

# Local community perception of climate change adaptation in Egypt

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**Abstract.** Climate change policies in countries of the Middle East and Northern Africa (MENA) region are evolving from a top-down, government-led approach towards more pluralistic climate governance, which incorporates a local perspective and actors while strengthening the communities' resilience. Egypt, as a case study with high economic and natural vulnerability to climate change, and a significant number of vulnerable communities, is struggling to coordinate and effectively manage current sketchy climate policies. This paper examines the perception of climate change in four urban and rural communities, and their adaptation needs. Results show high local awareness and diverse ad-hoc adaptation strategies. Local communities are in need of site-specific policies and special funds that encourage capacity building and networking, as well as the making available of climate data and adaptation knowledge.

## 1. Introduction

Evidence show that the MENA region is vulnerable to climate change-related risks such as sea level rise (SLR), increasing temperatures, and change in concentration and distribution of rainfall (*e.g.* [1,2]). Such risks will result in livelihood and economic losses as well as increased migration pressures (*e.g.* [3]). Adaptation and mitigation strategies to climatic risks can be strengthened by considering the needs and capacities of affected communities. The so-called “community-based adaptation” (CBA) to climate change has received growing attention from NGOs, public initiatives, and researchers worldwide [4]. The assumption is that climate change adaptation efforts, especially in low-income communities, are far more successful when local communities are empowered and their knowledge is used. CBA is thus seen as a participatory model and a response to top-down development policies, and thus beneficial for the community in terms of raising awareness and involving the poor [5]. CBA can be understood as a tool for multilevel, multidimensional and inclusive climate governance [6]. While CBA has been criticised as a “localist approach” which often cannot be scaled up, it generates a wide range of options for adaptation from a local perspective, and can be most effective if linked to development issues at large (*e.g.* [7]) as well as to wider issues such as development planning and migration [8]. Recently, the participation and CBA approach is reinforced by the Sustainable Development Goals (SDGs). For example, goals 16 (peace, justice and strong institutions), 11 (sustainable cities and communities) and 13 (climate action) respectively stress



the right to participate in decision-making, sustainable development in cities and settlements, and combating climate change.

Egypt has one of the largest vulnerable populations to climate change effects. Environmental politics in Egypt have become more popular and also more participatory and dynamic ever since the public upheaval during the revolution in 2011 [9]. Until then, environmental planning had largely followed a centralistic approach. For example, community involvement was not considered in master plans for urban development [10]. In recent years, climate change effects on Egypt's economy, ecosystems and communities, as well as on the country's overall vulnerability, have been studied in some detail [11]. Adaptation options in general were outlined [12], and specific measures with regard to agriculture were suggested [13]. There is also a trend towards more community involvement in adaptation to climate change. While there have been some donor projects on CBA by the German International Cooperation (GIZ), no study or programme has yet focused on the combination of urban and rural adaptation issues, nor tried to bridge the gap towards policymaking. This paper looks at the perception of local communities in urban and rural areas in Egypt, a neglected topic in the regional context. The results show differences in priorities and policy choice at the local level among different communities.

## 2. Case study

### 2.1. Climate change vulnerability in Egypt

Several factors increase the vulnerability of Egypt to climate change (CC). Egypt is dependent on the Nile river waters, which account for more than 90% of the available water resources [12]. Any changes to river flow or water quality represent a significant threat to the country's water security, which is already under threat due to emerging water-sharing conflicts with upstream riparian countries such as Ethiopia and Sudan [14]. Furthermore, 96% of Egypt's land consist of arid areas, resulting in few development options. Its large coastal areas are highly exposed to threats such as SLR [15]. Other factors are related to the large population size, the high population growth rate, and the widespread poverty, 40% of population living on under \$2.50/day in 2013 [16].

Egypt recognises itself as among one of the countries most vulnerable to climate change [11]. In common with other MENA countries, increasing temperatures are expected to affect Egypt's agricultural production and human health [9]. It is estimated that the total economic losses due to climate change will be equivalent to 2–6% of future gross domestic product, with the agricultural, tourism, and health sectors enduring most of the losses [17]. Three sectors are particularly vulnerable to climate-change effects in Egypt: agricultural land, coastal areas, and urban spaces (see table 1). Forty percent of the Egyptian population works in the agricultural sector, and about 60% of the nationally demanded food is produced inside the country. The agricultural area is concentrated along the Nile River, especially in the Nile delta, representing only 3% of the total Egyptian land surface. Rising temperatures are likely to reduce the productivity of major crops (maize, wheat) by 15–19% by 2050, and increase their water requirements.

**Table 1.** Affected sectors under different SLR scenarios in Alexandria (based on Agrawla [18]).

Sector	Under sea level	0.25 m	0.5 m	1 m
	% currently	% affected by sea level rise		
Population	40	60	67	76
Industrial	53.9	56.1	65.9	72.2
Vegetation	55	59	63	75
Tourism	28	31	49	62

### 2.2. Study area, rural: Baheira Governorate and Beni Suef Governorate

The Baheira governorate is located between Cairo and Alexandria in the North West of Egypt. It borders the Mediterranean Sea to the north, the Rosetta branch to the east, Alexandria and Matrouh to

the west, and Giza and El-Menofia to the south. Beheira is by far the largest governorate based on area of agricultural lands, which is estimated to be around 657 km<sup>2</sup>. The region is known for its diversified agricultural production, particularly onions, barley, beets, wheat, potatoes and fava beans. The survey participants were addressed through a contact of a family farm in the region. Most participants had not previously participated in any CC training or awareness meetings.

The Beni Suef governorate lies in Middle Upper Egypt. It borders to the east with the Assiut Eastern Mountain and the Red Sea governorate, to the west with Assiut Western Mountain and the New Valley governorate, to the north with the Menia governorate, and with the Souhag governorate to the South. Its location between two mountains causes hot and dry weather. Beni Suef is associated with trade in Upper Egypt, and is also famous for the production of cotton, wheat, maize, corn, fava beans, citrus fruits, pomegranates, mangoes, grapes, and bananas. The survey participants were contacted through the Centre for Environment and Development for the Arab Region and Europe (CEDARE). Most participants had participated in a training or awareness, where they identified problems of changing climate and clustering the causes and effects, to define needs and find the best adaptation solutions [12].

### *2.3. Study area, urban: Ezbet El Nasr and Bab Ashariya, Cairo*

Ezbet El Nasr, an informal settlement, lies in the south-eastern greater district of Cairo, mostly on desert and state-owned land. The construction of the area goes back more than 40 years, and is strongly linked with a migration of rural workers from Fayoum, Beni Suef, Menia, Asyut, Sohag and Qena governorates. The participants were contacted through the Arab Network for Environment and Development (RAED), who is involved in an upgrading initiative in Ezbet-El-Nasr towards CC adaptation. More than the half of the survey participants, exclusively young men, have participated in environmental training before.

Bab Ashariya is an old district in the east of Cairo, south of the large 6th of October Bridge, and north of Islamic Cairo. The survey participants were contacted through the Friends of Environment and Development Association (FEDA), who are located in the district. Most participants, exclusively women, have never participated in any CC awareness meeting or training before.

## **3. Methods**

In order to identify perception of CC and adaptation needs of the local community, a survey was conducted with two target groups (rural and urban populations) in four different locations. Rural and urban populations are the two main and distinctive groups affected by CC in Egypt. While peripheral populations represent the main groups affected by climate-change effects in vulnerable sectors such as the agricultural one, urban livelihoods are rather linked to the service sector [1].

The survey is based on a detailed questionnaire, which covers six areas: 1) basic knowledge of CC; 2) personal attitudes towards CC; 3) assumptions concerning CC in Egypt; 4) personal state of adaptation; 5) knowledge of governmental policies and engagement; 6) future needs for better adaptation. The survey structure followed recommendations from recent studies on the design of such perception questions. For example, God was included as an option for answering the question regarding the cause of CC, similar to the study of the Asia Foundation from Bangladesh in 2012, as many people believe that CC is a “home-made” effect as a reaction to sinful human behaviour, and as such is something outside people’s control [19]. In addition, following OECD perception guidelines [20], the study included simple option-based questions with the possibility of incorporating new answers.

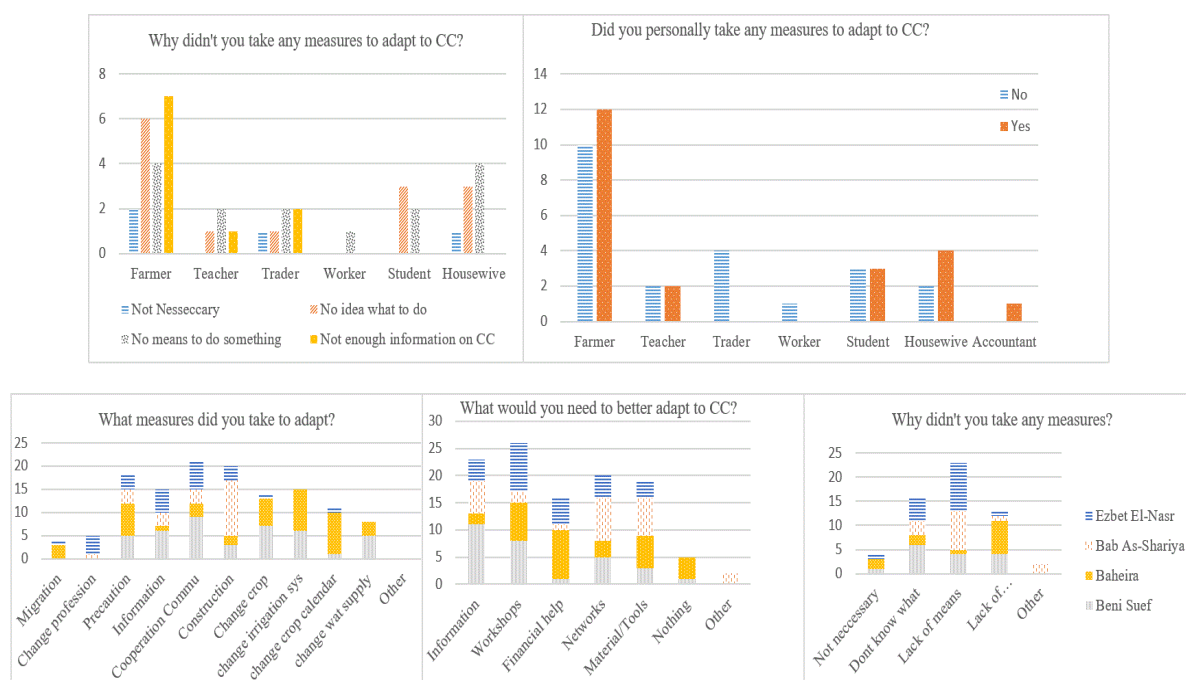
Out of 63 survey participants, 28 were female (44.5%) and 35 (55.5%) male. 61 participants indicated their age: 47.5% between 20 and 30 years; 14.7% between 31 and 40%; 13.1% between 41 and 50; 13.1% between 51 and 60; and 9.8% above 60 years. Egypt has a very young population, and about half of all participants were 30 or younger. The average age in Egypt is currently around 25 years. The majority of participants from the two rural areas were farmers (15 out of 17 in Beni Suef, and 11 out of 14 in Baheira), while the participants in the urban areas (in total 16 in Bab As-Shariya

and 17 in Ezbet El Nasr) had different work backgrounds such as teachers, traders, workers, housewives, students, and craftsmen. The survey was translated into an Arabic dialect called Ameya, which is widely used in Egypt.

## 4. Results

### 4.1. Perception and adaptation across communities

The survey results pertaining to the basic knowledge and assumption about CC and personal attitudes give a good picture of the communities' perception of CC. The phenomenon of CC is widely known. 94% of all participants personally sense a change in climate, and 87.5% have heard of the term "climate change" before. The term is less well known among rural participants, especially in Baheira, who had not previously had any CC workshops. In rural areas, participants were more likely to mention "God" as the key cause of CC, while in urban areas they were more likely to think that CC is caused by "nature" rather than "human activity". In general, 50% of respondents assumed that CC is due to human activity on Earth. The distribution of the responses for "natural causes", "human activity" and "God" was 30%, 44% and 72% respectively for rural areas, and 70%, 56% and 28% respectively for urban areas. Around 95% of participants claimed to personally sense CC, and to be affected by it at the same time. The three most common CCs perceived by the participants were both the increase and decrease in temperature, and the growing incidence of climate extremes. Changes related to water volume (droughts and precipitation) were overwhelmingly perceived by participants in rural areas. Regarding participants' concerns about facing CC, these were mainly related to personal health (fatigue/cough) due to a changing climate for almost all, but especially for urban people; while rural people additionally feared animal diseases, crop pests, and water shortages. Furthermore, most participants considered themselves as the most vulnerable group according to their social class and the region they live in.



**Figure 1.** Selected answers on climate change perception of four communities in Egypt.

With regard to adaptation to CC, the survey investigated the personal status of adaptation, knowledge about public interventions and the communities' needs. Almost all participants believed

that adaptation is possible and important. About 50% have already taken adaptation measures. No important differences in answer patterns were detectable according to the occupations of the participants. All participants, except for two students and a trader, claim to have recognised a change in climate. Housewives indicated that they had rearranged their houses (e.g. purchasing of cooling products) because of CC, and they gave diverse responses regarding their needs for better adaptation; but the major response was “capacity training”. Traders and workers (7 in total) reported not to have adapted to CC, but both groups indicated that they suffered from exhaustion and health problems due to the climate (see figure 1 for key results). Farmers reported suffering the most from animal disease and crop pests, water shortages, and health problems/exhaustion. The great majority of those who did not adapt reported lack information on CC. Moreover, with regard to age, the older survey participants (40+) were more favourable towards CC adaptation, as they have a longer life experience, especially looking back on changes in climate. However, the survey results show that younger participants have taken more measures to adapt to CC.

The lack of adaptation measures can be attributed to motivation and agency, or lack of knowledge or government initiatives. 50% of those who did not undertake adaptation methods, or did not take several actions, indicated that they lacked information on CC, or ideas on what to do. The other 50% claimed to lack the financial or materialistic means to adapt. The most chosen answer regarding adaptation measurements among all those 50% who indicated to have already adapted was cooperation within the community. Precautions (e.g. less work on extremely hot days) were also a frequently given answer (especially for women). Many urban participants reported to have changed their home accordingly (purchasing cooling technology such as fans – especially women). A few participants migrated because of the changing climate, and a few changed their jobs. It is possible that today’s inhabitants of Ezbet Al-Nasr had previously been living in the countryside and coming into town for work, which they did not indicate as migration in terms of adaptation. The majority of 66.5% are not aware of any governmental plans for coping with CC. The 33.5% who did indicate knowledge of such plans were exclusively from the group who filled out the surveys at the same time in a supervised setting, and through an official partner. The top three expressed needs with regard to adaptation were workshops (23.8%), additional information (21.1%), and networks within the community (18.3%), followed by material/tools (17%) and financial help (14%). These results depict the directions for the right CBA policy approaches in Egypt. Knowledge-based approaches to climate-change adaptation in Egypt might underestimate the high level of issue awareness already existing in the communities. While dissemination of basic knowledge is a prerequisite for action, adaptation is a site-specific and resource-intensive process requiring more capacity and technical knowledge. Survey participants expressed a need for, and an interest in, additional information on CC and adaptation (21% indicated that they needed additional information to better adapt, the second most common answer). Experts interviewed stressed the importance of correlating knowledge to improving skills in local communities by, for example, including CC in school syllabuses, providing research-based data platforms on CC impacts and adaptation options, or improving higher education on the topic. Rather than information, participants preferred options towards strengthening the community’s capacity to deal with CC effects; e.g. workshops, networks, tools, *etc.* While probably the most resource-intensive option, building of capacity is a promising approach. Trained farmers are more likely to ensure a successful harvest, while trained urban workers are more likely to stay healthy and to set up a resistant environment around themselves. Capacities are passed on, especially when fostered in communities, and thus are more likely to be sustainable. Interestingly, financial resources were the least-demanded option. Monetary solutions might not be sustainable time-wise, as future generations do not profit when the purchased good (or given fund) is broken, outdated, lost, or terminated. Furthermore, the actual root-cause analysis of CC issues, through which a CBA group should go, might not be fully captured when loans, subsidies, and funds are brought into focus. Any adaptation policy has also to consider the specific needs of the community. For example, the exclusively female participants in Bab Al-shariya demanded primarily networks for better adaptation, followed by materials/tools in second place, and then thirdly information. Women thus tend to prefer soft adaptation measures towards improving their

traditional role as housekeepers.

#### *4.2. Community-specific climate-change responses*

Urban dweller's demands regarding climate-change adaptation can be distinguished from the demands of rural agricultural workers. As their living/working/housing/environmental and social circumstances vary, it seems reasonable to identify these differences with regard to needs. Interestingly, both urban and rural populations reported nearly identical needs, while ranking them in opposite order of importance. The sample locations, Beni Suef, Baheira (rural) and Bab As-shariya, Ezbet Al-Nasr (urban), have locally specific living circumstances, which may have led to a different answer pattern.

Rural participants working in agriculture name workshops as their first and uppermost need to adapt to CC, followed by information (specific to Beni-Suef), financial help (specific to Baheira), and lastly materials/tools. The distinctive interest of Beni-Suef participants in additional information on CC may be explained by their already-stimulated awareness of the importance of knowledge and information based on self-initiatives. This awareness was stimulated during the workshop mentioned above by IUCN in 2013. The need for financial support expressed by the participants of Baheira may be influenced by the fact that Baheira is in fact a low-income region. The participants, who were visited on their fields and in their houses, live in very simple huts and houses, not all of which have electricity or running water. Financial support is thus generally a reasonable need. In summary, rural participants express a need for practical skills (capacities) in their everyday life on their fields, and in addition they demand basic information on CC, which is indispensable for their agricultural activities.

Urban survey participants, to the contrary, expressed a need firstly for networks (especially in Bab As-shariya), followed by materials/tools, workshops (specific to Ezbet El-Nasr), and lastly information. The high demand for better networks among the community was raised by Bab As-Shariya participants (exclusively women). Women in Egyptian society have traditionally up until now, inherited the role of "the connector" within the family and towards other families. Furthermore, it seems reasonable that such social networks are rarely found within a buzzing city such as Cairo, where people tend to live more anonymously than in rural areas. Materialistic needs are expressed by the demand for materials and tools (e.g. air conditioning products or shadow installations on roofs). The reported desire for workshops, mostly mentioned by Ezbet El-Nasr participants (who were exclusively male), point towards the fact that it is the traditional role of men within Egyptian society to work physically outside in order to earn the family's income. These urban young men, working on Cairo's streets, express the need to learn skills (capacities) in order to better adapt to CC. Information was named as the last choice by the urban participants. This might be because they already feel well enough informed, or that they believe that information leads to no plausible action to combat climate-change threats. In summary, urban workers desire social bonds (networks) within the community to adapt on the one hand, and materials/tools and capacities as individual skills and supports on the other. These needs quite reasonably reflect the anonymous and harsh living conditions of urban dwellers.

Overall, one can see that local circumstances (whether urban or rural) do seem to have an impact on the needs of the survey participants. While workshops and information are very important to rural workers and less important to urban dwellers, urban dwellers favour networks and tools, which have significantly lower importance for rural participants. With regard to the effects of climate-change awareness projects conducted in the two selected case studies, participants from those areas were more likely to mention adaptation measurements, especially "soft adaptation options" such as community networking and training workshops.

## **5. Discussion**

CBA requires site-specific policies with the participation and coordination of a wide range of actors like local government, civil society and businesses. Research shows that there is a lack of coordination among local governments and stakeholders in promoting CBA, for example in sectors such as disaster management [21]. In order for CBA to be successful, data, participation, local knowledge, social capital and trust need to be available at the community level [22,23]. For Egypt, Froehlich and Al-

Saidi [24] analysed the CC institutional frameworks and reviewed needed policies in order to mainstream CBA within these frameworks. They presented actions under three approaches for encouraging CBA, namely disseminating information, developing capacities and disbursing funds. Accordingly, incentives, leadership, a sense of ownership and trust within the communities are prerequisites for successful CBA policies. In fact, climate change policies are not yet consolidated and do not directly target communities. As mentioned earlier in this paper, there are only a couple of projects in Egypt on CC in communities carried out by the German donor GIZ and some local organizations. Meanwhile, a national council for CC is being discussed and, if established, could incorporate more CBA actions. Particularly, ‘soft adaptation measures’ such as capacities and information are needed. Current measures are largely vague in terms of target groups, communities’ needs and responsibilities. Egypt is a state with a strong central government and large state bureaucracy. This might generate a sense of reliance on the state at the community level and hinder the evolvement of pluralistic solutions involving local actors. An especially important group for a more successful and context-specific adaptation is that of women. More women have been participating in CC awareness programmes than men. Women are also important for handling natural resources within rural or low-income urban communities. They tend to have lower adaptation capacities due to problems of literacy, mobility or income [25].

## 6. Conclusions

The present study examined the status quo of climate-change effects, communities’ knowledge and needs, and the institutional set-up in Egypt aimed at formulating a suitable and realistic CBA policy. It has shown that awareness of CC is quite high among the rural and urban population in Egypt. Knowledge of diverse adaptation strategies does partly exist, but is not necessarily practised consciously. For example, urban dwellers did not understand the purchase of additional cooling products as measure of adaptation to increasing temperatures. At the same time, rural inhabitants changed their cropping calendar according to changes in climate, but did not always trace this back to global warming. Worthy of note is the high willingness to learn more and to adapt among both older and younger participants, and men and women alike. Striking differences in perceived adaptation needs could also be identified: While rural participants mostly claimed to need additional capacity training regarding CC, urban participants called rather for networks among the community. Both groups listed “financial aid” least often when they were asked what is mostly needed in order to adapt. Majorly lacking for the implementation of a regionally adjusted CBA policy is a strong institutional structure to set up, implement, enforce, and develop such a policy, along with its dedicated funds. Egypt, a centrally governed state, should establish or empower a clearly defined board or institution in full charge of all national climate adaptation actions.

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