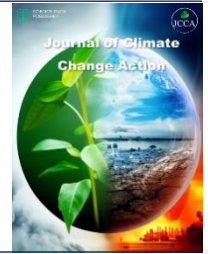


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A Framework for Assessing Institutional Capacities for Climate Change Adaptation

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Abstract

Climate change is a worldwide profound phenomenon that is expected to continue, especially with ever-increasing GHG emissions. Developing countries are particularly exposed and vulnerable to cross-cutting climate change impacts, making them vulnerable. Such vulnerability is aggravated by their low adaptive capacity, due to high competition for financial and natural resources required for development efforts and their limited institutional capacities. Such institutional capacities are essential for developing and implementing successful adaptation strategies. Assessing such capacities is crucial for identifying opportunities for improvements, through the detection of weaknesses and strengths. This paper aims to propose an integrated framework for assessing institutional capacities for climate change adaptation. For this purpose, the paper begins by reviewing existing literature on institutional capacities approaches, followed by proposing an integrated framework for capacity assessment for climate change adaptation. The proposed framework is then validated in the case of Egypt, which is followed by a conclusion and recommendations. The proposed framework consists of three pillars: governance, mainstreaming adaptation, and capacity strengthening as well as their specific criteria and indicators. The suggested framework application on climate change institutions in Egypt suggested that, despite the existence of a formal institutional structure for climate change in Egypt, with limited capacities and financial resources. Additionally, it is not inclusive and has a low level of accountability and transparency.

Keywords: Climate change, adaptation, institutional capacities, assessment framework, Egypt

1. Introduction

Climate change adaptation is essential to deal with inevitable climate change impacts that are varied, cross-cutting, and sometimes irreversible, particularly under limited inefficiency of mitigation efforts to reduce GHGs [1, 2]. This consequently, promoted the development of innovative climate change adaptation strategies in recent years, including for example, natural and ecosystem-based solutions, managing

retreat and relocation, insurance and financing programs and community engagement and education.

Nevertheless, climate change adaptation faces several challenges including uncertainty about the magnitude and trends of impacts at both spatial and temporal scales, and sometimes lack of accurate and detailed data on vulnerability to associated risks and potential adaptation options. There is also the lack of institutional capacities that support that may hinder climate change development and implementation of adaptation strategies [3-5].

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Institutional capacities

The term “institution” is debatable among different disciplines and even within the same discipline [6, 7]. For example, in economics institutions refer to rules, enforcement mechanisms, and organizations supporting certain objectives such as market transactions [8]. Meanwhile, in humanities, institutions may refer to systems of established and prevalent social rules that structure social interactions [6].

In decision and policy making, institutions may be defined as “systems of rules, decision-making procedures, and programs that give rise to practices, assign roles to the participants in these practices, and guide interactions among the key players” [9]. This definition highlights the main components of institutions including a set of actors playing their roles in an interactive way through particular mechanisms and procedures within existing rules and regulatory framework. Additionally, institutions include both formal and informal rules, the former includes tangible procedures, conventions, laws, and strategies, while the latter refers to beliefs, cultures, and knowledge that support formal rules [10].

It can be argued that dealing with institutions needs to have a holistic perspective as it represents a system that integrates different actors interacting together [11]. Also, institutions have a contextual nature, which requires getting insight into the context, within which each institution exists and performs [7]. Institutions, further, have common functions including controlling efforts, minimizing conflicts that may exist between different actors, and assisting in the planning for and implementing strategies for attaining common goals [6, 12].

In the climate change arena, institutional capacity can be defined as the ability of institutions to mobilize existing resources to address climate change-related issues [13]. Institutional capacity can play an important role in planning for and implementing climate change adaptation by promoting proper participation and facilitating interaction between research and policy-making cycles to support an informed decision-making process [14-16]. Such a crucial for institutional capacities in the climate change

arena highlights the importance of institutional capacity assessment to identify opportunities and capacity gaps that help in effective adaptation strategies [3]. However, the assessment of institutional capacity is challenging due to the complicated nature of institutions and the nature of adaptation, which involves a variety of impacts, sectors, actors, regions, and levels [3].

Still, there have been several attempts to assess institutional capacities for climate change adaptation. For example, in the health and water sector, Dany et al. [17] proposed several criteria such as financial resources, coordination between stakeholders, availability and quality of information on vulnerability and adaptation, and awareness level of stakeholders to assess such capacities [13]. Meanwhile, in the agriculture sector, Kalas (2018) proposed a methodology for assessing institutional capacities at three levels: the individual, organizational and the context (or what is known as the enabling-environment) [18]. The study emphasized the importance of participation in assessing and enhancing institutional capacity.

Ruiz-Luna et al., (2021) focusing on institutional capacities concerning extreme rainfall events, suggested that coordination and cooperation among various stakeholders and the effectiveness of the legal framework and the mechanisms for participation in the decision-making process are essential criteria for assessing such capacity [19]. Another attempt by Milman et al., (2013) employed a set of criteria for assessing institutional capacities for climate change including agreements and commitment for climate change, transparency and accountability, and communications between actors [20].

It can be argued that these studies, in their attempts to assess institutional capacities, focused on different sets of criteria reflecting specific dimensions of such capacities. Despite providing some insight into institutional capacities, they lacked a comprehensive perspective that reflects the multidimensional and diverse nature of such capacities. This led Gupta et al. (2010) to propose a general assessment tool “Adaptive Capacity Wheel” (ACW) which has six dependent dimensions including

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multidimensionality of levels, actors, and sectors, considering diverse solutions of problems (variety), learning capacity to promote M&E system, learning from experience dealing with uncertainty, and ability of institutions to respond to environmental change and generate resources as well as supporting leadership within governance system [9].

Despite that the ACW provided a list of twenty-one criteria to assess such dimensions, its application faced some critique, for example, the wheel includes some terms that may be misleading in different contexts such as legitimacy and authority, single and double loop learning. Also, the wheel despite providing several dimensions and criteria did not suggest specific indicators for assessment [3, 9].

Generally, it can be argued that whatever the perspective and/or scope of the assessment framework, it should be holistic; considering all aspects of institutional capacities, generic; can be applied in different contexts, and has specific criteria and indicators to be employed. Also, these criteria should reflect varied functions of institutional capacities for climate change adaptation.

Accordingly, the paper in hand intends to propose a framework for assessing institutional capacities for climate change adaptation with application to the case of Egypt. For this purpose, various aspects, criteria, and indicators for assessing such capacities in the climate change arena are discussed. This is followed by applying the proposed framework in the case of Egypt and then the conclusion and recommendations.

2. A framework for assessing institutional capacity

It is typically argued that the involvement of various stakeholders, at both horizontal and vertical levels, in all processes of the adaptation planning stages should not only be inclusive and collaborative but also promote shared leadership [21] This is essential as it is expected that conflict of interests entails a high level of coordination, for instance, the institutional structure for climate change in Canada involved all actors at both

sectoral and governance levels for policy implementation [22, 23]. Also, the diversity of stakeholders and their conflicting interests requires leadership to facilitate coordination efforts. Such leadership can be attained by assigning an active player to lead. For this purpose, the Ministry of Environment was assigned to lead the planning and implementation of climate change policies in many countries [22, 24, 25].

Effective participation of different stakeholders may require a high level of responsibility and accountability [26, 27], which led many countries have articulate pre-defined roles of different stakeholders and develop a monitoring and evaluation system (M&E) [18]. For instance, South Africa and the Netherlands have identified the responsibilities of different stakeholders at an early stage of developing their adaptation strategy [28, 29]. Concerning accountability, The Netherlands, Colombia, and South Africa, meanwhile, employed M&E systems to identify the progress of adaptation strategy implementation and set certain standards for different stakeholders [27-28, 30-31]. Accountability can, meanwhile, be supported by transparency through providing clear mechanisms for enforcing rules to exchange adequate, updated, and accurate information in an accessible and readable format [15, 32]. In this respect, transparency can play a significant role in combating corruption and promoting accountability, which is essential for fostering interaction among different stakeholders and increasing trust between them [26, 27, 33].

The development of adaptation strategies is a knowledge-based process that requires supporting capacities of research institutions and initializing efficient and effective communication channels to assist in investing in human resources [13, 18]. For example, India, South Africa, and Canada improved communications between scientific organizations and decision-makers to exchange knowledge [22, 24, 28]. Furthermore, developing adaptation strategies requires resource mobilization including human, financial, and technological resources, to create an enabling environment [34, 35].

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Furthermore, adaptation to climate change, due to its dynamic, uncertain, and long-term nature, requires a certain level of flexibility that can facilitate responding to changing circumstances over time [36, 37], for which an evolving institutional structure and capacities [24]. Additionally, effective adaptation strategies require a framework for mainstreaming and integrating adaptation measures into existing development plans [38, 39]. For instance, Canada, Colombia, and The Netherlands integrated climate change into the planning process for risk

management, sustainable development efforts, and sectoral plans [29, 40, 41].

It can be argued that, based on the above-mentioned various aspects related to institutional capacities in the climate change adaptation arena, such capacities can be assessed using a variety of aspects that can be grouped into three key pillars: good governance, mainstreaming, and strengthening capacity, discussed in the remaining part of this section (Figure 1).

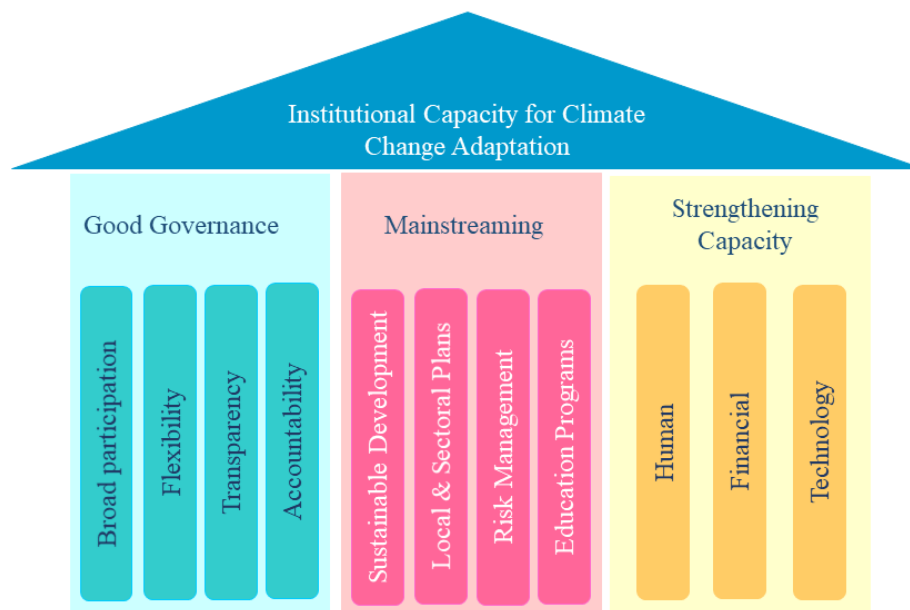


Figure 1. Framework for assessing institutional capacity for climate change adaptation.

2.1. Good governance

Good governance in the climate change arena can be reflected in several aspects including broad participation, flexibility, transparency, and accountability of the decision-making process [5]. For broad participation to be effective and sustainable, stakeholders should have adequate skills, knowledge, and experiences to support decision-making [42, 43]. Four criteria may be utilized to assess broad participation, including inclusiveness, effective communication channels, influence, and stakeholders' capacity [21]. Inclusiveness implies equal opportunities for all stakeholders to participate in policy and strategy making [21], while effective communication

channels refer to formal and informal ways to facilitate discussion between stakeholders to ensure clear and accessible information, transparent policies, and informed decision-making. Meanwhile, influence can be reflected in the degree, to which stakeholders' interests are considered an integral part of decision-making, stakeholders' capacity means improved skills and knowledge of all stakeholders to facilitate their participation effectively.

Institutional flexibility reflects the ability of the institutional system to generate alternative objectives, rules, and measures for addressing potential impacts [44]. Accordingly, the existence of early warning systems as well as monitoring and evaluation

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system and revising plans frequently can be used as indicators to assess such institutional flexibility.

Transparency may combat corruption and promote accountability thus improving governance [33], and thus is subtly intertwined with accountability [45]. Transparency infers clear mechanisms for enforcing rules [15]. Several indicators can be employed to assess transparency, such as general access to information and the existence of plans to deal with requests for information and communications in accessible formats [46, 47]. Also, the presence of effective communication strategies to facilitate participation can be used as an indicator to measure the effectiveness of channels for communication.

It is worth mentioning that different aspects of good governance in the climate change arena are highly interrelated and should be considered in a holistic approach. For example, the broad participation of different actors at different levels can be supported by system flexibility and transparency [9, 26, 44, 48]. Meanwhile, transparency and accountability cannot be effective separately [27].

2.2. Mainstreaming adaptation

It is worth noting that mainstreaming adaptation in development plans can indirectly support institutional capacities through resource conservation that are already limited and improve knowledge and expertise. Additionally, climate change adaptation actions may contradict certain aspects of development plans, particularly those addressing current needs and issues [39]. Accordingly, the second pillar of the suggested assessment framework is mainstreaming climate change adaptation in local, sectoral, and national development plans, including risk management and education programs [29, 49]. Mainstreaming adaptation into local and sectoral development plans may contribute towards meeting immediate needs, while managing climate change impacts under specific conditions and certain resources [50]. Mainstreaming climate change adaptation, especially in educational programs is essential for raising awareness, developing skills, and increasing information

of communities' individuals thus improving resilience to climate change [51].

2.3. Strengthening capacities

Strengthening capacities for climate change adaptation is essential for the development and implementation of adaptation strategies effectively. such capacities may include knowledge, tools, scientific expertise, and political know-how to address climate change [52]. Institutional capacities can be manifested in three main aspects: human, technological, and financial. Human aspects are reflected in the availability of experts, skilled individuals, and high-quality information to identify needs and appropriate adaptation options [34]. Such capacities can be enhanced through capacity building and training activities and involving research institutions in policy and strategy making.

Supporting the policy-making process and facilitating implementation measures require also the availability of sufficient financial resources [35]. For this purpose, the institutional structure, in many countries, has a separate unit seeking to provide necessary financial resources. For instance, India established a Climate Change Finance Unit within the Ministry of Finance to focus on the international climate finance context and increase India's domestic capacity to develop projects [24].

Furthermore, effective adaptation policies require tools and technologies to provide different stakeholders with a good understanding of risks, identify proper adaptation options, undertake vulnerability assessment, and review policies and implementation processes [35]. These technologies may include particularly in the case of extreme weather events - early warning systems, prediction systems, and monitoring and evaluation systems.

It may be concluded accordingly that in assessing institutional capacities for climate change adaptation, a holistic and generic framework can be suggested integrating nine criteria and twenty-five indicators (Table 1).

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Table 1. Institutional capacities pillars and their aspects, criteria, and indicators.

Pillar	Aspects	Criteria	Indicators
Good governance	Broad participation	Inclusive	Mapping stakeholders at vertical and horizontal levels
			Existence criteria for determining stakeholders
		Influence	Contribution of stakeholders in the decision-making process
			Communication
		Capacity for participation	Number of capacity building activities
			Availability of experts
	Flexibility	Ability to deal with uncertainty and changing circumstances	Existence of M/E system
			Existence of an early warning system
			Frequency of reviewing plans and policies
			Existence of a prediction system
	Transparency	Availability of information	Access to internet
			Public access to information
	Accountability	Clear Mechanism for implementation	Existence of a legal framework
			Existence of M&E system
Mainstreaming	Sustainable development	Integrated adaptation into plans & programs	Climate proofing of development projects
	Local & sectoral plans		Considering adaptation into sectoral plans
	Risk management		Considering adaptation as a part of risk management
	Education Programs		Existence of adaptation in education programs
Strengthening capacity	Human	Availability of different resources	Number of capacity building activities
			Impact of research on policy
			Needs assessment for capacity building
	Financial		Number of experts in different sectors
			Financial resources allocated for capacity building
			Existence of downscaled scenarios
Technology	Existence of a prediction system		

3. Methodology for applying the suggested framework

To validate the proposed assessment framework, it is applied to assess institutional capacities for climate change

adaptation in Egypt. As a result of the contextual nature of the adaptation process, a four-step methodology is developed including characterizing case studies, collecting data, screening indicators, and analyzing and interpreting the data (Figure 2).

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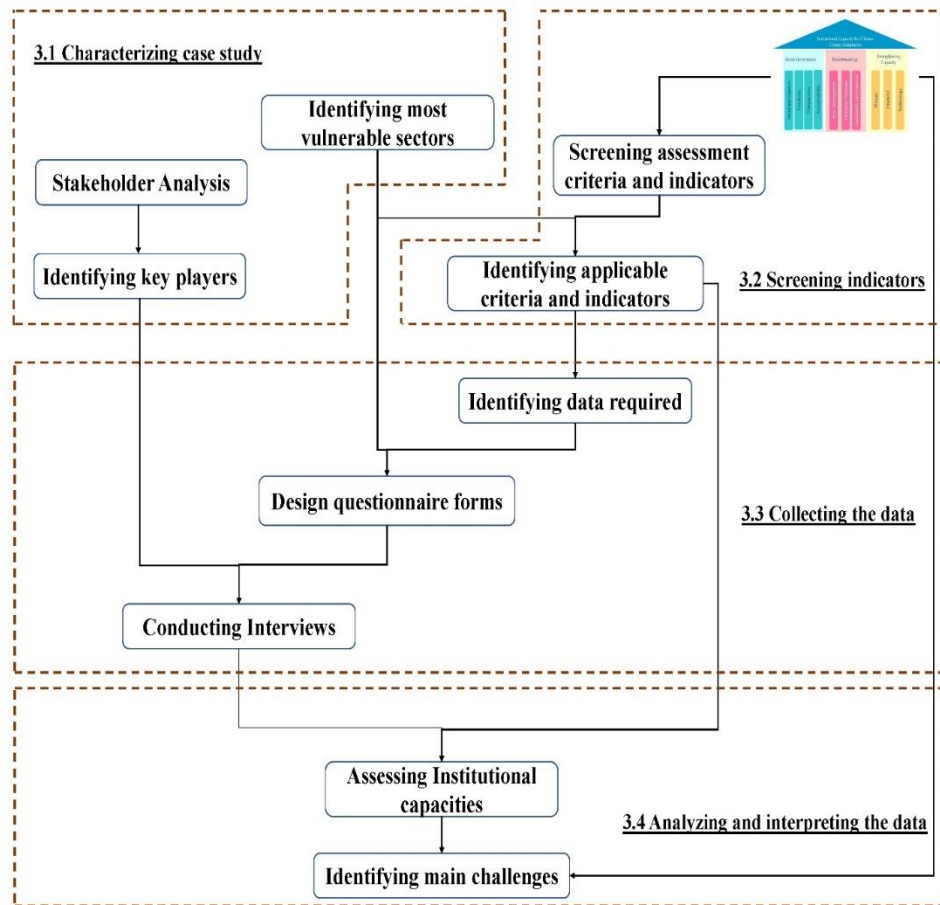


Figure 2. Methodology for validating the suggested assessment framework.

The case of Egypt: The characterization of the case of Egypt considers general geographical setting as well as socio-economic and demographic conditions to identify areas of impact and the most vulnerable sectors and/or groups. Also, a stakeholder analysis is undertaken and a reciprocal matrix is generated [53, 54]. Finally, the weight of each factor was estimated by averaging across the rows [54-56], with the consistency of the estimated weights evaluated through the Consistency Index (CI) [55].

Screening indicators: As the proposed assessment framework was intended to be generic, the framework suggested a wide range of criteria and associated indicators, these criteria have to be screened based on the preliminary characterization and situation analysis as performed above. As a result of the

screening process, the most applicable indicators, and a short list of most relevant indicators in the case of Egypt are developed.

Collecting data: This step involves collecting data on the various indicators through a series of semi-structured interviews, to ensure seriousness and a high rate of response, with stakeholders' representatives [57, 58]. For this purpose, tailored questionnaire forms discussing existing capacities, and the interest of players in climate change and their interrelationship with key stakeholders, the policy and decision-making mechanism, and the main issues and challenges facing each player. The Interviews were undertaken during the period 1/1–22/2/2020 with different key players in different sectors.

Analyzing and interpreting the data: This step involves analyzing and utilizing the data collected from different

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stakeholders' representatives through interviews to assess existing institutional capacities for climate change adaptation in Egypt.

4. Results and discussion

Potential impacts include but are not limited to, a decline in crop productivity, inundation of some areas in the northern parts of the Nile Delta, alteration ecosystems of the Northern Egyptian lakes, reduction in the Nile flow, and increasing mortality and morbidity, communicable disease, and heat strokes and bleaching coral reefs in the Red Sea area [59-74].

This means that climate change is projected to have varied, cross-cutting, and significant impacts on almost all sectors in Egypt. This, consequently, requires a precautionary approach to deal with climate change and associated risks through planning for an effective integrated adaptation strategy. Various stakeholders were mapped according to their power and interest identified through AHP. The calculated consistency index (CI) of estimated power and interest were about 9.45 % and 9.66 %, respectively. This means satisfactory consistency levels of the estimated interest and power as it did not exceed the 10% level. It is revealed that the main actors of climate change adaptation in Egypt can be classified into four categories (Figure 3).

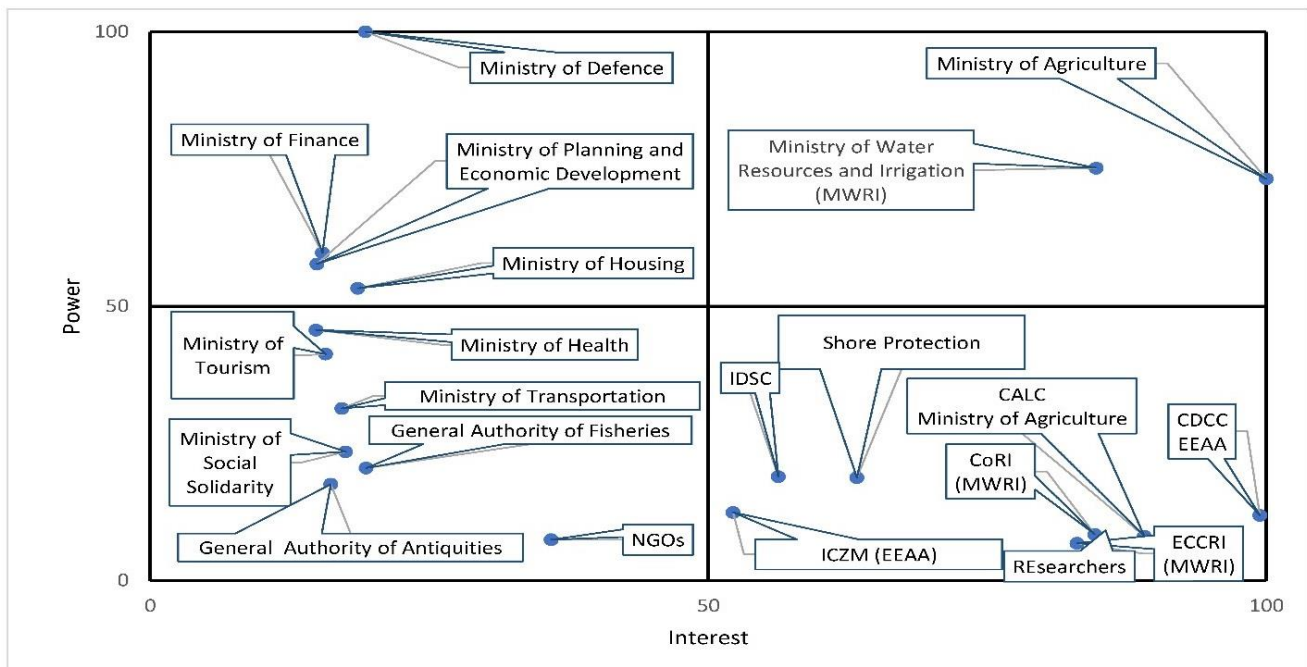


Figure 3. Stakeholders' matrix.

Thereafter, the most applicable indicators in the case of Egypt were identified (Table 2). Applying these indicators revealed that the institutional structure for climate change in Egypt, which is represented by the National Committee on Climate Change established in 1997 and restructured by Prime Ministerial Decree 272 in 2007 to develop strategies and policies to deal with

climate change whether mitigation and adaptation [71]. Later on, in 2015, the committee was restructured by the Prime Minister Decree No. 1912 to establish the National Climate Change Council (NCCC).

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Table 2. Applicable criteria and indicators in the case of Egypt.

Pillar	Indicators
Good governance	Mapping stakeholders at vertical and horizontal levels
	Existence criteria for determining stakeholders
	Existence of a communication strategy
	Number of capacity-building activities
	Existence of M/E system
	Rate of access to internet
	Existence of a legal framework
	Existence of M&E system
Mainstreaming	Climate proofing of development projects
	Considering adaptation into sectoral plans
Strengthening capacity	Number of capacity building activities
	Availability of experts

In terms of inclusive participation, it is noted that such structure adopted in the case of Egypt is not inclusive, where some sectors that are highly vulnerable to climate change such as health and tourism sectors are not represented in NCCC. This can be attributed to the absence of stakeholder analysis and the selection of sectors to be represented in NCCC was not based on specific criteria.

Moreover, the coordination between different players in the climate change arena is found to be minimal, with communication between various stakeholders depending mostly on personal contacts, and interactive communication between actors at the same level within ministries is limited. This can be attributed to the absence of a communication strategy for facilitating communication between different players.

Under such a low level of inclusive structure and poor communication, it was not surprising to notice that the existing institutional capacities for climate change adaptation in Egypt have limited influence on the policy-making process. This was highlighted by the fact that despite the existence of the National Committee for Climate Change, which was established in 2007, did not have a contribution to the development of Egypt's

National Strategy for Adaptation to Climate Change and Disaster Risk Reduction (NAS) in 2011. However, it was developed by the Information and Decision Support Centre [75] affiliated with the Egyptian Cabinet. Such limited influence may be due to a lack of knowledge and centralization [21].

Despite frequent updating and restructuring of NCCC during the period 2007–2015 might indicate to certain level of flexibility of the existing institutional structure, the rationale for these updates was unclear, which means a low level of transparency. Such a low level of transparency was emphasized by the absence of a clear mechanism for information exchange at both national and sectoral levels which may hinder policy-making for climate change in Egypt. For example, despite all information relevant to the General Department of Risk and Adaptation in EEAA being updated regularly and published through the EEAA website, the published data have no details about the decision-making process and policy formulation. This may be exacerbated by the low access to the Internet prevailing in Egypt, where more than two-thirds (71%) of the population do not have access to the Internet [76]. It should be noted that a low level of transparency due to the absence of a mechanism for the

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collecting and disseminating of information can represent a barrier to ensuring effective communication channels among different stakeholders [21].

As for accountability, it is noted that there is no regulatory framework for climate change in Egypt. According to Prime Minister Decree No. 1129 in 2019, the responsibilities of the Supreme Committee of NCCC and its executive office are generic without specific roles and tasks for different involved actors. This was highlighted by about 40% of the interviewed officials in those sectors that are represented in NCCC, who suggested that they have no idea about their roles in the council. Furthermore, they indicated that there is no integrated action plan to implement the National Adaptation Strategy at the national level. Despite the existence of action plans in some sectors, which means fragmented efforts, such as agriculture and water sectors, there is no program for monitoring and evaluation to follow-up implementation of these action plans. This was emphasized by all interviewed officials, who stated that implementation of action plans relies mainly on the perception of top management of different ministries and their priorities.

Generally, climate change adaptation action is rarely integrated into development plans in Egypt. This was manifested in Egypt's Vision 2030, which paid less attention to climate change adaptation. This was stressed by interviewed officials, who argued that National Development Strategies focused on environmental issues such as solid waste and air pollution rather than climate change. Meanwhile, mainstreaming climate change adaptation into development plans was more relatively noticed at the sectoral level such as agriculture and water sectors rather than the national level.

Concerning strengthening capacities, it was found that the key players in institutional structure in Egypt have limited human, financial, and technological capacities. For example, the Central Department for Climate Change in the Egyptian Environmental Affairs Agency (EEAA) has only four staff members. Even in some other institutions, which have a relatively large number of staff such as the Central Laboratory of Agricultural Climate [77],

which is supposed to be a think tank for the agricultural sector, it was noted that only 40% of total staff members is technical staff. Such limited human resources may be attributed to a lack of caliber staff specialized in climate change. Also, it was found that limited efforts were undertaken to improve existing capacities, for example, for the past ten years, the Central Administration of Climate Change (EEAA) organized only one workshop on vulnerability assessment.

As for financial resources, climate change adaptation has no funds in the national budget. However, some sectors such as the water and agriculture sectors depend on budget, which provides limited financial resources for funding adaptation programs and associated capacity-building activities. Accordingly, adaptation programs in most sectors depend mainly on donors and funding agencies such as STDF, Green Climate Fund, GIZ, and UNDP. Such a funding mechanism is usually associated with unsustainable financial resources due to potential contradicting priorities between these sectors and funding agencies. Such limited and unsustainable financial resources can be, among others, the main cause underlying the absence of an action plan to implement the National Adaptation Strategy and may hinder capacity-building activities. For example, India established a Climate Change Finance Unit within the Ministry of Finance to raise international funds and increase India's domestic capacity to develop projects related to adaptation [24].

5. Conclusion and recommendations

Assessment of institutional capacities for climate change adaptation can assist in improving resilience to climate change impacts by identifying shortcomings, opportunities, and potentials for improvements. For this purpose, this study has suggested a generic and holistic framework with specific criteria and indicators. These criteria and associated indicators can be categorized into three pillars including good governance, mainstreaming, and strengthening capacities.

Validating the suggested assessment framework through its application to the case of Egypt revealed a reasonable level of accuracy as it highlights several strengths and weaknesses in the

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institutional capacities for climate change in Egypt. The main strengths are represented in the existence of a formal institutional structure represented in the National Climate Change Council involving some of the highest vulnerable sectors and the existence of an adaptation strategy. Meanwhile, the main weaknesses can be summarized as a low level of inclusiveness, a low level of accountability and transparency, and poor communication between key players working on climate change. Also, climate change adaptation was found to be poorly integrated into development plans and the human and financial resources needed for strengthening capacities of the key players are so limited.

The successful application of the suggested framework in similar cases requires:

- a. availability of data
- b. screening proposed indicators to select the most applicable ones
- c. considering interrelationships between various criteria and indicators

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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