "Regarding Farmer Participation"
- Law 48 (1982), "Concerning the Protection of the River Nile and Waterways from Pollution"
- Law 4 (1994), "Law for the Environment" (MWRI, p. 3-9).

Law 12 on irrigation and drainage is the principle piece of legislation dealing with: "(1) the definition of public water streams, (2) requirements to use a water stream for irrigation and agriculture, (3) the creation and usage of water banks, (4) methods and requirements for distributing water, (5) prohibitions on the use of sewage and underground water, (6) methods to protect streams for the purposes of irrigation and navigation, (7) sanctions against violators, and (8) general provisions related to conflict resolution mechanisms between individuals using water resources and the MWRI" (Sadek, 2013). Furthermore, some of its provisions are

dedicated to settle disputes and create private funds to finance new water projects and develop the ones currently existing (MWRI, p. 3-9). The Law empowers the Ministry of Irrigation (now MWRI), as the principal governmental body has to provide consent to all abstractions of water management and governance (Ibid.). It grants the right to the Ministry is to declare specific water sources as public, to undermine the private usage of water even in possession of a previously issued license, as well as authorizes the General Director of Irrigation to prohibit the usage of any stream with the purpose to ensure fair water allocation (Sadek, 2013).

Law 213 is supplementary to the previous law, it provides the legal grounds for the participation of farmers to improve irrigation systems at the mesqa and farm levels (MWRI, 2005, p. 3-10). Law 21 also establishes funding to projects targeted to the development and maintenance of improved mesqas and to raise awareness as regards to water use (Ibid.; MWRI, 2000, p. 1-1). It is important to note that the Law originally determined the rights of water user organisations only on new lands, and recently it has been extended to include organizations on old lands (MWRI, 2005, p. 3-10).

Law 48 provides the legal foundation for the protection of surface and groundwater sources against pollution (MWRI, p. 3-11). The Law distinguishes between drinkable, and non-drinkable sources of water, the first being the Nile and the irrigation canals, while the second group is made up of drains, lakes and ponds. Law 48 determines standards for water quality with respect to "(1) the Nile river and canals, (2) treated industrial discharges to the Nile, canals and groundwater, (3) domestic and industrial discharges to drains, brackish lakes and ponds, (4) reuse water to be mixed with Nile river or canal waters, and (5) the drains, lakes and ponds themselves" (Ibid.). Furthermore, it is clarified that the MPWWR (now MWRI) is the entity in charge of the licensing of wastewater discharges, while the Ministry of Health is liable for monitoring the effluents (Ibid.).

Law 4 is the overarching law on the environment. Interestingly, Law 4 is not integrated with the aforesaid Law 48 on 'The Protection of the Nile and Waterways from Pollution', instead it refers to Law 48 for guidance regarding specific regulations on water quality (MWRI, 2005, p. 3-11). What makes this Environmental Law relevant to water management is it provides regulations for the protection against pollution of sea shores, ports which are not included in Law 48 as well as, the law established the Egyptian Environmental Affairs Agency (EEAA) (Ibid.).

Evidently, this short review of Egypt's legislative framework revealed that even though laws exist regulating different aspects of water management such as water usage, distribution and pollution while promoting stakeholder participation, it can still be argued that these laws are

not entirely integrated and coordinated. Especially, the fact that Law 4 on Environment and Law 48 on the Protection of Nile and Waterways from Pollution coexist, yet, they are not integrated which can make the division of responsibilities and tasks between the various agencies involved unclear with regards to the management of water quality (MWRI, p. 3-11). Rogers & Hall (2013) refers to the absence of a strong legislative framework along with the unclear definition of roles of actors as potential signs of poor governance (pp. 9-10). In similar fashion, Law 12 which is primarily aimed at reforming irrigation, the biggest water user sector, makes the MWRI the main dominant actor, at the same time neglecting the importance of other water users and stakeholders (p. 3-9). In particular, if conflicts arise between the different water users and stakeholders, there would not be any rules to specify priority water user rights. This is not ideal, as in theory, regulatory practices and policies should clearly define water use rights and create markets for these rights to be traded which would essentially allow water to be used by those for whom water means the most at that moment (Xie, 2006, p. 7).

Another issue that surrounds Egypt's legal framework is deep-rooted in its rigidity and is based on obsolete visions that were popular in the 1960s and 1970s (MWRI, 2000, p. 1-3). Given that policies and vision have changed over time and in light of factors such as increasing water scarcity and demand, the diversion of Nile water to new lands as well as the importance of participatory approaches in water management, the existing legal framework needs to be reviewed and revised (Ibid.). For instance, Law 12 fails to provide sufficient legal grounds for water resource management in a situation of change and disturbance, such as in a period of water scarcity. This would require the laws to adapt to the increased need of participation of all water stakeholders in the planning and distribution of water resources to ensure effective, sustainable and integrated water resource management. Evidently, coherent and up-to-date laws with strong and autonomous regulatory regimes to enforce them are integral parts of an enabling environment (Rogers & Hall, 2003; Hamdy & Choukr-Allah, 2012).

Furthermore, it is argued that not only local and national legislation matters but with the extension to international treaties when water is shared by multiple neighboring nations, water use and ownership rights need to be addressed as well on an international scale (GWP, n. d.). This is especially relevant to this case study, as the Nile River has been the source of tension amongst the three major riparian countries: Egypt, Sudan and Ethiopia (Swain, 2008). Interestingly, Egypt's water share has not been changed ever since 1959 when an agreement between Egypt and Sudan was concluded for the optimal use of Nile waters (Allam, p. 206). Although, it is not Sudan that poses a larger threat to Egypt's water security, but rather Ethiopia, dedicated to improving the country's agricultural production for which water resources are

considered indispensable (Bedawy, 2014, p. 115). Ethiopia is struggling with more frequent and drastic shortfalls of food which makes the country increasingly dependent upon food imports. On top of that, energy generation is also of utmost importance to Ethiopia and according to current estimations the country would need to generate 20% more energy annually and right now less than 0.2 % of its hydropower potential is utilized (Asempa, 2010 cited in Bedawy, 2014, p. 115). These have given the incentive to Ethiopia to begin the implementation of the Renaissance 'El Nahda' Dam Project to secure more Nile water for its own use. Notably, any irrigation project in the Ethiopian highlands would affect the downstream countries adversely with respect to their share of Nile's water supply (Bedawy, 2014, p. 115). Negotiation efforts have ended in futility, let alone the fact that they were postponed on several occasions. In May 2010, the Nile Basin Cooperative Framework Agreement (CFA) was established with the aim to fairly redistribute the river quota among the Nile Basin countries, to which upstream countries became signatories such as Ethiopia, Kenya, Uganda, Tanzania, Rwanda and Burundi, however, Egypt and Sudan refrained from signing the agreement (Sadek, 2013). Certainly, no international treaty and legislative framework exist recently which has been ratified by all Nile Basin countries and which would define the exact water shares and water use rights of each country. This leads to a conflict of interest, as demonstrated throughout the Renaissance 'El Nahda' Dam Project, Ethiopia's thirst for development through water is simultaneously raising water insecurities in Egypt. This can be interpreted through the lens of global governance theory, which acknowledges the plurality of governance actors and that certain problems exceed national boundaries (Zürn, 2018, p. 4). As Zürn (2018) expressed, global governance theory reflects power relations which are essentially shaped by the inferiority of interests and beliefs of some actors to others because "a certain choice of governance always includes a choice against another form of governance" (Ibid., p. 5). In the case of Egypt and Ethiopia, it is uncertain which actor is more influential, but looking at geopolitical power, Ethiopia has the advantage of being an upstream country meaning that its irrigation and dam projects might have an adverse effect on the water supply of more downstream countries but it does not happen to be the case vice versa. Nevertheless, the basic argument here is that water being a global public good (Pahl-Wostl et al., 2008, p. 420), it is the right of Ethiopia to seek development through water but it should take place by maintaining a balance to avoid harming the neighboring countries including Egypt's water supply. For this reason, it is crucial to adopt a global perspective on water governance and in consideration of the presence of transboundary water conflicts, international legislation and treaties have an essential role in conflict mitigation by laying down the basic water use rights and shares of the

respective countries while taking into account their individual interests and situation (GWP, n.d.).

**(iii) Financial incentives**

Financing and investment structures have a crucial impact on meeting water needs and constitute an important enabling factor towards efficient, effective, sustainable and equitable water resource management (GWP, n. d.).

In Egypt, the Government finances all the plans and programs through the State Budget (SWIM EU, 2014, p. 16). Correspondingly, irrigation and drainage infrastructure costs such as investment, operation, maintenance and rehabilitation have traditionally been covered by the Ministry of Water Resources and Irrigation (MWRI, 2005, p. 4-13). Other ministries might be involved as well according to their specificity, which especially appears to be the case with the Ministry of Finance being in charge of investment budgets and subsidies (SWIM EU, 2014, p. 1). In addition, Egypt also receives funding for investment projects from external/international donors including EIB, ADB, EU, AFD, KFW, World Bank, etc. (Ibid., p. 2). An issue of utmost importance concerns shortcomings on the revenue side (OECD, 2010, p. 14). A recent study revealed that "the total financing gap for the water and sanitation sector amounts to EGP 169.2 billion (EUR 23.6 billion) over 20 years and is expected to increase by almost 45% between the period 2000- 2026" (OECD, 2010). According to the MWRI, this gap can be attributed to two factors in Egypt: one being that a significant share of financial support originates from the central government and second being that the levels of full cost recovery are low due to the inability of user charges to cover water expenses (MWRI, p. 4-38). Financial sustainability is especially considered a sensitive issue in countries where strong centralized management prevails like in Egypt. Water user charges in Egypt cover only part of the service but not the actual costs of investments, provision, operation, maintenance, resource protection (SWIM EU, p. 25). For instance, user charges account for only 11% of the total budget, while the state contribution amounts to 83% (OECD, 2010). Evidently, the state should be able to cover the cost of provision of the resource in light of promoting social equity and following a human rights perspective on water, and the UN's principle of 'Leaving no one behind' and that every human being has the right to safe drinking water and sanitation (UNESCO, 2019, pp. 1-2, 35). However, it is expected that the sector has the capacity (from user fees) to provide the larger share of contribution in comparison to government subsidies. As mentioned at a previous section, Egyptian companies liable for drinking water and sanitation are not free to modify the

tariffs for their water services (SWIM EU, p. 27). Instead, it is the state that approves the rate in consideration of a range of socioeconomic and political conditions (Ibid.). The challenges of the state in respect to water pricing and cost recovery is deep-rooted in the fact that water has been traditionally regarded as a free commodity (Bedawy, 2014, p. 116) and this could explain why it is rather difficult to obtain social acceptance for measures imposed on paying for something that used to be free of charge. On the other hand, the lack of financial measures can restrict the possibilities of implementing practices of effective and sustainable water governance and management as well as obstruct the involvement of the private sector (OECD, p. 14). It is argued that "problems of low levels of cost-recovery may impede further involvement of the private partners in the water sector, either directly by limiting the interest of business to engage in activities with low cash-flows or indirectly by jeopardizing the financial capacity of public authorities" (Ibid.). In other words, situations when user charges do not cover the overall costs of water combined with the inability to fix water tariffs due to state limitations can seem unattractive to private companies. On the other hand, in theory, if the private sector is not involved in water management and water services like drinking water and sanitation, it is unable to contribute with its technological expertise and effective management practices, and accordingly, it can hinder development in the sector (Xie, 2006, p. 7).

Therefore, it is pivotal that Egypt turn efforts to the optimization of user charges in the water and sanitation sector to enable businesses to achieve financial independence (SWIM EU, 2014, p. 30). Let alone the fact that a viable cost recovery initiative would not only enhance private sector participation but it would also enlarge the funding for investment, operation, maintenance and rehabilitation of water. Ultimately, there is also reason to believe that a programme with reasonable user fees would promote the wise use of water and hence, reduce water demand that the country has been struggling with ever since the 1970s (Allam, 2007, p. 207). Although, such financial program can only be realized if that is accompanied by institutional and regulatory changes, as claimed by the MWRI, the installment of a regulatory body for controlling water prices and cost recovery would be of special need to facilitate tariff setting mechanisms (MWRI, p. 5-37).

## Institutional arrangements:

The second dimension of the IWRM framework in particular, highlights the role social, economic, political and administrative institutions have in developing and managing water resources (GWP, n.d.). It is especially important that as opposed to the conventional view, institutional arrangements based on the IWRM principles work towards a shared vision rather than fulfilling each of their own institutional functions (Ibid.).

Institutional System in Egypt:

The government structures in Egypt can be divided into three operational levels. The highest level is the central government of Egypt, inclusive of the Ministries. The de-central government is jointly made up of the second level structured in Governorates as well as the third level units referred to as markaz constituted by districts and some cities (MWRI, p. 2-50).

As emphasized beforehand, the central governmental organization in charge of managing the water resources, principally the waters of the Nile and irrigation projects in Egypt is the Ministry of Water resources and Irrigation (mwri.gov.eg - The Ministry of Water Resources and Irrigation). MWRI includes several departments and sectors for instance: Planning Sector, Nile Water Sector, Irrigation Department, Egyptian Public Authority for High Dam and Aswan Dam, Egyptian Public Authority for Drainage Projects, Mechanical and Electrical Department (pumping stations), Water Quality Management Unit, Institutional Reform Unit, National Water Research Center (MWRI, p. 2-51). At the de-central level, MWRI identifies 22 Irrigation Directorates separated into 62 Inspectorates and about 206 Districts (Ibid.).

Furthermore, on the central governmental level several institutions are involved in water management inclusive of resource management, development and conservation, wastewater management, water use and health protection (EU SWIM, pp. 9-10). Besides the Ministry of Water Resources and Irrigation, other key institutions are: Ministry of State for Environmental Affairs, Ministry of Water and Wastewater Utilities, Ministry of Health and Population, Ministry of Finance, Ministry of Interior, Ministry of Agriculture and Lands Cultivation, Ministry of Local Development, Ministry of Industry (Ibid.). Additional Ministries can also partake in planning, investments or local development such as the Ministry of Electricity for hydropower reasons, Ministry of Tourism concerning tourist and water infrastructure related development on the Nile (MWRI, p. 3-2).

At the de-central level, public administration is composed of 26 Governorates and one special status city, namely Luxor (MWRI, p. 2-52). There exist 2 different kinds of

Governorates, the first is present in four cities: Cairo, Alexandria, Port Said and Suez where they are further split into urban quarters (Ibid.). The second type of Governorates are complex and multi-city divided into 156 districts, and cities, urban quarters and villages (Ibid.). Twelve national Ministries hold Directorates at de-central (Governorate) level endowed with decentralized functions and budgets, amongst which the Ministry of Health and Population and the Ministry of Water and Wastewater Utilities can serve as cases related to the water sector (Ibid.). Moreover, fourteen Ministries possess certain decentralized functions but without any decentralized budget available (Ibid).

Evidently, Egypt's institutional system with respect to water governance reflects that a participatory approach towards integrated water resource management is under development because the need to involve several ministries in water management processes has been recognized. According to Biswas (2009) a this is especially important since water issues appear to be "multi-dimensional, multisectoral, and multi-regional and filled with multi-interests, multi-agendas, and multi-causes, and which can be resolved only through a proper multi-institutional and multi-stakeholder coordination" (p. 249). On the other hand, arguably, the participation solely of the respective ministries at the central governmental level may not be sufficient. Apart from horizontal sectoral integration, effective water governance also requires vertical integration to allocate responsibilities to lower level institutions (Pahl-Wostl, 2009, p. 357). As seen in Egypt, vertical integration exists but is not so common given that only two water related ministries: The Ministry of Health and Population and the Ministry of Water and Wastewater Utilities have Directorates with decentralized functions and budgets at a lower level (MWRI, p. 2-52). Consequently, it can be said that Egypt is lacking strong features of decentralization when it comes to water governance.

**(1) Organizational Framework (Regulation and Compliance)**

One of the major elements of institutional arrangements are the institutions themselves. Thus, this section calls for the scrutiny of the institutions managing water resources to identify what roles, rights and responsibilities they assume, how they operate in concert with each other, who has the power to make decisions, who is influential and most importantly, who can be held accountable for failures (GWP, n.d.).

Water management in Egypt is highly centralized and sectorized (EU SWIM, p. 12), thus the most important water management decisions inevitably take place at the highest administrative levels. In previous paragraphs, it has been demonstrated which Egyptian national ministries are involved in water management inclusive of resource management,

development and conservation, wastewater management, water use and health protection. At this stage, it is important to highlight and detail the five most influential key players in water and sanitation decisions which are: The Ministry of Water Resources and Irrigation, Ministry of State for Environmental Affairs, Ministry of Water and Wastewater Utilities(MWWU), Ministry of Health and Population and the Ministry of Agriculture and Land Reclamation (EU SWIM, 2014, p. 12).

The Ministry of Water Resources and Irrigation (MWRI), is the prime governmental organization responsible for managing all sources of water in Egypt: the Nile River, waterways, canals and groundwater (EU SWIM, p. 12). The Ministry also interferes in the reuse of drainage and wastewater. MWRI controls not only water quantity but also quality through its monitoring networks and laboratories (Ibid.). Additionally, the Ministry is involved in several inter-ministerial committees of development and planning such as Planning Committee for the crops for the Ministry of Agriculture, High Committee for Water, Wastewater Treatment Priorities Committee jointly with the Ministry of Water and Wastewater Utilities, as well as committees with regards to designing State policies and for the implementation of policies and initiatives (Ibid., pp. 12-13). Moreover, the MWRI is dependent upon its representation in the Governorates on the de-central level to realize its objectives (Ibid.).

The Ministry of State for Environmental Affairs (EEAA) "is responsible for the policy formulation and plan preparation for the protection of the environment, the monitoring of water quality and the definition of natural protected areas" (EU SWIM, p. 13). The Egyptian Environmental Affairs Agency is the executive body of the Ministry, which holds regional offices in the Governorates on the de-central level (Ibid.). The Ministry is also focused on policies of water quality (exclusive of the underground water for which MWRI is liable), it acts as an inspecting authority with the aim to enforce the rules and in case of violation, to take legal action (Ibid.). The EEAA uses a central laboratory, 12 further laboratories and its mobile units to fulfill its tasks and responsibilities among which are environmental impact studies compulsory for any development and investment project. The Ministry also plays an important function to raise awareness about environmental matters and transmit information to the general public (Ibid.).

The Ministry of Water and Wastewater Utilities (MWWU) is a relatively new governmental institution established in 2012 which acquired some of the duties of the Ministry of Housing, Utilities and Urban Communities. The MWWU is the single entity in charge of the entire drinking water and wastewater sector (EU SWIM, p. 13). In consequence, its mission is "to provide sufficient drinking water of good quality to all the population and to treat the

wastewater in such a way that the effluent discharge does not pose any health or environmental risks" (Ibid.). MWWU is tasked to enhance the capacity of water treatment in ways of establishing additional water treatment plants and at the same time improving the efficiency of the existing ones (Ibid.). The Ministry has reassigned some of its tasks and responsibilities to organizations that fall under its supervision for instance, Egyptian Water and Wastewater Regulatory Agency (EWRA), Holding Company for Water and Wastewater (HCWW), and 23 further Affiliated Companies, National Organization for Potable Water and Sanitary Drainage (NOPWASD), Construction Authority for Potable Water and Wastewater (CAPW) (Ibid.).

The Ministry of Health and Population is an important actor in terms of water management because through its Department of Environmental Health, "establishes and enforces the drinking water standards, monitors and protects the quality of surface waters, inspects the wastewater treatment plants and is responsible for the population control programs" (EU SWIM, p. 14). The Ministry is also represented in the Governorates, moreover, the Higher Committee for Water (HCW) falls under the authority of the Ministry of Health (Ibid.). The Committee members are: MSEA, MWWU, MWRI, Ministry of Defense, Water Companies, EWRA and National Center for Researchers who jointly prepare laws and strategies for monitoring, determine water standards and requirements for licenses (Ibid.).

The Ministry of Agriculture and Land Reclamation is responsible for improving agricultural activities which affect water management on farm-level. Given that the Ministry is also involved in water management, it works closely with the MWRI in a Committee to realize their shared goals (EU SWIM, p. 15).

Considering the different ministries involved in water management processes, it can therefore be stated that water management roles and responsibilities are defined and distributed mostly among the different ministries on the highest national level. In Egypt, the MWRI has influence in all aspects of water management including managing the Nile waters, waterways, groundwater, and interferes in water quality and quantity which would otherwise fall under the control of the Ministry of State for Environmental Affairs. The same applies to the drainage and wastewater sector as such would principally be expected to be managed by the new national institution the Ministry of Water and Wastewater Utilities specifically established to fulfill that duty. Evidently, it can be assumed that MWRI is the most powerful and influential actor in Egypt's water management and since the Ministry interferes in all water sectors, that can disturb the balance of power relations (EU SWIM, 2014, p. 12). Power relations are important elements of governance structures because they influence the ways by which various interests are represented in water decision-making (Rogers & Hall, 2013; Hamdy & Choukr-Allah,

2012, pp. 271-272), therefore it is essential to maintain a balance and ensure that all water interests are equally represented and to involve as many actors in water management as possible.

MWRI is in possession of roles overlapping with other ministries (Mumssen & Triche, 2017, p. 35), which can bring the issue of accountability into discussion. As stated, the MWRI is legally liable to plan and manage all water resources in Egypt, however, in practice the Ministry does not display major concern for water quality (Tayie & Negm, 2018, p. 105). In case governing entities lack the interest to deal with certain issues, Graham et al. (2003) remarked that governmental failures and incapacity are more likely to happen. At the same time, if the MWRI, as the most influential actor, is also legally liable for water resource management, that implies that the governing institution holds a significant share of accountability. The accountability of institutions responsible for water governance is an integral element of the resource governance theory, according to which accountability means, in its operational sense, the role that institutions play to ensure that governments operate effectively and efficiently." (Schacter, 2000 cited in Graham et al., 2003, p. 21). When assessing the degree of effectiveness of institutions, the corruption index can be of great use (Pahl-Wostl, 2009, p. 356). Based on the Corruption Perceptions Index (CPI) of Transparency International, published in 2020, Egypt scored 33 out of 100 which makes the country rank close to the bottom of the list among countries in the world perceived as highly corrupt (transparency.org). The CPI measures the levels of government corruption, where 0 indicates high levels and 100 indicates low levels of corruption and it is based on data from a great variety of sources including ADB, AfDB, WB, etc. (Kenton, 2021). Based on the Corruption Perceptions Index, the Government of Egypt is perceived as rather corrupt, and supposedly, since water management mostly takes place at the highest national levels, ministries including the MWRI need to be more accountable to ensure that they operate effectively and efficiently towards realizing the water objectives. According to Rogers & Hall's (2013) good governance theory, structural and institutional reforms could come handy in this case as they could create institutional accountability, build capacity to improve policy formulation, implementation and enforcement mechanisms essentially needed to transform poor governance to good governance (pp. 9-10).

In Egypt's institutional setting, it has been noticed and elaborated that there are many national-level parties responsible for parts of water resource management. Key functions such as "policy making, regulation, planning, and investment are carried out by national-level institutions" (Mumssen & Triche, 2017, p. 37) which makes Egypt's water management appear

centralized and sectorized. Therefore, Egypt's governance in the domain of water can be identified as a hierarchical governance system when applying Rogers & Hall's (2003) distinction among the three types of governance systems. Hierarchical governance systems are characterized by top-down models and strong centralized institutional settings (Rogers & Hall, 2003, p. 11). On the other hand, there have been a few indications that the Egyptian water sector is slowly transitioning to another type of governance system, defined by Rogers & Hall (2003) as distributed governance. These indications include the delegation of some of the responsibilities from high to lower administrative levels (Tayie & Negm, 2018, p. 106). For instance, as mentioned in relation to the MWRI, the Ministry does not display interest in water quality regardless of the fact that it is legally liable for all aspects of water resource management, including qualitative measures. Consequently, the Ministry has reassigned some of its functions in relation to monitoring the quality of surface and groundwater to the National Center for Water Researches which appears on decentral level (Ibid., p. 106). Apart from the National Center for Water Researches other specialized parties and bodies also assist the Ministry, the two major departments of MWRI are the Irrigation Department (ID) and the Mechanical and Electrical Department (MED) which have the widest spatial coverage as they are represented by various bodies of irrigation directorates, inspectorates and districts (EU INECO, 2009, p. 30). Furthermore, the Planning Sector is responsible for "data collection, processing and analysis, for planning and monitoring investment projects", the Sector of Public Works and Water Resources is in charge of coordinating water resource development, while the Nile Water Sector has a role in cooperating with Sudan and other nations along the Nile River Basin (Ibid.). Another public authority affiliated to the Ministry is the Egyptian Public Authority for Drainage Projects (EPADP) which is tasked with draining activities encompassing the construction and maintenance of open and closed drainage systems, EPADP is represented in directorates in the Nile network (Ibid). In addition, the High Dam Authority controls the operation of Aswan Dam (Ibid.). Interestingly, while reassigning some of its tasks and functions, the MWRI has changed from an operational to a more strategic and supervisory role (MWRI, p. 5- 35). The strategic role refers to the leading role of the Ministry in national planning and policy making, while the supervisory role indicates that the MWRI is the one that can be hold accountable for the performance of its affiliates (Ibid), thus it requires the extensive monitoring of the institutions in the Districts i.e. decentral level. The way the MWRI delegated and reallocated some of its roles among the different public authorities and bodies while the Ministry has remained in supervisory and regulatory role showcase that Egypt has begun to transition towards a more distributed governance system in the domain of water. It is argued

that distributed governance can have the potential to reduce corruption and create more accountability among public administrative processes which are essential to improve the effectiveness of a governance system (Rogers & Hall, 2003, p. 13). Based on this theory, while recognizing that still most of the water governance processes take place on the highest national levels in Egypt, the country has shown signs of taking a first step towards a more distributed and vertically integrated water governance system. Proponents of resource governance theory express the need for such actions to allocate the authority and responsibility of water management to the lowest appropriate administrative level because central organisations might lack the local information and insight (Xie, 2006, pp. 5-6; Pahl-Wostl et al, 2008, p. 421).

One of the most evident examples denoting that Egypt has proceeded with vertical integration measures in the water sector, is the transfer of MWRI's management responsibility to the Water Boards which has brought about the establishment of integrated MWRI Districts (MWRI, p. 5-34). These Districts can "enable local water management carried out by the Water Boards and WUA's within the national regulatory policy framework" (Ibid). Moreover, the Districts can also ensure that the MWRI's operational planning is aligned with local needs and interest raised by local users (Ibid.). It needs to be noted that the MWRI Districts are currently in progress of implementation and are anticipated to reach full coverage by 2022 (Ibid.). Local governance is based on the idea that since water problems appear to be local, they should naturally be dealt with on a local level, thus, in resource governance, many express the need to interpret local rights, needs and stakeholders when effectively addressing governance challenges (Pahl-Wostl et al, 2008, p. 421). Pahl-Wostl et al. (2008) asserted that water governance tends to occur on scales of the national, basin, and local, usually omitting the global dimension. Bearing in mind that Egypt's institutional framework is highly centralized and sectorized regardless of the fact that it had partially opened up to decentralization visible in the reallocation of some roles to lower administrative levels, water governance processes still predominantly occur on national level. National water governance holds that water is a national resource "that should be governed for the benefit of national economy and society: domestic interest comes first" (Pahl-Wostl et al, 2008, p. 421).

While governance on basin and global levels cannot be considered the most dominant view in Egypt's water governance compared to the national and local perspectives, some initiatives do exist in light of transboundary water management and to facilitate cooperation among the riparian countries in the Nile Basin (EU INECO, 2009, p. 20). An example for that can be the Nile Basin Initiative (NBI), officially launched in 1999 by the Council of Ministers of Water Affairs of all the Nile Basin countries (Ibid.). The objective of the initiative shared by

all riparian states of the Nile was "to achieve sustainable socio-economic development through the equitable utilization of and benefit from the common Nile Basin water resources" (Ibid.). In line with that, the first meeting of the International Consortium for Cooperation on the Nile (ICCON) was held in 2001, in Switzerland where Ministers, Senior officials, both bilateral and multilateral donors and other NGOs and civil society organisations participated to strengthen the cooperation among the 10 Nile Basin states (Ibid.). When adapting a river-basin approach in water governance, benefits can emerge, because resource-related conflicts and issues can be better taken care of within the natural boundary of the hydrological system (Pahl-Wostl et al, 2008, p. 421), in this sense the Nile Basin states joining forces can be seen an effective way leading to sustainable development and management of the Nile. These river basin initiatives have not only served the purpose to encourage effective water governance and sustainable development among the riparian countries, but to a large extent they have become the key mediators of conflicts that arose in relation to the water quota from the Nile. As pointed out in a previous chapter, the Nile River has been the source of tension (Swain, 2008), particularly in the case of Egypt and Ethiopia, when Ethiopia initiated the Renaissance 'El Nahda' Dam Project adversely affecting the water supply of Egypt (Bedawy, 2014, p. 115).

The role of informal institutions and non-state actors

Having argued that water management responsibilities are divided amongst the ministries at the highest administrative levels (Mumssen & Triche, 2017, p. 37), it can therefore be stated that Egypt's water governance mode indicates the nature of a bureaucratic hierarchy. In bureaucratic hierarchies, formal institutional structures dominate and state actors have the most important roles in governance in contrast to networks and markets in which cases, informal institutions and non-state actors come into play (Pahl-Wostl, 2009, p. 358). Proponents of good governance theory highlight that the most ideal form of governance is when a more diverse governance system prevails composed of elements of all three governance modes (Ibid.). Thus, a correlation exists between good governance and the informal institutional structures and non-state actors, which are said to foster the flexibility of the system in a situation of change and disturbance as well as they are also considered the keys to knowledge generation (Pahl-Wostl, 2009; Newig et al., 2005). Given that Egypt's water governance is highly centralized and sectorized, the participation of Egyptian NGOs and other non-state stakeholders are significantly limited compared to state actors (EU SWIM, 2014, p. 26). For instance, they are involved in projects submitted to the Ministry of Environment with respect to impact studies, as well as their interventions take place in the management of solid waste (Ibid.). On the other

hand, in spite of the fact that Egypt has adopted an IWRM approach, participative management, where informal institutions and the lowest administrative levels are also engaged, is still very uncommon in practice. Concerning the relationship with the public water user groups, water management decisions are mostly exclusive of public consultations and the only exception for that is when the grievances of the public are collected in relation to drinking water and sanitation services or when information campaigns are launched by EEAA (Ibid., p 27).

However, a significant development in the irrigation sector can be the establishment of the previously mentioned Water Boards which essentially gave rise to the voluntary organizations of farmers, namely the Water User Associations (WUAs) (EU INECO, 2009, p. 43). WUAs are expected to contribute to the equity, efficiency and sustainability of the system in terms of water use and distribution. They are also seen as the "means for communicating farmer needs and expectations to the irrigation system authorities, both prior to contraction or improvement projects and during their operation" (Ibid.). Moreover, WUAs are also said to play a role in revenue collection and conflict resolution among individual users at local levels (Ibid.). Based on the above, WUAs can be considered key actors in representing the interests and needs of the public which is in principle a way to knowledge generation and since WUAs work closely with state actors such as the Water Boards, the government can better manage informational uncertainty (Newig et al., 2005, p. 340). In other words, it means that the Egyptian authorities can benefit from the WUAs' local knowledge, as well as learn about their acceptance or potential resistance to the proposed measures which can make the implementation period easier (Ibid.).

**(2) Water Supply and Sanitation Services**

As part of the institutional arrangements, the GWP's framework highlights the importance of institutions assigned to deliver water supply and sanitation services (GWP, n.d.). In consideration of the social, economic and environmental contexts, these institutions play a role in "establishing, maintaining, and upgrading the water supply system, which typically involves for: collection, treatment, distribution, quality control, sewage, and reuse of water" (Ibid.). In Egypt, such service provider roles are carried out by organizations under the supervision of the Ministry of Water and Wastewater Utilities (MWWU) (EU SWIM, p. 13).

For instance, The National Organization for Potable Water and Sanitary Drainage (NOPWASD) and Construction Authority for Potable Water and Wastewater (CAPW) are organizations in charge of investment in the domain of water and wastewater, including water services (EU SWIM, p. 14). In addition, the Egyptian Water and Wastewater Regulatory

Agency (EWRA) is responsible for the technical and economic regulation of utilities as well as it is assigned to supervise, review and monitor the entire water and wastewater activities (Ibid., p. 14). EWRA lacks regional representation, so it operates on the central level to control the quality of services granted by the water companies (Ibid.).

The Holding Company for Water and Wastewater (HCWW) and its 23 Affiliated Companies (ACs) are considered Public Service Companies in terms of status (EU SWIM, p. 14). Their mandates are to "purify, distillate, transport, distribute and sell drinking water in addition to collecting, treating and safe disposal of wastewater" (Ibid.). The HCWW is in a supervisory role because it monitors, and provides technical support as well as training to the ACs (Ibid.). The ACs, such as the General Economic Authorities for Drinking Water and Sanitation, operate on the Governorate level and their operation is based on 5-years Master Plans (EU SWIM, 2014, p. 14; EU INECO, 2009, p. 36). The HCWW is especially engaged in the quality control of the drinking water and wastewater throughout the water treatment procedures, for that purpose, laboratories are established in each AC where 2 700 000 samples are tested annually (EU SWIM, p. 14).

As advised by the GWP's IWRM framework, several institutions are assigned responsibilities in relation to the provision of water supply and sanitation services in Egypt (GWP, n. d.). It is clear that the HCWW and ACs are entrusted with the operational and maintenance tasks of water networks and wastewater treatment processes, however it might be less evident if planning and investment infrastructure matters are within or outside of their reach (EU SWIM, p. 26). Regarding the two organizations responsible for the investments, CAPW controls investment activities for the two Megacities (Cairo and Alexandria), while NOPWASD has been assigned the rest of Egypt's territory (EU SWIM, p. 14 & p. 26). This geographical allocation of competencies for the investments can bring about a number of issues related to the activities of HCWW especially in terms of priorities for planning for which an overview is needed about the investment structures. It can be argued that "this can lead to overlapping jurisdictions between agencies if a perfect coordination is not assured (which is always difficult for organizations independent of the other)" (EU SWIM, p. 14 & p. 26). This risk is most certainly limited by the current state of Egypt's governance system which is predominantly centralized, but since the country is transitioning towards a more decentralized and distributed governance approach, the roles and responsibilities of institutions in the provision of water and sanitation services would need to be redefined in a clearer manner. As per Rogers and Hall (2013) good governance theory, the division of labor along with the clear definition of the roles of both state and non-state actors could substantially improve the

effectiveness of water governance systems in the long term (p. 10), which needs to be fulfilled in Egypt.

Another crucial aspect that has been previously touched upon but is of particular relevance to the provision of water and sanitation services is the notion of economic and financial sustainability (GWP, n. d.; Xie, 2006, p. 8). As mentioned previously, drinking water and sanitation companies in Egypt struggle to reach full cost recovery due to their inability to fix tariffs for the provision of services (EU SWIM, p. 27). Instead, the State makes the final decision about water user rates in consideration of a range of social, economic and political conditions (Ibid.). As a result, water user prices have become especially low that companies are unable to cover for the service, operation, maintenance, let alone the investment costs which resulted in the companies' dependence on state support. Financial support and investments in the water sector are pivotal to preserve, manage and develop water as a scarce resource and provide adequate service delivery and provide public goods (Xie, 2006, p. 8), therefore, Egypt struggling with a financial gap could endanger meeting the water needs of its citizens. Additionally, the absence of financial sustainability in Egypt can also have detrimental effects on the private sector engagement in the provision of water and sanitation services which is otherwise highly recommended. According to Xie's (2006), the involvement of the private sector is a requisite to achieve effective water governance and management because without the expertise, technical contributions and effective management practices of the private sector, development can hardly be realized in the sector (p. 7). In Egypt, there is a strong political will to engage the private sector especially in the domain of wastewater to manage networks, sludges, wastewater treatment plants and water reuse (OECD, 2010, p. 22). This strong interest of the Government of Egypt to allow privatization can be confirmed by the current policy and legal framework including the establishment of a central PPP Unit within the Ministry of Finance and the creation of Law 67/2010 (OECD, 2010, pp. 6-8). For instance, the most recent initiative, Egypt's National Water Resource Plan has been the subject of analysis at previous chapters according to which the MWRI expresses its vision which includes seeking for the privatization of selected Government responsibilities in water management and building private sector capacity to be prepared for these responsibilities (MWRI, p. 5-37). Moreover, the central role of the private sector is also described in Egypt's national development objectives in the policy document "Egypt and the 21st Century" (Ibid., p. 3-2). Regarding the legal framework, a new Law for Regulation of Public Private Partnership (Law 67/2010, thereafter PPP Law) was created and approved by the Cabinet in January 2010 (OECD, 2010, p. 8). The new PPP Law fostered state and private sector cooperation and extended the

involvement of the private companies to other water sectors which was previously limited to the branch of wastewater (Ibid.). In Egypt, the wastewater sector is considerably leading when it comes to PPP deals, i.e. private sector involvement. One of the first investment projects managed and operated by the PPP Unit was the project for the wastewater treatment plant for New Cairo (Ibid., p. 5). There are indicators that PPP projects are perceived attractive to both the private sector and the government. For the private sector, this can be confirmed when considering the interest expressed in tenders such as 'New Cairo' (60 interested parties, 7 qualified, 5 bids) and pre-qualification stages for the initiative '6th of October' entailing 10 qualified projects (OECD, 2010, p. 5).

Clearly, several options exist for negotiating contracts of private sector involvement in which the respective company is liable for the operation and maintenance duties, however, the direct control remains in the hands of the state (EU INECO, 2009, p. 45). On the other hand, a scheme used for major capital investments in Egypt is the BOT-type of contract, referring to the Build, Operate, Transfer arrangements. Essentially, in BOT arrangements "the private sector organization has the responsibility for the design, construction, operation and maintenance and for project funding" (Ibid.) while, public utilities control the fees and set the standards of service. Currently, only one BOT exists in Egypt and although several other related projects are in progress (EU SWIM, 2014, p. 28), there are still reasons to assume that private sector involvement needs to be enabled more in Egypt's policy and legal context. Further measures should be aimed to make the water sector look more attractive to private companies, and one way to do that could be through a viable cost recovery initiative allowing water companies to fully recover the cost for the provision of water and wastewater services and thus, lessen their dependence on state support.

**(3) Coordination and Facilitation**

An institutional framework, in which administrative systems are well-functioning individually, is not sufficient to govern water effectively. A proper institutional system requires solid components just as much as it needs articulating mechanisms to harmonize and match these individual components (GWP, n. d.). Therefore, coordination and facilitation bodies and instruments are necessary to articulate and harmonize the actions and processes initiated by numerous entities on regional, national or international levels (Ibid.).

In Egypt's institutional setting, both horizontal and vertical integration can be observed. Horizontal integration is apparent from the division of water management roles and responsibilities among the different ministries related to the water sector (MWRI, p. 3-2; EU

SWIM, 2014, p. 12). Regarding vertical integration, due to recent measures, including Egypt's National Water Resource Plan, to pursue decentralization and privatization, more and more authorities are involved in water management practices on multiple administrative levels (EU INECO, 2009). To highlight an example from the previous demonstrations, the case of Water Boards and MWRI Districts signals that the Ministry has transferred some of its management responsibilities to lower levels which has enabled local water management (MWRI, p. 5- 35). To facilitate both sectoral and cross-level interactions, it is vital that the different entities work towards a shared vision rather than fulfilling each of their own institutional functions (GWP, n.d.).

One of the main coordination and facilitation instruments are the Inter-Ministerial Committees in Egypt (EU SWIM, p. 20). Given that MWRI is the lead actor in the water sector, most of these Inter-Ministerial Committees are tied to the Ministry's participation such as the Planning Committee for the crops with the Ministry of Agriculture, High Committee for Water, Wastewater Treatment Priorities Committee with MWWU, and several other committees exist for planning state policies and for the implementation of plans and programs (EU SWIM, pp. 12-13). These committees are targeted to improve sectoral coordination among the different water-related ministries, because in Egypt's case "as the mandates and objectives of each ministry are so different that, while one ministry may push for a new approach that would result in sustainable water use, another will often vehemently oppose it" (Bedawy, 2014, p. 118). Therefore, it is important that not only Ministries with direct connection to water but also actors with secondary roles are involved in coordination processes. This could be the case, for instance, with the Ministry of Electricity and Energy and the Ministry of Industry and Foreign Trade which are excluded from most inter-sectoral meetings, even though water is needed for power generation and is also an essential component in industries like cement, ceramics and textiles (Ibid.). Correspondingly, as communicated in Egypt's National Water Resource Plan, it is intended to establish one permanent Inter-Ministerial High Committee for Integrated Water Resource Management encompassing all water-related matters to improve coordination (MWRI, p. 5-39). Arguably, these Inter-Ministerial Committees tend to play a bigger role in facilitating sectoral coordination among the ministries than cross-level interactions. In consideration of the interplay of levels, the creation of the Central Authority for the Drinking Water and Sanitation Sector and Protection of the Consumer is of significance in the provision of drinking water and sanitation services (EU INECO, p. 36). The authority operates as a liaison body between the Government of Egypt, the Holding Company and the public (Ibid.) which makes its role pivotal in connecting both state and non-state actors. In the domain of irrigation,

the Water Boards and Water User Associations can be of similar function as conveyors of local interests and needs to higher authorities (MWRI, p. 5-35). Good governance draws upon the idea that mediating differing interests of groups with the aim to reach consensus on decisions reflects what is in the best interest of society (UNDP cited in Graham et al., p. 8). While acknowledging that coordination and facilitation bodies of similar kind do exist in Egypt, for example the Water User Associations was formed to avoid conflicts among the farmers (MWRI, p. 5-16), it is however not indicated if the orientation of a variety of actors and stakeholders on multi levels with different interests towards shared objectives could be within their reach. Moreover, it can be argued that in light of Egypt's strong centralized management and that water management decisions and governance processes still take place mostly on higher Ministerial levels (EU SWIM, p. 1), the current efforts of decentralization are visibly not sufficient (Bedawy, 2014, p. 118). This can imply that the need and reach of interest orientation and facilitation bodies are relative to the process and the extent of decentralization in Egypt.

Another crucial aspect of coordination and facilitation mechanisms is related to their part in exchanging data and information among the different institutions and stakeholders. As also recognized in Egypt's National Water Resource Plan, "to follow an integrated approach for developing and managing the water resources system it is essential that the different authorities have access to all data and other information on the status of the system and planned developments" (MWRI, p. 5-38). It is further remarked that having one central data and information system for the entire country seems rather unrealistic, thus in Egypt, information and data collection and storage remains in the hands of individual authorities (Ibid., p. 5-39). In Egypt, Ministries and National Organizations such as the Ministry of Health and Population and EWRA have national, centralized databases, while Water Companies such as the Holding Company and Affiliated Companies possess their own decentralized databases (EU SWIM, p. 22). Notably, no local databases exist (Ibid.). Owing to the fact that each authority on multiple administrative levels (central and decentral) own measuring stations network, sampling programs and database, they create their personal management criteria without holding any consultation between the operators (Ibid., p. 28). Consequently, this can result in the multiplication of the databases, the differences in terms of format and geographical dispersion which can pose a challenge to adequate information dissemination among the different institutions and stakeholders (Ibid.). In addition, some of these data can only be accessed within the organizations and not by the public (Ibid.). This is conflicting with one of the good governance principles according to which governmental institutions and processes should be

based on full transparency - the free flow of information - enabling all stakeholders to monitor and understand the outcomes (Graham et al., 2003). Considering that no local database exists and that most of the other, higher-level databases are not available for the public can substantially delimit the engagement of all water stakeholders and make it especially difficult to implement participatory approaches in Egypt. Therefore, effort is needed to improve the compatibility and transparency of databases in order to maximize data and information acquisition and at the same time avoid duplications and optimize costs (EU SWIM, p. 28). Another effective measure can be the development of a national database for water which could ensure the access and coordination of all stakeholders.

**(4) Capacity Building**

Capacity building is an integral part of developing effective water governance structures. It is a twofold process meaning that "(1) it is about understanding the obstacles that prevent the people, the organisations, or any other elements of an institutional framework from fully realizing their development goals; and (2) it is also concerned with finding the applicable mechanisms in overcoming these challenges and ultimately achieving better and more sustainable results" (GWP, n.d.).

In Egypt, capacity building takes place mostly in tangible forms of training, information dissemination and awareness campaigns (MWRI, p. 5-26, p. 5-34) and it can be divided into institutional and society levels. In terms of institutional capacity building, the National Water Research Center (NWRC) can be of great relevance. The NWRC works on a national level to strengthen the research programmes of its affiliated institutes while establishing linkages with Egyptian Universities and other research centers (EU INECO, 2009, p. 31). The institution is also connected to the African Water Resources Network, and it is a member of other international networks established in and outside of Europe, thus it operates on a regional scale too (Ibid.). The NWRC supervises institutes and research centers dealing with various water management issues including the Water Management Research Institute (WMRI) and the Hydraulic Research Institute (HRI) (Ibid., p. 32). These institutions are known for developing and implementing training programmes specialized in various themes for different target groups (Ibid.). For instance, in the case of HRI, the institution delivers specialized training in river hydraulics for infrastructure development and coastal areas (Ibid.). Furthermore, the Egyptian Public Authority for Drainage Projects (EPADP) affiliated to MWRI, has also capacity building mandates as described, the training of personnel on surface and sub-surface drainage projects (Ibid., p. 34). Therefore, it seems that the different authorities involved in

water management and governance are also the ones managing training and other capacity building activities. In Egypt, there are no indications that institutions specialized in capacity building would exist, but rather each institution is responsible for their respective capacity building. However, it is argued that capacity building efforts should be manifold and apart from the strengthening of technical expertise through the training of staff and institutions in charge of water management and implementation plans, information dissemination, education and other training programs with respect to the public should also be prioritized (EU SWIM, pp. 29-30). Capacity building on society level is currently undeveloped (Ibid.), efforts of this kind are limited to awareness campaigns and information dissemination in Egypt. In the strategy of Egypt's National Water Resources Plan, public awareness was presented to be "a component of the activities needed to reach certain policy goals" (NWRI, p. 6-26). As well as, it is also mentioned that public awareness and information dissemination have a huge effect on the success of governmental measures as they are dependent on their social acceptance (Ibid.). Public awareness campaigns are directed at affecting the daily behavior of people in relation to efficient water use and water quality preservation. These campaigns promote the consumption of clean products by drawing attention to the environmental impacts certain products have on water quality (MWRI, p. 5-26). Given that information and awareness campaigns on water quality are closely related to the environment, one of the institutions which plays an essential role in the planning and implementation of such activities is the Ministry of State for Environmental Affairs (EEAA) (EU SWIM, p. 13).

Local NGOs in Egypt do not participate actively in water management alone, their interventions are more apparent in projects of impact studies submitted to EEAA (EU SWIM, p. 26). However, it is crucial to highlight the importance of international donors and NGOs in capacity building activities aimed at reforming the water sector. Several investment projects and cooperation programmes have been implemented in Egypt in cooperation with international donors and agencies including the USAID, KfW, EU, EIB, AfD, JICA, ADB, Swiss, Italian, Spanish development cooperation agencies, etc. (Ibid., p. 17). Notably, most of these foreign investment projects are oriented on strengthening Egypt's institutional framework and capacity building (Ibid.). For instance, in cooperation with the UNDP, the MWRI concluded the Integrated Management for Coastal Resources training program aimed at strengthening Governmental personnel capacity at Northern Egyptian governorates (UNDP, 2020). As part of the training programme, workshops were held to local administration and government branches as part of the "Enhancing Climate Change Adaptation in the North Coast of Egypt" project (Ibid.). Another example can be the campaigns carried out with the assistance

of The Micro, Small and Medium Enterprise Development Agency (MSMEDA) who signed contracts with four local NGOs in Assiut and Sharqeya governorates to educate the Egyptian youth about environmental and health issues (MENAFN, 2020).

Certainly, capacity building activities are present in Egypt both on institutional and societal level as presented above and they are either carried out by national institutions or in cooperation with international donors and NGOs. It can be argued that national NGOs are weak alone (EU SWIM, p. 26), therefore, their involvement in information and awareness campaigns relies on their strategic partnerships with international funding agencies. As prescribed in the theory, capacity building is a form of knowledge generation and an effective way to foster the active participation of the general public in water management (Xie, 2006, pp. 7-8). Further to that, in order to achieve long lasting development in the sector, it should be a continuous progress not a one-time intervention (Ibid). Since Egypt is the place of intervention for numerous investment projects and cooperation programmes funded by international organizations, it would make sense to strengthen national efforts targeted at long-term information dissemination, awareness campaigns, education and training programs in respect to water use and water quality preservation.

# Conclusion

This Thesis has had the objective to analyze the actions of the Government of Egypt in the domain of water and identify the factors that influence its water governance system. Another purpose of this research is to provide propositions with regards to improving the effectiveness of Egypt's water governance system. To find answers, a thorough analysis was conducted on Egypt's enabling environment (inclusive of policies, laws, financial incentives) and institutional arrangements with the application of the Global Water Partnership's IWRM framework. Furthermore, a theoretical framework was established on Resource Governance Theory (Graham et al., 2003), Good Governance (Rogers & Hall, 2013), Global Governance (Zürn, 2018; Pahl-Wostl et al., 2008), Effective Water Governance (Hamdy & Choukr-Allah, 2012) and Water Management (Xie, 2006).

To sum up the major findings, policies have a crucial role in affecting water governance practices in Egypt. The analysis showed that the Government of Egypt used to solve the issue of water scarcity by extending the country's resource base, instead of focusing on measures aimed at reducing water demand and more efficient, sustainable and effective management

practices. However, Egypt's recent policy attempt, the Nation Water Resource Plan (NWRP) has served as a milestone because for the first time a policy was formulated with the intention to guide all water-related sectors and stakeholders to improve water governance and management through measures of integration and decentralization while taking into account economic, social and environmental aspects. The NWRP laid out an effective participatory approach for Egypt's water governance which requires cooperation among the sectors and administrative levels and is based on a human rights perspective to lessen socio-economic inequalities. On the other hand, it was found that, regardless of the fact that effective water policies exist in paper that alone does not translate into actions.

A strong and coherent legal framework is also needed to enable policy implementation. Egyptian legislation in the domain of water is not very integrated as seen in the case of Law 4 on Environment and Law 48 on the Protection of Nile and Waterways from Pollution, their coexistence but division poses issues to the involvement of agencies in water quality management. Furthermore, water laws are very rigid and obsolete in Egypt. It was argued that these laws are based on visions that were popular in the 1960s and 1970s, hence, they fail to provide sufficient legal grounds for water resource management in a situation of change and disturbance, such as in the current period of water scarcity. Therefore, to improve water governance, Egypt needs to update its legal framework and ensure that it includes laws which are coherent and clearly define water use rights of all stakeholders.

It was further identified that financial sustainability and shortcomings on the revenue side pose a significant challenge to implement the actions of water governance regimes. This originates from two reasons, first that in Egypt, the Government finances all the national plans and programs through the State Budget and second, the levels of full cost recovery are low because water user charges in Egypt do not cover the actual costs. This latter also affects the private sector involvement negatively as low cash-flows can reduce the interest of private companies to engage in the water sector which is otherwise considered essential to effective water governance. Consequently, the optimization of water user fees and the introduction of a viable cost recovery initiative was proposed as a possible solution to Egypt's financial difficulties.

The analysis further revealed that Egypt's institutional framework is highly centralized and sectorized because water governance processes predominantly occur on national level regardless of the fact that the country has partially opened up to decentralization. Considering the mode of governance Egypt represent, formal institutions dominate water governance processes, and the contribution of non-state and informal actors is very limited. The MWRI is

the primary actor which has influence in all aspects of water management, additional key actors include other Ministries related to water who were assigned some management responsibilities. This denotes horizontal integration however, effective water governance also entails vertical integration so that institutions on lower administrative levels also participate in water decisions. Evidence was found that Egypt is slowly moving towards a more distributed and vertically integrated water governance approach, which was visible in the distribution of some of the roles to authorities that operate on decentral level. For instance, with the establishment of MWRI Districts local management was enabled which is said to be an effective way of knowledge generation.

In conclusion, considering that Egypt' water governance system is largely influenced by the mode of governance (if that is centralized or decentralized), the kind of state and non-state actors involved and their cross-level interactions, more decentralized measures can have the potential to increase effectiveness. It is due to the fact that assigning roles and task to water stakeholders implies a more integrated and polycentric system associated with many benefits. For instance, polycentric systems have the prominent ability to remain intact and adapt easily in events of disturbances. Correspondingly, the role of private actors and informal institutions need to be acknowledged and their engagement facilitated to fully realize a participatory approach in Egypt. Finally, it is crucial that all the institutions involved share a vision rather than fulfilling each of their own institutional functions, thus coordination mechanism such as information sharing forums and facilitation bodies, committees could improve the effectiveness of water governance in Egypt.

# References

Allam, M. N & Allam, G. I. (2007). Water Resources In Egypt: Future Challeges and Opportunities. *Water International*, 32(2), 205-218. DOI: 10.1080/02508060708692201

Andelman, D. A., & Pauker, B. (2010). *Water Wars? A Talk with Ismail Serageldin*. World Policy Journal.

Asempa. (2010). *The Battle of the Nile, North-East Africa*. Africa Confidential, 51 (17), 6-8.

Bedawy, R. (2014). Water Resources Management: Alarming Crisis for Egypt. *Journal of Management and Sustainability*. 4 (3), 108-124. DOI: 10.5539/jms.v4n3p108

Biswas, A. K. (2004). *Integrated Water Resources Management: A Reassessment, Water International*, 29(2), 248-256. DOI: 10.1080/02508060408691775

Bithas K., Stofors C. (2006). Estimating urban residential water demand determinants and forecasting water demand for Athens metropolitan area, 2000-2010. *South-Eastern Europe Journal of Economics* 1, 47–59. Retrieved from http://www.asecu.gr/Seeje/issue06/bithas.pdf

Blühdorn, I., & Deflorian, M. (2019). The Collaborative Management of Sustained Unsustainability: On the Performance of Participatory Forms of Environmental Governance. *Sustainability*, *11*(4), 1189. MDPI AG. DOI: 10.3390/su11041189

Borowski, I., Le Bourhis, J., Pahl-Wostl, C., Barraque, B. (2008). Spatial misfit in participatory river basin management: effects on social learning a comparative analysis of German and French case studies. Ecology and Society 13(1), 7. DOI: 10.5751/ES-02341-130107

Brandes, O. M. & Brooks, D. B. (2007). *The Soft Path for water in a nutshell*. University of Victoria: A joint publication of Friends of the Earth Canada, Ottawa, and the POLIS Project on Ecological Governance.

Chaffin, B. C., Gosnell, H., & Cosens, B. A. (2014). A decade of adaptive governance scholarship: synthesis and future directions. *Ecology and Society* 19(3), 56. DOI: 10.5751/ES-06824-190356

Dedeurwaerdere, T., (2005). The contribution of network Governance to Sustainable Development. Les se´minaires de l'IDDRI, no.13, 15.

Edalat, F.D., Abdi M.R. (2018). Concepts and Approaches of Main Water Managements. In: *Adaptive Water Management. International Series in Operations Research & Management Science*, (Vol. 258, pp. 11- 19). Springer, Cham. DOI: 10.1007/978-3-319-64143-0_2

Elsaeed G. (2012). Effects of Climate Change on Egypt's Water Supply. In: Fernando H., Klaić Z., McCulley J. (Eds.), *National Security and Human Health Implications of Climate Change. NATO Science for Peace and Security Series C: Environmental Security* (pp. 333-347). Springer, Dordrecht. DOI:10.1007/978-94-007-2430-3_30

EU INECO (2009). *Institutional framework and decision-making practices for water management in Egypt: Towards the development of a strategy for water pollution prevention and control in the Bahr Basandeila region.* Retrieved from http://environ.chemeng.ntua.gr/ineco/UserFiles/File/Deliverables/Publishable%20Report%20-%20Egypt.pdf

EU Sustainable Water Integrated Management (SWIM) (2014). Review and Analysis of Status of Implementation of Wastewater Strategies and/or Action Plans. Retrieved from http://www.swim-sustain-water.net/fileadmin/resources/EG_NATIONAL_RAPPORT_.pdf

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of social-ecological systems. *Annual Review of Environmental Resources*, 30, 441–473.

Graham, J., Amos, B., & Plumptre, T. (2003). *Governance Principles for Protected Areas in the 21st Century.* Prepared for the Fifth World Parks Congress, Durban South Africa In Collaboration with Parks Canada and Canadian International Development Agency. Institute on Governance. Retrieved from https://www.files.ethz.ch/isn/122197/pa_governance2.pdf

GWP (2002, April). *Introducing Effective Water Governance*. Global Water Partnership. Mimeo.

GWP (n. d.). *IWRM ToolBox*. Global Water Partnership. Retrieved May, 27 2021 from gwp.org

Hamdy A., Choukr-Allah R. (2012). Effective Water Governance and How to Achieve. In: Choukr-Allah R., Ragab R., Rodriguez-Clemente R. (Eds.), *Integrated Water Resources Management in the Mediterranean Region*. Springer, Dordrecht.
DOI: 10.1007/978-94-007-4756-2_15

Holton, R.J., (1998). *Globalization and the Nation-State*. Basingstoke, UK: Palgrave.

Jiménez, A., Saikia, P., Giné, R., Avello, P., Leten, J., Liss Lymer, B., Schneider, K. (2020). Unpacking Water Governance: A Framework for Practitioners. *Water*, *12*(3), 827. MDPI AG. DOI: 10.3390/w12030827

Kenton W. (2021, May 19). *Corruption Perceptions Index (CPI)*. Investopedia.
Retrieved May 27, 2021 from https://www.investopedia.com/terms/c/corruption-perception-index.asp

Martínez-Espiñeira R, García-Valiñas M.A. & Nauges, C. (2014). Households' pro-environmental habits and investments in water and energy consumption: determinants and relationships. *Journal of Environmental Management*, 133,174–183.

MENAFN. (2020, March 11). *Egypt- MSMEDA, NGOs to launch environmental, health awareness campaigns.* Middle East North Africa Financial Network. Retrieved May 25, 2021 from https://menafn.com/1101065607/Egypt-MSMEDA-NGOs-to-launch-environmental-health-awareness-campaigns

Mohamed AG, M., AM, E., MS, S. (2013). Current Situation of Water Pollution and its Effects on Aquatic Life in Egypt. *Egyptian Journal of Occupational Medicine,* 37(1), 95-115. DOI: 10.21608/ejom.2013.775

Mumssen, Y. U. & Triche, T. (Eds.). (2017). *Status of Water Sector Regulation in the Middle East and North Arica*. World Bank Group. Retrieved from https://documents1.worldbank.org/curated/en/415861498577162057/pdf/116883-WP-P145807-PUBLIC.pdf

MWRI (2005). *National Water Resources Plan 2017* Arab Republic of Egypt. The Ministry of Water Resources and Irrigation.
Retrieved from http://extwprlegs1.fao.org/docs/pdf/egy147082.pdf

Newig, J., Pahl-Wostl, C., & Sigel, K., (2005). The role of public participation in managing uncertainty in the implementation of the water framework directive. *European Environment*, 15, 333–343.

OECD (2009). *Good governance for development in Arab countries initiative water governance.* Regional Conference Background Note, Tunis, Tunisia, 8–9 July 2009
Retrieved from https://www.oecd.org/mena/governance/43316591.pdf

OECD (2010, August). Mediterranean Component of the EU Water Initiative Egypt. Country Dialogue on Water. *Framework Conditions for Private Sector Participation in Water Infrastructure in Egypt*.
Retrieved from: https://www.oecd.org/daf/inv/investmentfordevelopment/47360935.pdf

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*, 19 (3), 354–365. DOI: 10.1016/j.gloenvcha.2009.06.001

Pahl-Wostl, C., Kabat, P., & Möltgen, J. (Eds.). (2007). *Adaptive and integrated water management*. Springer Verlag. DOI: 10.1007/978-3-540-75941-6

Pahl-Wostl, C., Tabara, D., Bouwen, R., Craps, M., Dewulf, A., Mostert, E., de Ridder, D., & Taillieu, T. (2008). The importance of social learning and culture for sustainable water management. Ecological Economics, 64(3), 484-495. DOI: 10.1016/j.ecolecon.2007.08.007

Pahl-Wostl, C., Yoyeeta, G. & Petry D. (2008). Governance and the Global Water System: A Theoretical Exploration. *Global Governance*, 14(4), 419-435. DOI: 10.2307/27800722

PAI (2011). *Why population matters to water resources*. Population Action International. Retrieved from https://pai.org/wp-content/uploads/2012/04/PAI-1293-WATER-4PG.pdf

Punch, K. F (2014). *Introduction to Social Research: Quantitative & Qualitative Approaches*. London: SAGE Publications Ltd.

Rhodes, R.A.W. (1997). *Understanding Governance: Policy Networks, Reflexivity and Accountability*. Buckingham: Open University Press.

Rogers, P. & Hall, A., W. (2003). *Effective Water Governance*. Global Water Partnership Technical Committee, The Background Papers, 7, 4-45.

Sadek, G. (2013, October). Legislation on Use of Water in Agriculture: Egypt. Library of Congress. Retrieved May 27, 2021 from https://www.loc.gov/law/help/water-law/egypt.php#_ftnref2

Sanchez-Plaza, A., Broekman, A., & Paneque, P. (2019). Analytical Framework to Assess the Incorporation of Climate Change Adaptation in Water Management: Application to the Tordera River Basin Adaptation Plan. *Sustainability*, *11*(3), 762. MDPI AG. DOI:10.3390/su11030762

Schacter, M. (2000). *When Accountability Fails: A Framework for Diagnosis and Action*, Policy Brief No.9. Institute on Governance. Retrieved from https://www.files.ethz.ch/isn/103085/policybrief9.pdf

Scott, R.W. (2001). *Institutions and Organizations* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Swain, A. (2008). Mission Not Yet Accomplished: Managing Water Resources in the Nile River Basin. *Journal of International Affairs*, 61(2), 201.

Tayie M.S., Negm A. (2018). Administrative Context and the Legal Framework Governing Water Resources and Agriculture in Egypt. In: Negm A.M. (Ed.), *Conventional Water Resources and Agriculture in Egypt. The Handbook of Environmental Chemistry*, (Vol. 74, pp. 101-124). Springer, Cham. DOI: 10.1007/698_2017_206

The Ministry of Water Resources and Irrigation (n. d.). Retrieved May, 27 2021 from mwri.gov.eg

Thompson, G., Frances, J., Levacic, R., Mitchell, J. (Eds.). (1991). *Markets, Hierarchies and Networks: The Co-ordination of Social Life*. London, UK: Sage Publishers.

UN (n. d.). Sustainable Development Goal 6 on water and sanitation (SDG 6). United Nations. Retrieved May, 26 2021 from sdg6data.org

UN (2018). *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation*. United Nations. Retrieved May, 27 2021 from https://www.unwater.org/publications/sdg-6-synthesis-report-2018-on-water-and-sanitation/

UN (2021). *The United Nations World Development Report 2021: Valuing Water*. UN Water. Retrieved May, 27 2021 from https://www.unwater.org/publications/un-world-water-development-report-2021/

UNESCAP (2009). *What is good governance?* United Nations Economic and Social Commission for Asia and the Pacific. Retrieved from https://www.unescap.org/sites/default/files/good-governance.pdf

UNESCO (2020). *The United Nations World Water Development Report 2020:* Water and Climate Change World Water Assessment Programme. Retrieved from https://www.unwater.org/publications/world-water-development-report-2020/

UNESCO WWAP (World Water Assessment Programme) (2019). *The United Nations World Water Development Report 2019: Leaving No One Behind*. Paris, UNESCO.

UNDP (2020, October 28). *The Ministry of Water Resources and Irrigation and UNDP conclude the Integrated Management for Coastal Resources training program.* Retrieved May 27,2021 from https://www.eg.undp.org/content/egypt/en/home/presscenter/pressreleases/2020/the-ministry-of-water-resources-and-irrigation-and-undp-conclude.html

USAID (n.d.). *What is Integrated Water Resources Management?* United States Agency for International Development Retrieved from http://www.usaid.gov/our_work/environment/water/what_is_iwrm.html

WHO (2019, June 18). *1 in 3 people globally do not have access to safe drinking water-UNICEF, WHO*. Retrieved May 26, 2021 from https://www.who.int/news/item/18-06-2019-1-in-3-people-globally-do-not-have-access-to-safe-drinking-water-unicef-who

Xie, M. (2006). *Integrated water resources management (IWRM)– Introduction to Principles and Practices.* New York: World Bank Institute.

Zürn, M. (2018). *A Theory of Global Governance: Authority, Legitimacy, and Contestation*. Oxford.