Climate Centre

Climate fact sheet | 2024

Egypt

This climate fact sheet summarizes the available information on the climate of Egypt and the impact of climate change on humanitarian activities in-country. Each fact sheet in the series was written using information from peer-reviewed academic papers, government publications, and other documentation from international non-governmental organizations.

1. Climate overview

Average temperature: Temperatures are highest in the south-eastern part of the country in June to August, when average high temperatures can exceed 40°C. A prevailing north-westerly wind moderates temperatures along the northern coast, where average temperatures vary from 9.5–23°C in wintertime to 17–32°C in summertime.

Average rainfall: Very little rain falls over most of the country, with the highest amounts along the northern coast, with about 200mm falling on average.

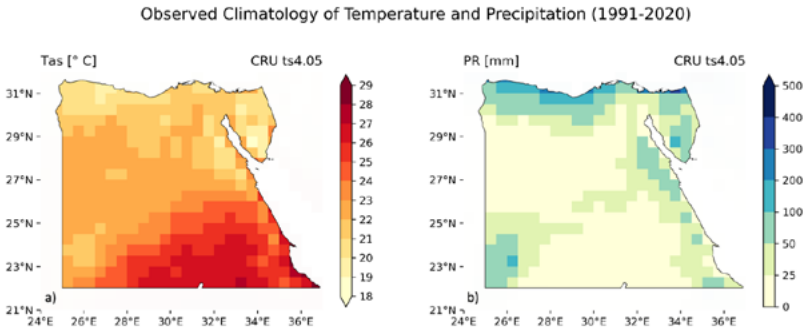

Figure 1: Observed climatology of (left to right) mean temperature and annual mean total precipitation1991–2020. (Adapted from World Bank, 2021).

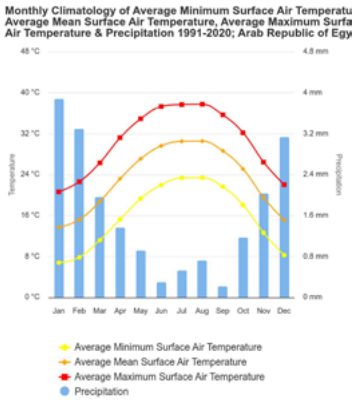

Figure 2: Average monthly climatology of minimum and maximum air temperature and precipitation 1991-2020 (World Bank, 2021).

Short overview

Egypt is in north-eastern Africa with the Mediterranean Sea to its north, and the Red Sea to its east. Very little rain falls throughout the year and there is no distinct rainy season, although rainfall is on average slightly higher in December to February (World Bank, 2021). Temperature ranges can be extreme with large differences between daytime highs (exceeding 40°C) and nighttime lows (below 0°C). The coastal region in the north has a low elevation and is subject to sea-level rise. The majority of the population lives along the Nile River and its delta which provides critical water resources.

The diverse and varied geography of Egypt means that it is exposed to a broad array of environmental hazards (hydrometeorological as well as geophysical) which are directly impacted and exacerbated by the impacts of climate change across the country. Egypt is one of the most vulnerable countries to humanitarian crises and disasters, ranked 37th out of 191 countries in the 2024 Inform Risk Index, a global assessment measuring countries' vulnerability to social, economic and environmental risks and their capacity to respond (DRMKC, 2024).

1.1 Climate change in Egypt

Historical climate change	Projected climate change
Temperature	
▪ The mean annual temperatures over Egypt have increased across the whole country. ▪ The frequency and intensity of hot extremes have increased, and cold extremes have decreased.	▪ Mean temperatures over the region are projected to rise until 2050 by at least 2–3°C for a high greenhouse gas concentration scenario (SSP5–8.5) and by 1.5–2.5°C for a low greenhouse gas concentration scenario (SSP2–4.5). ▪ Maximum and minimum temperatures will increase, and heatwaves will intensify in duration and peak temperatures for every increase in global warming levels above the pre-industrial values. In line with rising mean annual temperatures, the annual number of very hot days (days with a daily maximum temperature above 35°C) is projected to rise and with high certainty (World Bank, 2021).
Precipitation	
▪ Overall, there has been no significant change in total rainfall (World Bank, 2021). ▪ There is also no significant trend in the frequency and magnitude of extreme rainfall events (World Bank, 2021).	▪ Mid-century (2040–2060) estimates of annual precipitation changes over Egypt under a low emission scenario (SSP2–4.5) show a decrease of around 1–5 per cent. Under a high emissions scenario (SSP5–8.5), precipitation is projected to decrease by around 5–10 per cent (World Bank, 2021). ▪ The frequency and intensity of heavy precipitation events is projected to increase with the potential for flash floods.

2. Priorities of the Red Cross Red Crescent Movement under climate change

2.1 Scale up climate-smart disaster risk reduction (DRR), early action and preparedness

Existing hazard	Projected risk
Flash floods	
Heavy rain throughout the year causes flash floods in both rural and urban areas of the country, particularly in the most arid zones – notably in the Sinai, north coast and Upper Egypt (Negm, 2020; Helmi & Zohny, 2020). These cause significant amounts of death and damage.	The frequency and intensity of heavy precipitation events is projected to increase with the potential for flash floods.
Heatwaves (and compound risks such as wildfires)	
These are a significant and growing concern in the country (Saleh *et al.*, 2017; Morsy and El Afandi, 2021) with severe impacts on human and livestock health, crop production and water resources.	The frequency, intensity and duration of heatwaves in Egypt is increasing, with implications for air quality, food, energy and water security (Mostafa *et al.*, 2024; Hamzawy *et al.*, 2023). Egypt has the highest absolute number of heat-related deaths in the Middle East and North Africa region, a figure that will increase substantially with projected levels of global warming (Hajat *et al.*, 2023).
Erosion	
The Nile Delta and its Mediterranean coast are highly exposed to changes in coastline caused by accretion and erosion, linked to sea level rise and storm surges. This, in turn, puts exposed communities and infrastructure at risk of flooding and saline intrusions (Torresan *et al.*, 2020).	As sea levels are projected to rise significantly, and ongoing urban development along the coastline increases exposure to storm surges, the risks of flooding and saline intrusions are expected to increase, impacting infrastructure along the low coastal lands and threatening socioeconomic security (Torresan *et al.*, 2020).
Drought	
Egypt is an arid country with significant pressure on water resources. This pressure is driven by different combinations of meteorological (precipitation) and hydrological (streamflow and groundwater) droughts (Mabrouk *et al.* 2020) as well as population growth, economic pressure, and upstream–downstream water management policies (Luo *et al.* 2020; Nikiel & Eltahir, 2021). Water resource questions are among the most researched and emphasized in literature about the country and the region.	These stressors are generally projected to increase with further projected demographic and economic growth, due to a greater demand for water and higher evapotranspiration rates caused by increased average temperature (Nashwan *et al.*, 2024). Even if the goals of the Paris Agreement are achieved, 33 million more Egyptians are projected to be vulnerable to droughts by 2100 (Nashwan *et al.*, 2024).

It is important to note that many of these hazards are interrelated and produce compound risks in the same areas and communities. In addition, risk must be understood as the interplay between hazard, exposure and vulnerability which makes certain individuals, communities and sectors more impacted by the hazards. All project design should take such compounding risks into account.

Disaster risk management strategies

Historically, Egypt's disaster risk management (DRM) plans convey a general focus towards response and short-term recovery, rather than preparedness and risk management (Abulnour, 2014; Al Kurdi, 2021). Recent key DRM strategies – as formulated in Egypt's National Strategy for Disaster Risk Reduction 2030 (NSDRR) (The Cabinet of Egypt, 2017) – follow the DRM continuum: increased understanding of hazard risk, early warning, disaster governance and investment, preparedness, response and recovery, and link these factors to sustainable development in the country.

Disaster risk management law and policies

National Strategy for Disaster Risk Reduction 2030 is the key DRM strategy in Egypt. The NSDRR outlines a comprehensive multi-level institutional framework to implement the strategy, involving the Crisis Management Committee, National Committee for Crisis/Disaster Management, and various government and non-government entities. This document is a reformulation and update of the country's previous strategy from 2010, developed as part of Egypt's commitment to the Sendai Framework for Disaster Risk Reduction 2015–2030 (Al Kurdi, 2021). The updated NSDRR acknowledges climate change as a significant factor in increasing disaster risks and emphasizes the importance of building mitigation and adaptation capacities. Proposed mitigation measures include the integration of DRR into sustainable development plans and policies, significant investment in education and scientific research, building private–public sector partnerships and implementing targeted sectoral legislation to reduce risks. Adaptation measures involve building community and institutional capacities, investing in the development of early warning systems, promoting resilient infrastructure and services, and increasing financial protections in the form of insurance.

2.2 Reduce health impacts of climate change

Climate change affects health directly in Egypt through increased extreme events: storms, floods and heatwaves. Indirect impacts include changes in the geographical range and distribution of vector-borne diseases, increase in waterborne pathogens, and declining air quality and food and water availability (EEAA, 2016).

Heat-related morbidity and mortality, especially among elderly people, are expected to increase due to higher temperatures (USAID, 2018). For example, in August 2015, several people died due to heatstroke and many others were hospitalized due to heat stress (GIZ, 2017). These numbers are expected to increase as the climate continues to change.

The expected increase in temperatures is also anticipated to widen disease vectors' geographical ranges and transmission periods (Anoopkumar & Aneesh, 2022; EEAA, 2016). Climate change increases the risk of re-introducing malaria and the spread of other vector-borne diseases, such as dengue fever and Rift Valley fever, in Egypt as conditions become favourable (EEAA, 2016).

A projected increase in flash floods could raise the incidence of waterborne diseases, such as diarrhoea (World Bank, 2021). Warmer temperatures and shortages in water, leading to limited hygiene and sanitation services, could similarly increase the risk of diarrhoeal diseases (EEAA, 2016). Statistics show that 3,500–4,000 children under five years old die of diarrhoea in Egypt every year (UNICEF, n.d.).

Dust and sand storms are becoming more frequent due to temperature rises, increasing the risk of air pollution (World Bank, 2021). As a result, respiratory diseases such as asthma, influenza, pneumonia and pulmonary fibrosis are projected to increase, with the elderly and children at the highest risk (World Bank, 2021; USAID, 2018). Finally, the disruption of food systems caused by climate change is projected to increase both malnutrition and obesity, particularly among children, due to decreased food availability and nutritional quality (EEAA, 2016; Ibrahim, 2023).

2.3 Ensure sustainable water supplies

Water, Sanitation and Hygiene (WASH)

Egypt relies on the Nile, which provides 98 per cent of its annual renewable water resources (World Bank, 2019). It is projected that hot and dry conditions will increase in the Nile basin, thereby reducing water availability across Egypt (Coffel *et al.*, 2019). The water available for people, industry and agriculture will therefore diminish in the future.

Further temperature increases and declines in precipitation could decrease water availability still further while increasing demand for water resources (USAID, 2018). Moreover, the country's water quantity and quality are impacted by management, climatic and environmental stressors outside its borders in the Upper Nile Basin countries (Takele *et al.*, 2022). The Nile streamflow is extremely variable, and climate change is expected to increase the uncertainty surrounding the Nile River's capacity (Chandler, 2017). Some studies suggest that, as rainfall decreases and temperatures increase, the Nile River's streamflow will reduce by up to 54 per cent (Tekele *et al.*, 2022). Any future reductions in streamflow, in addition to the rapidly growing population and increasing demand, will stress the limited water resources in Egypt even further. Furthermore, changes in surface water availability, due to low rainfall and high temperatures, also reduce water infiltration and groundwater recharge, decreasing the reliability of groundwater (World Bank, 2021).

Coastal areas, especially the Mediterranean shoreline, are the most vulnerable to sea-level rise due to low elevation (EEAA, 2016). Such coastal areas are highly vulnerable to saltwater intrusion, which will reduce water quality (Omar *et al.*, 2021). Declining freshwater quality will further exacerbate water scarcity.

Infrastructure and electricity

Most of the country (99.8 per cent) is electrified (IRENA, 2018) and more than four-fifths of the country's electricity production is generated by thermal plants (Britannica, 2020). However, energy shortages for domestic consumption are a well-documented issue (USAID, 2018). Today, the country is the second largest producer of natural gas in the world (ASP, 2015). However, as with oil, the production of natural gas is decreasing annually and is not keeping up with domestic consumption. As a result, Egyptians experience increasing power outages and electricity rationing. Depleting crude oil reserves, ageing infrastructure, geopolitical tensions and lack of long-term investment into renewable energy sources are factors contributing to Egypt's energy crisis (Salah *et al.*, 2023).

Hydropower is an important source of Egypt's domestic energy production (Rashad & Ismail, 2000). Climate change significantly threatens this energy source, however. Research has shown a visible decrease in hydropower potential caused by lower discharge levels in the Nile which, in turn, is caused by increasing water demands upstream of Egypt and changes in precipitation patterns, as explained above.

The country currently only has a small proportion of installed solar and wind power technology – approximately 0.9 gigawatts-worth – but with a high potential for the development of these sources (IRENA, 2018). The country has pledged that renewables will make up 20 per cent of its electricity mix by 2025 and 42 per cent by 2035 (UNFCCC, 2017; IRENA, 2018). A 2018 study on Egypt by the International Renewable Energy Agency (IRENA) highlights the potential of a focus on the renewable sector to boost employment as well as the resilience of energy independence.

Egypt's infrastructure that is arguably most at risk of the physical impacts of climate change are its buildings, roads and public structures built on land bordering the Nile Delta. This region is the most exposed to flooding, saltwater intrusion and erosion (NAP-GSP, 2018). In March 2015, severe rainfall and floods in Cairo reportedly collapsed buildings, tore down electrical poles and overwhelmed the sewer system – experts blamed the significant weather impacts on overcrowded urban development and crumbling public infrastructure (The National, 2020).

2.4 Enable climate-resilient livelihoods and economic security

Egypt's economic sectors – including agriculture, fish farming, industry, inland river navigation, power generation and tourism – depend significantly on Nile water (EEAA, 2016). This makes core livelihood sources vulnerable to climate change impacts and changes in Nile water availability.

The agricultural sector will continue to be the most impacted by climate change-induced droughts, heat stress and increasing evapotranspiration due to higher temperatures, decreasing water availability and rising salinity (Perez *et al.*, 2021). In Egypt, agriculture employs 30 per cent of the population and contributes 12 per cent of the country's GDP (USAID, 2018). Agricultural labour is informal, comprising mainly women (Netherlands Ministry of Foreign Affairs, 2019). Eighty per cent of cultivated land ('old land') is in the Nile Valley and the Nile Delta, while 20 per cent ('new land') is in the land which has recently, or is being, reclaimed (EEAA, 2016). Over 85 per cent of all freshwater in the country is used by irrigated agriculture and is heavily polluted by industrial effluents and untreated sewage (World Bank, 2019). A reduction in water availability and quality, especially of the Nile River, due to climate change will negatively affect irrigation and, as a result, agricultural production (Omar *et al.*, 2021; Perez *et al.*, 2021; Samiha *et al.*, 2022). This means that most farm workers and farmers will lose their daily incomes (Omar *et al.*, 2021).

Increasing temperatures will also affect the yields of crops and fruit trees (Abutaleb *et al.*, 2018; World Bank, 2021). In addition, the area of crops under production will significantly decrease, mainly in the Nile Delta region, due to increasing salinity (Omar *et al.*, 2021b). Crop yields will also be affected by the projected increase in crop pests and diseases (World Bank, 2021). Yield and production declines will lead to a soar in food prices (Perez *et al.*, 2021).

The livestock sector – dominated by cattle, goats, sheep and water buffalo – may be impacted by increasing heat stress and high incidence of diseases, such as the Rift Valley fever and bluetongue disease (Goma & Phillips, 2021). In addition, decreased water supply and pasture availability due to droughts will further affect the livestock sector (Goma & Phillips, 2021; USAID, 2018).

Sea-level rise will lead to beach and shoreline erosion, inundation of significant attractions (such as coastal monuments and marine ecosystems) and damage to coastal infrastructure, which will affect tourism in Egypt (El-Masry *et al.*, 2022). Furthermore, the recurrence of storms and hurricanes and damage to ecosystems will further affect tourism (EEAA, 2016).

2.5 Address climate displacement and protection

Current and future displacement challenges

Egypt has a relatively low number of internally displaced persons (IDPs), with only 3,181 IDPs recorded in 2021 (IDMC, 2022). In 2008–2021, over 30,660 internal displacements were recorded due to disasters, including drought, flooding and wildfire (*ibid*). Egypt hosts significantly more refugees than IDPs, with 271,102 refugees officially recorded as of December 2021 – half of them Syrians (UNHCR, 2022).

Some scenarios project that a 0.5m rise in sea level by 2050 could displace 2–4 million Egyptians and increase the out-migration of people from coastal zones to other parts of the country (TNC, 2016). Egypt's second largest city, Alexandria, sits on the Nile River Delta and is one of the world's most vulnerable cities to rising sea levels (MMC, 2023). High numbers of people in the densely populated Lower Nile Delta are projected to have to migrate due to rising sea levels and related negative implications including pollution, coastal erosion, flooding and the salination of agricultural land (Netherlands Ministry of Foreign Affairs, 2019; Bonnefoi, 2024). The majority of these communities have limited capacity to migrate due to lack of resources, and there is a substantial lack of awareness that the changing environment is caused by climate change, thus resources are often directed to short-term fixes rather than invested into long-term resilience (Bonnefoi, 2024; Kassem *et al.*, 2019; MMC, 2023). One study conducting household surveys in Alexandria found that up to 20 per cent of the population might refuse to be voluntarily resettled by the Government due to unfavourable and/or unsuitable resettlement conditions, which, in turn, would lead to a high number of IDPs in the city (Sušnik *et al.,* 2015).

Research has found that neither low nor high temperatures and precipitation influence Egyptians' decisions to migrate. Consideration is instead given to the climate of their destination (Arouri *et al.* 2017). More months of cooler temperatures increases in-migration to governates, whereas governates with an extra month of high temperatures significantly reduces the number of older migrants (*ibid*).

Water scarcity will likely drive internal migration and displacement within Egypt as agricultural livelihoods become less viable, which will severely impact the 40 per cent of the population that depends on agricultural as a main income source (Aty, 2022).

Negative health impacts related to climate-induced migration and crowded urban areas are projected to rise, including an increase in the prevalence of infectious and non-infectious diseases and cardiovascular conditions such strokes and heart attacks ((Government of Egypt & UNDP, 2011)).

Potential needs of migrants and displaced people

As rural–urban migration and displacement rises, in part due to water constraints limiting Egypt's agricultural production, urban migrants and IDPs will need job training (Cohen & Sirkeci, 2021). Those living in urban informal settlements, including refugees and other forcibly displaced people, will need access to resources such as running water and adequate shelter, particularly as extreme heat and other hazards increase (Laue *et al.*, 2022).

Migration law and policies

Presidential Decree No. 331 of 1980, 28 May, 1981. This decree adopted the 1951 Refugee Convention as domestic law.

Protection

People in detention frequently have heightened vulnerability to natural disasters due to spatial marginalization resulting from prison locations on hazard-prone land and/or isolation from emergency evacuation services; limited to no connections to social networks which are crucial aspects to hazard resilience; and political marginalization, including lack of policies and services to prevent disaster impacts on imprisoned populations (Gaillard & Navizet, 2012). While specific information is not available for Egypt, vulnerabilities such as these, coupled with more frequent and intense disasters due to climate change, may leave prison populations in especially precarious positions to hazards such as extreme heat and floods.

2.6 Policy

Relevant information from the Nationally Determined Contribution (NDC) (2022)

Emission target: The NDC does not include a specific quantitative emissions reduction target but a list of actions to reduce greenhouse gas (GHG) emissions across sectors. Focuses on energy (including oil and gas), agriculture, waste transportation and industrial sectors to mitigate emissions.

Area of focus on adaptation: Costal zones; water resources and irrigation; agriculture; health; rural areas; population and roads; tourism; energy.

Inclusion of DRR: The NDC is aligned with the NSDRR 2030. It highlights the importance of reducing vulnerabilities to climate-induced disasters, particularly in coastal and low-lying areas, through planning and infrastructural development, community-based resilience programmes and raising awareness of climate change risks.

Next review of the NDC: Egypt's fourth national communication to the UNFCCC is underway and is expected to be submitted by the end of 202. The next formal review of the NDC will likely coincide with or follow this submission.

National designated entity: Egyptian Environmental Affairs Agency

Other national policies on climate

- 2050 National Climate Change Strategy (NCCS), 2022. DRM is one of the components of the Strategy such as in 'Objective 2: Enhancing adaptive capacity and resilience to climate change and alleviating the associated negative impacts'. It emphasizes forecasting and warning as the mechanisms to address climate risks.
- Third National Communication (2016). This document details climate vulnerabilities and adaptation for the following sectors (in order of priority): water resources, costal zones, tourism, urban areas, health, biodiversity and extreme events. The introduction of an early warning system along with disaster preparedness activities respond to some of the expected impacts of a changing climate.
- Climate Action Tracker, an NGO measuring government action against Paris Agreement targets, rates Egypt's climate and environmental policies as insufficient. The Egypt Vision 2030 includes few references to climate mitigation actions, while the 2050 National Climate Change Strategy lacks an overall emissions reduction target (Climate Action Tracker, 2022). Despite the development of a National Adaptation Plan (NAP) beginning in 2015, the country has not submitted a NAP to the UNFCCC. A comprehensive NAP is considered important for the improvement of Egypt's institutional and technical capacity for integrating adaptation into national and sectoral planning and determining priorities (UNDP, 2021).

Climate finance

Green Climate Fund (GCF) readiness and regional projects are currently ongoing in Egypt, aiming to centre energy efficiency, renewable energy and climate resilience in the transformation of financial systems in developing countries. In addition, two national GCF projects are being implemented in Egypt, including the adaptation project 'Enhancing climate change adaptation in the North coast and Nile Delta Regions in Egypt', providing defensive coastal infrastructure and building a coastal management plan; and a mitigation project 'Egypt Renewable Energy Financing Framework', working to scale up renewable energy investments and develop a supporting technical assistance programme (GCF, 2022).

National Societies cannot apply directly for climate finance from the Green Climate Fund but they can be an implementing partner for an accredited entity (Climate Centre, 2022a). National Societies can explore options for accessing climate funds through smaller funds, such as the GEF's Small Grants Programme or the FFEM's Small Scale Initiatives Program. These grants range from about 20,000–50,000 US dollars and are intended to support community-level initiatives. The GEF Small Grants Programme sits under the United Nations Development Programme and has a National Coordinator in each country. Some countries have National Climate Funds, which may be accessible to the National Society. Other funding from bilateral donors, or multilateral climate funds like the Adaptation Fund, CREWS or GCCA+ could be explored (Climate Centre, 2022a).

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional resources

Climate Centre. (2022a). *'Fact sheet on climate finance.* Red Cross Red Crescent Climate Centre. https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf

Climate Centre. (2022b). *Entry points for National Societies on climate finance partnerships.* Red Cross Red Crescent Climate Centre. https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance-Partnerships.pdf

References

Abulnour, A. (2014). 'Towards efficient disaster management in Egypt', *HBRC Journal*, 10 (2), 117–126. https://doi.org/10.1016/j.hbrcj.2013.07.004

Abutaleb, K.A.A., Mohammed, A.H.E.-S., & Ahmed, M.H.M. (2018). 'Climate change impacts, Vulnerabilities and adaption measures for Egypt's Nile Delta', *Earth Systems and Environment,* 2(2), 183–192. https://doi.org/10.1007/s41748-018-0047-9

Al Kurdi, O. (2021). 'A critical comparative review of emergency and disaster management in the Arab world', *Journal of Business and Socio-economic Development*. https://www.emerald.com/insight/content/doi/10.1108/JBSED-02-2021-0021/full/pdf?title=a-critical-comparative-review-of-emergency-and-disaster-management-in-the-arab-world

ASP. (2015). 'Energy in Egypt: Background and issues', *Background report, Sungtae Park.* American Security Project. https://www.americansecurityproject.org/wp-content/uploads/2015/03/Ref-0190-Energy-in-Egypt-Background-and-Issues.pdf

Anoopkumar, A.N., & Aneesh, E.M. (2022). 'A critical assessment of mosquito control and the influence of climate change on mosquito-borne disease epidemics', *Environment, Development and Sustainability*, 24(6), 8900–8929. https://doi.org/10.1007/s10668-021-01792-4

Arab Republic of Egypt. (2017). *Intended Nationally Determined Contributions.* United Nations Framework Convention on Climate Change. https://unfccc.int/sites/default/files/NDC/2022-06/Egyptian%20INDC.pdf

Arouri, M., Youssef, A., & Viet Cuong, N. (2017). 'Is internal migration a way to cope with climate change? Evidence from Egypt', *Economic Research Forum Working Paper Series, no. 1099*. https://erf.org.eg/publications/is-internal-migration-a-way-to-cope-with-climate-change-evidence-from-egypt/?tab=undefined&c=undefined

Aty, A. (2022). *Presentation: 'Dialogue on water scarcity and migration — Challenges and opportunities for sustainable development in the Middle East and North Africa'* in Zawya (2022) Egypt's Irrigation Minister highlights impacts of climate change on water, migration. https://www.zawya.com/en/business/energy/egypts-irrigation-minister-highlights-impacts-of-climate-change-on-water-migration-twy0wmls

Bonnefoi, F. (2024). *Sea-level rise in the Nile Delta: Promoting adaptation through circular migration.* Rice University's Baker Institute for Public Policy. https://doi.org/10.25613/X6P9-H105.

Britannica. (2020). *Egypt: Agriculture and fishing*. https://www.britannica.com/place/Egypt/Agriculture-and-fishing

Chandler, D.L.(2017). *Nile faces greater variability: Climate change could lead to overall increase in river flow, but more droughts and floods, study shows.* MIT News Office. https://news.mit.edu/2017/nile-climate-change-droughts-floods-0424

Climate Action Tracker. (2022). *Egypt*. https://climateactiontracker.org/countries/egypt/policies-action/

Coffel, E.D., Keith, B., Lesk, C., Horton, R.M., Bower, E., Lee, J., & Mankin, J.S. (2019). 'Future hot and dry years worsen Nile basin water scarcity despite projected precipitation increases', *Earth's Future*, 7(8), 967–977. https://doi.org/10.1029/2019EF001247

Cohen, J.H. & Sirkeci, I. 2021. *Handbook of culture and migration.* Edward Elgar Publishing. https://www.e-elgar.com/shop/gbp/handbook-of-culture-and-migration-9781789903454.html

DRMKC. (2024). Inter-Agency Standing Committee and the European Commission, *Inform Report 2024: 10 years of INFORM*. Publications Office of the European Union, Luxembourg, 2024. https://data.europa.eu/doi/10.2760/555548, JRC136641.

EEAA. (2016). *Egypt Third National Communication Under the United Nations Framework Convention on Climate Change.* Egypt Environmental Affairs Agency. (https://unfccc.int/sites/default/files/resource/TNC%20report.pdf

Elboshy, B., Gamaleldin, M., & Ayad H. (2019). 'An evaluation framework for disaster risk management in Egypt', *International Journal of Risk Assessment and Management*, 22(1), 63. https://www.researchgate.net/publication/330061064_An_evaluation_framework_for_disaster_risk_management_in_Egypt

El-Masry, E.A., El-Sayed, M.Kh., Awad, M.A., El-Sammak, A.A., & Sabarouti, M.A. 2022). 'Vulnerability of tourism to climate change on the Mediterranean coastal area of El Hammam–EL Alamein, Egypt', *Environment, Development and Sustainability*, 24(1), 1145–1165. https://doi.org/10.1007/s10668-021-01488-9

Gaillard, J.C & Navizet, F. (2012). 'Prisons, prisoners and disaster', *International Journal of Disaster Risk Reduction,* 1(1), 33–43. https://www.sciencedirect.com/science/article/pii/S2212420912000039?via%3Dihub

GCF. (2022). *Egypt*. Green Climate Fund. https://www.greenclimate.fund/countries/egypt

GIZ. (2017). *Protecting health from heat stress in informal settlements of the greater Cairo region.* Deutsche Gesellschaft für Internationale Zusammenarbeit. https://health.bmz.de/toolkits/climate-health/vulnerability-assessments/a-vulnerability-assessment-in-cairo-egypt/

Goma, A.A., & Phillips, C.J.C. (2021). 'The impact of anthropogenic climate change on Egyptian livestock production', *Animals*, 11(11), 3127. https://doi.org/10.3390/ani11113127

Government of Egypt. (2015). *Egypt Vision 2030*. http://sdsegypt2030.com/?lang=en

Government of Egypt & UNDP. (2011). *Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction*. http://www.climasouth.eu/docs/Adaptation011%20StrategyEgypt.pdf

Hajat, S., Proestos, Y., Araya-Lopez, J.L., Economou, T. & Lelieveld, J., (2023). Current and future trends in heat-related mortality in the MENA region: A health impact assessment with bias-adjusted statistically downscaled CMIP6 (SSP-based) data and Bayesian inference. *The Lancet Planetary Health,* 7(4), pp.e282-e290. https://doi.org/10.1016/S2542-5196(23)00045-1

Hamzawy, A., Al-Mailam, M. & Arkeh, J. (2023). *Climate Change in Egypt: Opportunities and Obstacles*. CEIP: Carnegie Endowment for International Peace. United States of America. https://policycommons.net/artifacts/6935728/climate-change-in-egypt/7844253/

Helmi, A.M., Zohny, O. (2020). Flash Flood Risk Assessment in Egypt. In: Negm, A. (eds) *Flash Floods in Egypt. Advances in Science, Technology & Innovation*. Springer, Cham. https://doi.org/10.1007/978-3-030-29635-3_13

HRW. (2023). *Egypt: Electricity Cutbacks Threaten Rights*. https://www.hrw.org/news/2023/08/08/egypt-electricity-cutbacks-threaten-rights

Ibrahim, E.A. (2023). The impact of climate change on food security dimensions in Egypt by 2070. New Medit, *A Mediterranean Journal of Economics, Agriculture and Environment*, 2023 n.2. https://doi.org/10.30682/nm2302i

IDMC. (2022). *Country profile: Egypt.* Internal Displacement Monitoring Centre. https://www.internal-displacement.org/countries/egypt

IRENA. (2018). *Renewable energy outlook: Egypt.* International Renewable Energy Agency https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Oct/IRENA_Outlook_Egypt_2018_En.pdf

Kassem, H.S., Bello, A.R.S., Alotaibi, B.M., Aldosri, F.O. & Straquadine, G.S., (2019). Climate change adaptation in the delta Nile Region of Egypt: Implications for agricultural extension. *Sustainability*, 11(3), p.685. https://doi.org/10.3390/su11030685

Laue, F.; Adegun, O.B.; Ley, A. (2022). 'Heat stress adaptation within informal, low-income urban settlements in Africa', *Sustainability*, 14, 8182. https://doi.org/ 10.3390/su14138182

Luo, P., Sun, Y., Wang, S., Wang, S., Lyu, J., Zhou, M., Nakagami, K., Takara, K. & Nover, D., (2020). Historical assessment and future sustainability challenges of Egyptian water resources management. *Journal of Cleaner Production,* 263, p.121154. https://doi.org/10.1016/j.jclepro.2020.121154

Mabrouk, E.H., Moursy, F.I., Mohamed, M.A. & Omar, M.E.D.M. (2020). Impact of Meteorological Drought in Upper Blue Nile Basin on the Hydrological Drought of Nile River in Egypt. *International Journal of Engineering and Advanced Technology (IJEAT)*, 9(6), 50-55. https://doi.org/10.35940/ijeat.F1213.089620

MMC. (2023). *Climate and mobility case study: Alexandria, Egypt: Al Max.* Mixed Migration Centre report. https://mixedmigration.org/wp-content/uploads/2023/01/259_Case_Study_2_Egypt.pdf

Morsy, M., El Afandi, G. (2021). Decadal changes of heatwave aspects and heat index over Egypt. *Theoretical and Applied Climatology*, 146, 71–90. https://doi.org/10.1007/s00704-021-03721-x

Mostafa, A.N.; Alfaro, S.C.; Robaa, S.M.; Zakey, A.S.; Abdel Wahab, M.M. (2024). Heatwaves and Their Impact on Air Quality in Greater Cairo, Egypt. *Atmosphere*, 15, 637. https://doi.org/10.3390/atmos15060637

NAP GSP. (2018). *National Adaptation Plans in focus: Lessons from Egypt.* National Adaptation Plan Global Support Program. https://www.globalsupportprogramme.org/sites/default/files/resources/naps_in_focus_lessons_from_egypt.pdf

Nashwan, M.S., Eltahan, A.M.H. & Shahid, S., 2024. Millions more Egyptians will be exposed to drought by 2100 under the goals of the Paris climate agreement. *International Journal of Disaster Risk Reduction*, 101, p.104257. https://doi.org/10.1016/j.ijdrr.2024.104257

Negm, A. M. (2020). Flash floods in Egypt. *Advances in Science, Technology & Innovation*. Springer, Cham https://doi.org/10.1007/978-3-030-29635-3

Netherlands Ministry of Foreign Affairs. (2019). *Climate change profile: Egypt.* https://reliefweb.int/report/egypt/climate-change-profile-egypt

Nikiel, C.A. & Eltahir, E.A.B. (2021). Past and future trends of Egypt's water consumption and its sources. *Nature Communications* 12, 4508. https://www.nature.com/articles/s41467-021-24747-9.pdf

Omar M.E.D.M., Moussa, A.M.A., & Hinkelmann, R. (2021). 'Impacts of climate change on water quantity, water salinity, food security, and socioeconomy in Egypt', *Water Science and Engineering*, 14(1), 17–27. https://doi.org/10.1016/j.wse.2020.08.001

Perez, N.D., Kassim, Y., Ringler, C., Thomas, T.S., & ElDidi, H. (2021). *Climate change and Egypt's agriculture*. https://doi.org/10.2499/p15738coll2.134318

Rashad, S.M. & Ismail, M.A. (2000). 'Environmental-impact assessment of hydro-power in Egypt'. *Applied Energy,* 659(1–4), 285–302. https://www.sciencedirect.com/science/article/abs/pii/S0306261999000689

Salah, S.I., Eltaweel, M. & Abeykoon, C., 2022. Towards a sustainable energy future for Egypt: A systematic review of renewable energy sources, technologies, challenges, and recommendations. *Cleaner Engineering and Technology*, 8, p.100497. https://doi.org/10.1016/j.clet.2022.100497

Saleh S., Heggi M., Abrabbo M., Farag A. (2017). 'Heat waves investigation during last decades in some climatic regions in Egypt', *Egyptian Journal of Agricultural Research*, 95 (2). https://ejar.journals.ekb.eg/article_148901.html

Samiha, O., Zohry, A.E.-H., & Ahmed, T. (2022). 'Approaches to increase the resiliency of Egyptian agriculture to climate change', *Moroccan Journal of Agricultural Sciences,* 3(2). https://techagro.org/index.php/MJAS/article/view/940/1018

Sušnik, J., Vamvakeridou-Lyroudia, L.S., Gebert, N., Kloos, J., Renaud, F. La Jeunesse, I., Mabrouk, B., Savić, D.A., Kapelan, Z. Ludwig, R., Fischer, G., Roson, R., & Zografos, C. (2015). 'Interdisciplinary assessment of sea level rise and climate change impacts on the lower Nile delta, Egypt', *Science of the Total Environment*, Vo. 503, pp. 279-288, doi: 10.1016/j.scitotenv.2014.06.111.

Takele, G.S., Gebrie, G.S., Gebremariam, A.G., & Engida, A.N. (2022). 'Future climate change and impacts on water resources in the Upper Blue Nile Basin', *Journal of Water and Climate Change,* 13(2), 908–925. https://doi.org/10.2166/wcc.2021.235

The Cabinet of Egypt. (2017). *National Strategy for Disaster Risk Reduction 2030. Summary for Dissemination.* Information and Decision Support Center Crisis Management and DRR Sector. https://www.preventionweb.net/files/57333_egyptiannationalstrategyfordrrengli.pdf

The National. (2020). 'In Egypt, floods add to difficulty of fighting pandemic', *Editorial*. https://www.thenational.ae/opinion/editorial/in-egypt-floods-add-to-difficulty-of-fighting-pandemic-1.992424

TNC. (2016). *Egypt's Third National Communication (TNC) to the UNFCCC.* United Nations Framework Convention on Climate Change. https://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/tnc_report.pdf

Torresan, S., Furlan, E., Critto, A., Michetti, M., & Marcomini, A. (2020). Egypt's coastal vulnerability to sea-level rise and storm surge: Present and future conditions. *Integrated Environmental Assessment and Management*. 16(5):761–772. https://europepmc.org/article/MED/32320132

UNDP. (2021). *Formation and Advancement of the National Adaptation Plans Process of Egypt.* Green Climate Fund Readiness and Preparatory Support. https://www.greenclimate.fund/sites/default/files/document/egy002-ap.pdf

UNHCR. (2022). *UNHCR Egypt monthly statistical report as of 31 December 2021.* United Nations High Commissioner for Refugees. https://reporting.unhcr.org/document/1324

UNICEF. (n.d.). *Egypt: Water, Sanitation and Hygiene.* https://www.unicef.org/egypt/water-sanitation-and-hygiene

UNFCCC & Arab Republic of Egypt. (2017). *Egyptian Intended Nationally Determined Contribution*. United Nations Framework Convention on Climate Change. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Egypt%20 First/Egyptian%20INDC.pdf

USAID. (2018). *Climate risk profile: Egypt.* United States Agency for International Development. https://www.climatelinks.org/sites/default/files/asset/document/Egypt_CRP_Final.pdf

World Bank. (2021). *Country summary: Egypt.* Climate Change Knowledge Portal. https://climateknowledgeportal.worldbank.org/country/egypt

World Bank. (2019). *Egypt: Pioneering participatory integrated water resources management in the Nile Delta.* https://documents.worldbank.org/en/publication/documents-reports/documentdetail/498201553062791934/egypt-pioneering-participatory-integrated-water-resources-management-in-the-nile-delta