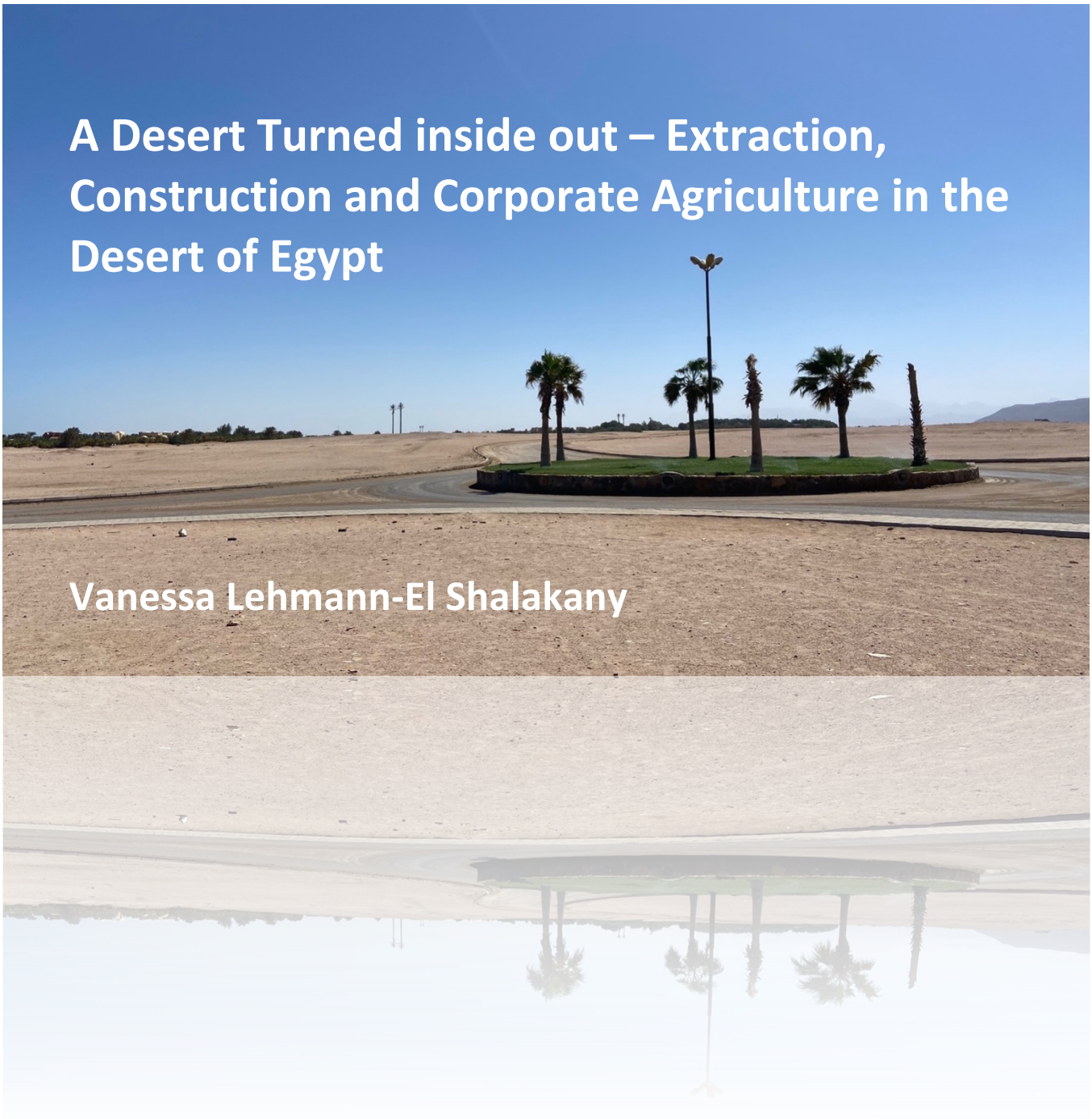
A Desert Turned inside out – Extraction, Construction and Corporate Agriculture in the Desert of Egypt



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Abstract

Deserts are not usually seen as sites of contentious politics, economics and as landscapes whose metabolic changes are important to track. More often than not arid terrains are viewed as wastelands, as resource reservoir or dumping ground, empty of significance and therefore an ideal blank canvas for states or other actors to re-invent themselves. The desert country of Egypt, although most known for its millennia-old history of life on the Nile, has witnessed decades of large-scale human interventions in its desert territories. Yet, many of those interventions have taken place beyond any major accounting for with regards to what happens in and what happens to those arid regions and in effect, to the Nile regions as well. Today, a wide array of desert projects perforates those dry terrains with programmes ranging from desert agriculture, mega-urban developments, energy schemes to mining. At the same time, the country's arid lands are being highly securitized by an opaque and ephemeral apparatus that obstructs access and mobility of the general public as well as land uses and claims of Bedouin communities. The research sheds light onto how these programmes have been developed and how regions both arid and fertile have transformed along the way. It argues critically against a perception that treats arid lands as a mere backdrop of development and planning efforts, making the desert the main field of enquiry instead. The project asks: How are Egypt's desert regions capitalized? Who benefits from that and what is the price of those endeavours? How do desert projects concretely operate and what kind of resources do they require? How are socio-ecological contexts being affected both in arid and fertile regions? Ultimately, the question is: What is specific about the desert as a space for extraction and production? To answer those questions, for the case of Egypt, the research mobilizes archival resources and empirical research to capture some of the legal-discursive and techno-infrastructural systems that sustain these vast capital-making processes shaping the country's drylands.

Note on Transliteration

For the accessibility of this text to a broad audience, Arabic words and names have been transcribed in their most common English language use. I have applied diacritical markings such as (‘) for the letter *‘ayn* and (`) for *hamza*. Other markings have been omitted to simplify the script. Names of authors who are writing and publishing in English are referred to as they appear in the original publication.

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You See a Desert – We See a Market

International Finance Corporation, *Visible from Space: The World Largest Solar Power Plant,* promotional campaign on the Benban Solar Park in Egypt, YouTube video, published on 14 January 2019

How to break this perverse circuitry that resolves the economic as the ethical as it brings – or perhaps only because it brings – the scientific in support of authority?

Denise Ferreira da Silva, *Unpayable Debt*, 2022, 13

Because deserts are perceived as the most "worthless" lands on the planet, the history of desertification and dryland development policies lay bare the political and economic foundations of our most common and influential desert imaginaries and our deeply capitalist relations with nature more generally. Moreover, they reveal the degree to which we have been willing to write off entire populations, including peasants, nomads, and aboriginal populations, due to our perception of their alleged worthlessness or culpability for environmental destruction.

Diana K. Davis, The Arid Lands, 2016, 168

In the desert everything has a system.

Sheikh Marʻy, clan leader of the Khushmaan belonging to the Maʻaza tribe of Egypt's Eastern Desert, conversation on 30 October 2020

INTRODUCTION

Deserts in Focus

Deserts are sometimes viewed as timeless or as sites beyond history and change. While about two-thirds of our planet's landmass is made off arid terrain, the socionatural conditions of dry sites, their specific ecological disposition and social configuration as a home for human habitation as well as of more-than-human life remains little recognized. This is true even for a now quickly growing field of enquiry called the Environmental Humanities, sometimes dubbed GeoHumanities. This field of research has put over the past two decades or so an emphasis on studying the working together of human life and its politics with the life and agency of the non-human world including a variety of sites and actors ranging from rivers to cities, oceans to aerosols, microbes to infrastructures and more. Desert regions across the globe have featured rather marginally within this space of debate. Deserts remain somewhat charged with elements of mystery or with security concerns or again, they figure as wastelands, resource reservoirs or dumping grounds of our capital-centred present. Yet, dryland regions vary drastically in their geological, biophysical and atmospheric-meteorological constitution. They have altered and have *been* altered in multiple ways and with multiple effects. They are far from being homogeneous, timeless or empty. They do not stand apart or outside of wider socio-ecological networks and histories. Today, in many different regions on the planet, arid lands are actually sites of tremendous human-led interventions that are also affected by global as well as local ecological changes, themselves also changing those conditions in return. Across the Sahara of North Africa, for instance, rare metals, sands and rocks are being extracted at a staggering scale. The geo-engineering of growing swaths of arid land through deep-subsurface irrigation - often from non-replenishing fossil groundwater bodies - or costly desalination programmes give a renewed socio-ecological reality to dry areas of the USA (California, Arizona), the Atacama Desert in Chile, desert regions in China, Israel and Palestine, the Arabian Peninsula and in Egypt. New built-from-scratch megacities are booming in Saudi Arabia (i.e. NEOM), the UAE, Egypt (New Administrative Capital), China (Ordos) and in the USA (Telosa) and those are built on and out of arid terrain. Those desert mega-schemes are adding to a broader development taking place across our Earth, where large-scale geo-manipulation is being deployed to expand beyond

what was previously regarded as thresholds of habitation and capital production, at least at a major scale. Developments taking place in dry regions join the construction on swamp lands, coastal areas and even former ocean sites. Look at urban developments across Asia in Singapore, South Korea and Malaysia, again at the UAE and Saudi Arabia and across Africa (Nigeria's Eco Atlantic City, Nkuna Smart City South Africa and Kenya's Konza Technopolis). Huge geo-engineering efforts are made to create ever more spectacular building sites and governments, often in the driver's seat for planning and facilitating those large schemes with their access to public resources, funds and sovereign terrain, hope to make them a success for raising Foreign Direct Investments, expanding labour and capital markets. Mega-scale construction of this kind is often only possible because of an extractivist economy that provides construction materials, energy sources and infrastructural networks. And again, we can see, how arid sites, beaches, mountain ranges and forests are transforming along the way; being carved out, moved, erased, flattened, geo-engineered and turned into piecemeal resource commodities that can supply and sustain speculative mega-ventures.

What could be specific however about development efforts of arid lands, one might ask? Are those often lesser populated regions, in a way, not particularly well-suited for techno-political visions and missions; as testing grounds for new ideas and new developmental efforts that seek to open up new avenues for political or economic, social or even ecological aspirations? The here presented research addresses this proposition. It strongly opposes however to the claim of deserts as ideal sites, or as a blank canvas even, for the human-led interference guided by an extractivist-capitalist apparatus. The research even puts this environmental imagery of the blank canvas into context, referring (for the selected case study) to its historical conception as well as the implications that this discursive ascription allows for. To answer, what are the specificities arid sites as regions of the contemporary extractivist capitalist condition, the research looks through the prism of one specific geopolitical context, namely desert regions across the desert-country Egypt. Taking the example of Egypt, we will be able to follow exemplarily, who has an interest in developing arid thresholds? What kinds of development projects are being built into Egypt's drylands and with what tools, what kinds of infrastructures and what resources? How is labour employed and finally, what are the costs of those schemes? The research lays out and evaluates in a complex and encompassing way, what it takes to turn arid regions into productive sites of the economy. At the same time, it

highlights the counter-effects of desert programmes too, asking about the communities and the more-than-human life *not* benefitting from desert programmes, those that are negatively affected or simply bypassed by those schemes. This is a research project that sits at the intersection of political-economy and techno-politics, the making of resources as speculative assets of the economy, political-ecology and socio-ecological change. While it is situated within the context of the Middle East and North Africa and takes places in Egypt in specific, the research also has the goal to show in an exemplified way, how much larger issues, also beyond the region of the Middle East and North Africa, articulate themselves concretely? Those issues concern for example extractivist capitalism and the ongoing afterlives of colonial histories. The research makes a distinct proposition which is to focus on arid landscapes anew, with a particular attention to actors and actions manipulating them. I argue with this research that in sites, such as in desert terrains in Egypt, exploitative, extremely costly and sometimes destructive missions are taking place that too often remain hidden and uncontested behind a veil of development on the one hand and security concerns on the other. Yet, desert schemes do not happen in any sort of vacuum, they are not detached from other socio-ecological contexts but are vastly consequential. A central call of the research is to therefore blow away this veil of politics and financial speculation that treats desert sites as mute backdrop of capital production, as empty regions or isolated dumping grounds. The research puts desert development schemes into a concrete socio-ecological setting, places and grounds them and thus makes the desert the centre stage of the enquiry. Deserts, such as discussed here for the case of Egypt, are not timeless, not apart from history and not apart from their socio-ecological context. Rather, they are regions of geo-biological specificities, sites in interaction with humans and other forms of life and their changes have concrete histories that we can trace. The research puts Environmental Humanities into practice, seeing desert politics (in Egypt) in dialogue with a diversity of local conditions as well as wider contexts both geographically/in space and historically/in time.

The dissertation empirically grounds contemporary debates that opened up in recent decades within the context of the Environmental Humanities. Those debates include for instance the study of our contemporary era as characterized by human-led actions resulting in major geo-biological, atmospheric planetary consequences, debates assembled under the term of the Anthropocene and its linkages to industrial production, colonialism, the nuclear age as well

as a variety of other issues. Again, my focus with this research rests on the study of arid land within this context and, if this research achieves its set targets, I successfully provide a claim to study desert regions as significant and important sites of the Anthropocene as well as providing a case study on how to conduct such a study.

In the upcoming section, I will explain, why Egypt lends itself as a prolific case for studying desert programmes in the contemporary era. Here, I will also give an overview of the current state of desert schemes and showcase the context and relevance for the study. Then, I will set the contours of the research with the core research question and overview of empirical case studies as well as already foreshadowing some of the main take aways of the research. I will subsequently delineate the theoretical body of work that carries the research and that this research is in active dialogue with. Further, I lay out the core conceptual tools of the analysis both concerning the whole thesis as well as the specific concepts relevant for the individual empirical chapters. Later on, I will be describing the research methods and how the project was conducted in practise. This section includes some observations that have to do with the security concerns that apply in this highly securitized and opaque research environment and that have also influenced the access of material and information as well as my analysis of it.

Deserts as Sites of the Egyptian Economy

The case of Egypt provides us with an ideal example of spectacular changes built on the re-configuration of vast pieces of land (and water) taking place within contemporary context of speculation, finance, politics and immense technical interventions into an existing socioecological context. Egypt lies centrally within the world's largest desert belt that stretches from the Sahara of North Africa across the Arabian Peninsula and the Eastern Mediterranean into Central Asia. Although most known throughout the recorded history for its agricultural production along the fertile soils of the Nile, Egypt is in its grand majority made off drylands (about 90 percent of its landmass) and it is in these tracts of desert land, and not in the largely populated regions on the River Nile - where the majority of Egyptians live - where we find a mindboggling evolvement of new development projects; mega-projects with

entire new cities, new industrial zones and touristic growth poles, desert agricultural production and corporate industrial farming, energy production and mining ventures. Especially, urban construction in the desert has been booming in Egypt whether that is in the arid outskirts of the capital, Cairo, or along the country's coastlines both on the Mediterranean and the Red Sea. Just over the past four decades, about forty-five new desert towns or satellite conglomerations have appeared across Egypt (Sims 2022a) with a real estate construction peak reached in the years following the takeover of Egypt's ruling president, Abdelfattah el Sisi, in 2013. At the same time, new touristic growth poles have also been initiated, mostly along the coastal shorelines. Those enabled a proliferation of a web of infrastructures that supplies newly conceived development sites with water, electricity, labour and consumer goods. Besides, the reclamation of desert land for agricultural purposes has been taking new dimensions in Egypt. New crop fields are geo-engineered not just along the arid thresholds of the Nile Valley and Nile Delta. Also further away from the Nile, new fields of corporate agriculture are changing the flow of the country's dominant fresh water source, stretching the outreach of the Nile's watershed into formerly arid regions. The chain of oases that perforate the large Saharan regions west of the Nile are being drastically expanded and entirely new desert oases have appeared – or better, have been made – in the country's southern dryland areas. Now, NASA imagery shows the human-made patterning of industrial agriculture in Sharq Ouweinat and in Toshka with a dotted carpet of massive desert irrigation schemes shaped by centre-pivot watering stations in this largely unpopulated, most-southern area of the so-called Western Desert.

At the same time that new sites are being developed in arid regions and new parcels of desert land are being put up on an investment map, also an ephemeral security apparatus obstructs and polices those areas with checkpoints, contradictory security protocols and permits. A growing carceral complex of a prison archipelago is somewhat disturbing but in a way also complementing this growing construction and extraction taking place in arid lands.[1] Entire desert regions are put under obscure security protocols and some areas are even militarily

[1] Human Rights Watch reported that during the Sisi-rule between 2013 and 2021 dozens of new prisons have been built, over thirty (!) by various departments of the Ministry of Interior, amounting to total number of 168 detention facilities in the country, excluding police stations which also serve for the detention purposes. The NGO reports that not just the number of prisons grew dramatically but also their size. So is the new Wadi Natrun prison that lies on the axis between Cairo and the Mediterranean coast estimated at a capacity of 20,000 people. Previous structures were built much smaller, with an average capacity of less than 2000 people. (Human Rights Watch 2023)

closed off zones, such as the Halayeb-Shalateen Triangle[2], a resource-rich area that spans about 20,000 squarekilometers (about the size of Slovenia) and borders the northeast of Sudan. But also other desert sites are being tightly policed and mobilities are interrupted or diverted in an often contradictory fashion. Traveling by car from Cairo to the seaside holiday town of Sharm El Sheikh, for example, one passes through three to six checkpoints, depending on the route and time of the year, with repeating checks of IDs, car licences, the car's contents and hotel reservations. With male-only car passengers, the inspection will be thorough, probably at each point. Women in the car make for less invasive checks and tourists have it the easiest (especially Western tourists, unless you are a journalist and declare yourself as such). Passing along the littoral edge of the Red Sea and the Eastern Desert, the security measures are more fluid. Trucks carrying cargo and construction loads are frequently inspected while passenger-cars can more seamlessly pass through the landscape on semi-private road networks built, operated and serviced by subsidiaries of the local military. Checkpoints appear at fixed intervals throughout the crossover road network on the east-west-axis that connects the Red Sea coast with Nile Valley towns. Also across the Western Desert, the few road tributaries that service the desert's oases remain important ways to regulate and police the vast dryland region by concentrating the traffic through few selected arteries and frequently shutting down other existing infrastructural pathways. Other ways of patrolling the vast arid regions include air patrolling or the complete closure civilian access in some areas, during certain timeframes or for specific kinds of people. After an accidental execution of a tourist convoy through air bombing by the Egyptian Airforce, that left 12 passengers killed in the Western Desert oasis of Bahariya, the touristically developed desert region remained closed for about two years after the incident from 2015. The civilian access of regions across Sinai shifts frequently in accordance with political events taking place in the region, especially along the bordering thresholds between Egypt, Palestine and Israel.

The dissertation uses the case of Egypt as one example to reflect in-depth of this interplay of securitization and obstruction on the hand and intensive commodification on the other. It is concerned with the ways in which landscapes of sand, rocks and gravel are being turned into

[2] The Halayeb-Shalateen Triangle falls under Egyptian administration and sovereignty. Neighboring Sudan also lays claims onto the region since the British colonial administration introduced changes delineating the borderline of the northern Sudanese sovereign limits in 1902. (Serag 2023)

productive sites of the economy and how this historically unfolded. Successive Egyptian governments have turned towards the country's deserts with a number of strategies, tools and goals. The credo of the past sixty years, so it seems, has been to search for solutions for all kinds of ills and desires in the country beyond the ancient agricultural sites on the Nile. One such goal for desert developments is the increase of local food production through the horizontal expansion of agriculturally productive land. Another is the relocation of a growing population, away from the existing urban centres and rural sites on the Nile, propagated as *over-crowded*. Other goals include the growth and diversification of local industries through the construction of new industrial areas and introduction of new industries such as tourism as well as through an increase in the extraction of raw materials ranging from phosphate to fossil fuels and gold amongst others. The late 1970s are seen as a turning point for the government's more strategic focus on using desert landscapes as a resource of the economy. With the market opening agenda of newly liberalizing and globalizing markets, also in Egypt, new investment sites emerged and those were foremost situated in the country's arid sites. The so-called *Infitah* (the opening), opened up new markets through newly built industrial towns to the east and to the west of the Nile Delta. It also allowed for the emergence of a newly opened tourism industry on the Red Sea shores, along the Mediterranean and in southern Sinai. But even before that, already the revolutionary general Gamal Abdel Nasser, prime minister of the first government of an independent Egyptian republic, was invested in desert schemes at large scale. Following a more rural agenda, the regime tested out new rural lifestyles in model villages built on reclaimed sites. Nasser's centrepiece, the Aswan High Dam, built between 1960-1970, epitomizes the period's focus on supreme engineering projects that were meant to alter the local geography in a long-lasting way and with aspirations of economic gains (despite Nasser's politics' socialist tones) through the horizontal growth of the productive Nile Basin into arid thresholds. Towards the end of the century, desert projects took on increasingly the shape of real estate investment sites and massive-scale land reclamation projects. The metropolis Cairo doubled in size at the turn of the millennium with an explosion of new urban extensions onto the capital's desert peripheries (Mitchell 2002, 273) and new fields of agricultural production long-lastingly altering the flow of the Nile.

The idea of this research is not just to trace these governmental desert planning strategies and to map them out. Rather, its goal is to understand desert programmes somewhat from

the ground up. This means to understand them in their politico-economic and politico-ecological context, in relation to one another as well as putting them into a historical perspective. With this research, I do not just seek to know whether or not a desert megaproject was successful, for instance, how many reclaimed acers or feddans of a land reclamation scheme were successfully turned into continuous production. The research is an attempt to understand Egypt's desert economy and its desert politics in both their more immediate and wider socio-metabolic contexts and it wants to understand on what basis have the programmes been designed, with what goals, and what tools and finally, in whose benefit and at whose detriment?

To contextualize the research also geographically, I went to give a bit more detail about Egypt's desert regions. Arid lands border the country's coastlines on the Mediterranean and the Red Sea. Deserts hug the Nile and its supreme fertile soils to the east and the west. Some geographers suggest that Egypt is essentially a desert country and the Nile and its green Valley and Delta, that the formerly inundating river created over millennia, are in principle an elongated oasis. All the country's land borders are in deserts; on the country's western limits where Egypt borders Libya, its southern border to Sudan and eastern land border to Palestine, Israel and Jordan, all hyper-arid and arid landscapes. But these regions are not homogenous. Egypt is not made off coherent desert features, despite those geographies being similar with respect to the marginal precipitation that they receive. Geologically speaking, they vary quite significantly. West of the Nile lies the Western Desert and it is the utmost eastern extremity of the earth's largest desert, the Sahara. This Egyptian Western Desert, sometimes also referred to as Libyan Desert, has in a way more in common with arid landscapes in Morocco, Mauretania, Algeria and Libya than it has with the desert terrains that lie on the other, eastern side of the Nile. Here, east of the Nile, desert sites are mountainous, with plateau and *wadis* (dry out riverbeds) often with a rusty-coloured tint whose reflection gave the Red Sea its distinctive appearance and hence its name. This so-called Eastern Desert of Egypt lies together with its geological counterpart in Sinai and the water bodies that connects the two, the Red Sea and the Gulf of Suez, on top of the Arabian Nubian Shield, a geological pressure zone that led the findings of a variety of valuable resources in the area ranging from petrochemicals to precious metals (Hamimi et al 2021). Also, in terms of human habitation, those arid landscapes differ, for instance in Bedouin land holdings and regions of pasture but

also with regards to towns and settlements that developed over the previous centuries, like the coastal ports and trade points such as Marsa Matruh on the Mediterranean and Qusseir on the Red Sea or along the pilgrimage routes such as Suez. Further, a small series of colonial company towns were built along the Red Sea and the Gulf of Suez and those developed in majority around the later nineteenth century in correspondence with the upcoming extractive industries' commodities of that time: fossil fuels, phosphates, nitrates, manganese, coal and gold. Many of those towns have grown into large settlements such as Hurghada, Marsa Allam and Ras Gharib. In terms of nomad life, the most southern segments of the Eastern Desert belong to three major Bedouin tribes - Ma'aza, Bisharin, Ababda - whose regional outreach extends from the Red Sea to the Nile Valley in the areas south of Za'afarana. Throughout the Sinai Peninsula significant Bedouin land holdings, pasture and orchard cultivation characterize the region as well as touristic towns and resorts that starkly grew (parallel to those along the other side of the Red Sea) since the 1980s. There is widespread inhabitation along the semi-arid Mediterranean shores, west of the Nile Delta, mostly populated by Awlad 'Ali and Jumi'at whose land claims reach to the western thresholds of the Nile Delta (Cole & Altorki 1998). Touristic developments have dramatically altered this Mediterranean coastal strip however with first camping sites and touristic villages appearing in the 1960s (Moursi 2022, 287-289). A number of significantly large towns exist today along the coastline such as Alamein, Dabaa, Hamam, Sidi el Kirayr and Sidi Abd ar-Rahman. The Western Desert remains sparsely inhabited with conglomerations of oases towns individually perforating a very vast arid terrain. The oases are sustained by the world's largest known fossil aquifer, the Nubian Sandstone. The oasis of Siwa is the most populated region in this part with a population of about 30,000 inhabitants. Most of the population is Berber and speaks the local Berber dialect, called Siwi, next to Egyptian Arabic (Vivian 2000).

These are the regions that have become in Egypt's most recent history the centre stage of state-led action and forms of private speculation with desert programmes that were outlined above. These are also the diverse sites in which the research takes place. In my assessment, these regions have witnessed tremendous change and the research is set out to grabble with this change and to understand it in its contexts.

What and Who Is this Research up against? – Main Research Questions and Empirical Foci

The overarching research question of this dissertation is: How are desert regions in Egypt being *capitalized*, in whose benefit and at what price? Who are the main actors and drivers of processes of capitalization? What tools have been necessary and what tools are been employed along the way – meaning infrastructural systems, socio-ecological resources, labour practices and also administrative as well as legal discourses? Upon which discursive underpinnings do desert schemes rest, for example, in reference to the environmental imaginations of arid lands as well as legal structures that regulate those sites? What is specific about the desert as a space for extraction and production in Egypt? Finally, what is the price for turning a desert inside out and who will pay the price? In other words, what are the more immediate and the more *longue durée* effects of this process of capitalization and who or what will have to deal with those over time?

Throughout the research, I look at how desert development projects in Egypt are conceived? How are they designed and by whom? This means to look at material and technical infrastructures that enable those projects such as irrigation and road networks as well as the use of raw materials. It also means to investigate legal and bureaucratic settings that regulate desert areas, for instance governmental institutions that manage these sites. Rather than focussing one single industry, the research applies a cross-sectoral view. The reason for this is to grasp on a more encompassing way and on a level that concerns territory (not just one specific region), how desert regions have morphed to become a centre stage of the economy? Looking at a diversity of desert programmes, one starts to put together a kaleidoscopic picture of actors and discourses, of types of actions and priorities, of privileges and their counter-effects. We will see in the different empirical segments, how different actors involved worked across those industries, from investors to planners, builders to labourers. It is also my goal with the research to demonstrate governmental approaches and their practical take on desert territories – again, rather than segmenting it to one specific industry.

The research consists of three main empirical case studies making up the three empirical chapters of the dissertation. Each one represents a concrete spatial practice of capitalization

taking place and reshaping arid terrains in consequential ways. I argue that those have been constitutive for morphing Egypt's deserts into becoming sites for capital production. The three practices are first, land reclamation and industrial corporate agriculture, second, geological research and mining and finally, the construction of new cities and touristic resorts. All these are happening across the Egypt's desert terrains and they are majorly altering its geo-physical materiality as well as legal-bureaucratic conditions. While emerging historically in specific ways, these practices also overlapped in different moments in time and it is fair to say that all three have been flourishing under the current Sisi-administration. Today, governmental plans, such as Sisi's Egypt 2030, plan to conduct numerous projects in the three industries - desert agriculture, mining and desert real estate. The three industries exist alongside other desert programmes such as in the field of energy production, industrial zones and environmental protection programmes. Why were those excluded from the research? The empirical chapter on real estate contains helpful information on industrial zones. Therefore, this issue did not seem to lend itself towards an individual analysis. The production of energy, on the other hand, could have been a valuable addition to the overall project. It has been however excluded from this version of the research because of simple time constraints. An analysis of this sector will make a beneficial addition to the research later on and I plan to include it in subsequent work on the subject. The same goes for a discussion of environmental protection programmes, such as national parks. Thanks to the works of Jeannie Sowers on the issue, we know that investments and governmental programmes in this sector are extremely marginal (2013). It will however be useful to trace the involvement of multilateral organizations in this sector and also the sector's overall changes throughout the years in correspondence with the rise of desert regions becoming more and more economically relevant.

To repeat, the research investigates the processes that have led to the capitalization of desert regions in Egypt and further examines the ways in which this ongoing process – of capitalizing the dryland regions – concretely materializes and it does so across three different industrial segments which are land reclamation and corporate desert agriculture, mining and geological research and finally, new town developments and tourism in Egypt's booming desert real estate industry. In a later part of the introduction, I will present the research methodology and plan in detail. It is necessary at this moment of the dissertation to open up the theoretical

backdrop in front of which the research takes place and based on which it was conceived in terms of the research method and design.

Theoretical Setting of the Research

The research draws from several theoretical streams and in correspondence with that, from different methodological approaches to grabble with the subject of Egypt's desert politics, desert ecologies and desert economy. At the heart, the project interweaves four important fields of scholarly inquiry which are: the Environmental Humanities, studies of extractivist capitalism, research on colonial histories and deserts as ground of inquiry. These are however not discrete theoretical camps, at least not those elements of research that I draw from for this research. Rather, there are intersectional links between them. It may be argued that theories around extractivism and extractivist capitalism have developed as a subfield of the Environmental Humanities. While this may be simply wrong for some, what is noticeable with certainty for the evolution of the field is that extractivist analyses picked up new steam as discussions around the subject of the Anthropocene, as a central locus of debate in the Environmental Humanities, unfolded. Drawing from other theoretical traditions such as Marxist economics, next to development studies, logistics analysis, research on global networks, raw materials, labour, manufacturing and others, extractivism as a field, has grown over the past ten years into an active arena of debate that brings together ecological issues with socio-economic relations and as such it is of critical value for the research laid out here. Somewhat comparably, the study of colonial histories is also not *per se* exclusive to the Environmental Humanities. There is of course a hugely rich body of scholarship that has its home in the fields of History and Postcolonial Studies, studies of race and also studies of slavery that concerns the research of colonial histories. But again, within the more recent – meaning about two decades old – forming discussions around the convergence of climate change and social disparities, held within a context of the Environmental Humanities, research on colonial histories and its aftermath in influencing socio-ecological environments has contributed a great deal to our understanding of today's crises. Finally, within a contemporary context of desert research strong linkages to the other selected fields can be found whether it regards research of colonial relations, resource extraction and

environmental injustices. It is in this way that I bring in bring these scholarly streams into the analysis because it helps to situate contemporary conditions within their historical contexts while pointing towards deep injustices and violences that lay at the root of the more recent misuses and exploitations of ecological resources and also, to understand in a nuanced way, the complexities of power relations and their impacts.

But let us go back to the beginning to situating the dissertation project in the theoretical framework of the Environmental Humanities. In the next step, I will introduce how the Environmental Humanities and in specific the field of Anthropocene research has served as a central frame of reference for the research and then, explain how those other theoretical influences – extractivism, the focus on colonial histories and on deserts – further enriched the project's theoretical body. The core concepts that the research applies both overall as well as in the specific empirical chapters together with the methodological tools of research were strongly informed by those theoretical streams and those will be presented later on.

Environmental Humanities and the Study of the Anthropocene

The Environmental Humanities are the field of inquiry of nature-human relations, an interdisciplinary field at the conjuncture of History, Philosophy, Ethics, Cultural Geography, Anthropology, Literature and Political Ecology. It has been majorly influenced, over the past two decades, by the debate of the Anthropocene. The concept of the Anthropocene postulates a new geological age in which humans have come to act as a geological force impacting our planet in irreversible ways. The term, Anthropocene, has grown into a sort of mega-category under which scholars coming both from the social and the natural sciences are addressing challenges caused by human, societal and industrial interventions into Earth. First claimed by the chemistry Nobel prize winner Paul Crutzen and Eugene Stoermer in the year 2000, the term was meant to formally recognize the magnitude and planetary reach of human activities. Since then, the Anthropocene idea has surged multidisciplinary interest. It became gradually absorbed by different scientific disciplines as an informal term that still awaits formal consideration of the Earth's contemporary geological epoch (Luciano 2021, 3). In 2009, the Anthropocene Working Group was formed at the International Commission on Stratigraphy to achieve this formal recognition of a very recent and yet distinct geological era that replaces the Holocene epoch which lasted for over 10,000 years. Headed by the British

geologist Jan Zalasiewicz, the working group included, for the first time in the history of the the International Commission on Stratigraphy, a group of social scientists - archelogists, historians and lawyers - that were meant to support finding new methods and tools to define and capture the Anthropocene age (Zalasiewicz in conversation with Rowan Deer at the Anthropocene Curriculum 2022). Now, the working group recommends as a starting point for this new geologocal epoch the mid-twentieth century. It states, this is "coinciding with the array of geologocal proxy signals preserved within recently accumulated stata and resulting from the 'Great Acceleration' of population growth, industrialization and globalization." (Subcommission on Quaternary Stratigraphy 2019)

As the concept migrates through academic fields, new accents are being put on it. For instance, new propositions come from the field of history, feminist and postcolonial studies as well as the field of political-economy. Dipesh Chakarbarty's essay "The Climate of History: Four Theses" that appeared in *Critical Inquiry* in 2009 is seen as somewhat seminal not just for the discipline of history but for shifting the dyanamics of approaching the Anthropocene debate with the social sciences which specifically influenced the Environmental Humanities. While geologists continue to debate the validaity of the Anthropocene thesis, Chakrabarty argues, no less is at stake than the radical transformation of the meaning of history and our perception of human history as one that is entangled with geological history and timescales. Other important voices from the fields of the social sciences and humanties join in into the discussion such as the anthropologist Anna Tsing. Tsing points in her reflection "Earth Stalked by Man" (2016) to the uneven, "patchy, fractured" nature of the Anthropocene and to the "post Enlightenment Man, the one who got us into the mess we call the Anthropocene" (Tsing 2016, 2). Tsing further thinks with the figure of the *plantation* for reflecting upon the epoch's definition and character, while the plantation stands for "those ecological simplifications in which living things are transformed into resources – future assets – by removing them from their life worlds" (4). This figure of thought even cumulates in the term *Plantationocene* as an alternative terminology for the era, yet, Tsing herself does not exclude working with the Anthropocene conception as well. In contrast to that, Donna Haraway's take on the issue, proposed in *Staying with the Trouble* (Haraway 2016), takes it a notch further, arguing for the need of a replacement term and also a replacement conception to capture the ongoing planetary epoch. Her main point of critique towards the Anthropocene idea is the *anthropos* itself which refers to the centrality and exceptionalism of not just certain humans but the

human in general. Haraway's proposal is the *Chthulucene*; a neologism created after the Californian spider *Pimoa Cthulhu.* Its name carries the chthonic, goddesses and forces of the Earth worshipped by animistic faiths (Haraway 2016, 54-55). "[Human] beings are not the only important actors in the Chthulucene, with all other beings simply able to act. The order is reknitted: human beings are with and of the earth, and the biotic and abiotic powers of the earth are the main story." (Haraway 2016, 55) During the 2010s, conference titles, exhibition pamphlets and new journal series, issues or entire journal publications across the social sciences and humanities as well as in the natural sciences start to carry the issue of the Anthropocene in their titles[3]. Berlin's Haus der Kulturen der Welt, for example, launches, as one of the pioneers, the *Anthropocene Curriculum* in 2013 and the Zentrum fuer Kunst und Medien curates with *Critical Zones* a large exhibition on the issue, with catalogue and online symposium during the lockdown of 2020, where Anthropocene discussions and case studies are presented from many flagship thinkers such as Donna Haraway, Bruno Latour, Forensic Architecture and Jan Zalasiewicz amongst others. Bruno Latour's work, for instance, can in many ways be seen as path leading in the Anthropocene debate overall, even if in his works, he refers to the actual term rather in passing. The French historian and sociologist of the sciences shaped however methods and epistemological conceptions of the Anthropocene like few others. Latour's actor-network theory and the planetary hypothesis of *Gaïa* have widely provided conceptual tools for Anthropocene research. His transdisciplinary calls for action and analysis reshaped scientific approaches by inextricably linking natural with social worlds and processes.[4]

[3] To give some example, many large publishing houses have by now launched an entire journal to the issue of the Anthropocene, such as the journal *The Anthropocene* which started to publish in 2013 (Elsevier), *The Anthropocene Review* (Sage), *Anthropocenes-Human, Inhuman, Posthuman* (University of Westminster Press), *Anthropocene Science* (Springer) and *Elementa: Science of the Anthropocene* (University of California Press). Countless individual journal issues have by now been published responding to the Anthropocene and its diverse sub-fields.

[4] Important references for Latour's work that relates to conceptions and discourses of the Anthropocene start with the early work *We Have Never Been Modern* (1993) and also include *Politics of Nature* (2004), *Reassembling the Social: An Introduction to Actor-Network-Theory* (2005), *Facing Gaia: Eight Lectures on the New Climate Regime* (2017) and *Down to Earth: Politics in the New Climate Regime* (2018). Actor-network theory will be introduced with some more information in the methods-section of the dissertation. To say a few words about the Gaïa hypothesis: it suggests that all kinds of living beings can collectively regulate and influence their abiotic environments, meaning the composition of the atmospheres and oceans as well as potentially the climate. In other words, "Gaïa is Life plus its effects on habitability" according to Lenton, Dutreuil & Latour (2020) following Lovelock and Margulis.

What stands out in the further progression of the Anthropocene debate and the tangent evolvement of the Environmental Humanities with it, is a renewed focus on critically examining the social aspects and social disparities of ecological devastation and ecological change in general. Like suggested in Tsing's *Plantationocene*, many other social scientists and researchers from the humanities have come forward to reconceptualize the debate, and thus the geological time period in a way that better accounts for the uneven social relations linked to the ongoing climate crisis. For example, researchers highlight the ways in socio-economically marginalized or racialized communities are more affected by deteriorating ecological conditions than others. Postcolonial approaches to the topic are able to emphasize those disparities for example by historically situating them into colonial relations and dependencies (see discussion of those below). Other examples include research done in the fields of racial capitalism, colonial extractivism, labour studies, conflict studies, urban planning, feminist and indigenous research among many others.

Concerning the relevance of this body of work for the research on the research of Egypt's deserts, Anthropocene discussions provide an analytical lens that brings together social and natural worlds as co-productive, hence I work with terms such as socio-ecological, socionatures or sociometabolic. Deserts in general, not just the drylands of Egypt, are significant sites of the Anthropocene and it is one goal of this research to advocate for this and demonstrate it exemplarily.

To summarize this section, as far as concerns this research, the Environmental Humanities and the Anthropocene debate in specific, provide a theoretical frame of reference for the co-workings of social and ecological processes involving a multitude of actors and actions. In its a core a multidisciplinary venture, this field looks at shifting ecological conditions as a problem of and intertwined with social-political, socio-economic themes.

Extractivist Capitalism

The second theoretical emphasis of this research lies on extractivist capitalism. Academic works on extractivism has seen a momentum in recent years. This surely has to do with some of the above-described research on the Anthropocene and the convergence of the use of

ecological resources and its social effects as well as networks. Research done on regions in Latin America have significantly contributed to the extractivism field. Other regions of the world are today also studied within this framework such as regions in the Artic (Kroeger 2016, 2019, Wilson and Stammler 2016) or Soviet and post-Soviet regions (Ocaklı et al 2021). As a theoretical concept, extractivism studies extraction of raw materials and wealth as "a mode of accumulation starting at massive scale about 500 years ago" (Acosta 2013, 62). The Helsinki Research Group on Global Extractivism and Alternatives characterizes extractivism, in 2022, as an *organizing concept*, rather than a mere practice, that is founded in "socio-ecologically destructive processes of subjugation, depletion, and non-reciprocal relations, occurring at all levels of practices" (Chagnon et al 2022, 762). Extractivism does not just deal with the digging up of ecological matter and its circulation around global industrial networks. Rather, as stated by the working group, the field examines the unequal social relations that are inscribed into extractivist systems and practices. In terms of its application, research on extractivism, is not just relevant for the fields of mining of minerals and fossil fuel extraction. Also agrarian practices, forestry and fishing as well as raw material manufacturing and processing are part of the analysis. This means that the exploitation and appropriation of raw materials is being reviewed under this umbrella. Foundational theoretical thought comes from Marxist material analysis and research that specifically targets the commodification of nature (Arboleda 2020, Moore 2015, Coronil 1997, Mezzadra and Neilson 2019). Other fundamental inputs to the field originated in extractivist paradigms of the colonial era's resource and labour exploitation (Acosta 2013, Galeano 1973, Gudynas 2015, Rodney 1972). There is a large tradition of thought that interrogates the socio-environmental consequences of resource extraction for instance as capital production expands into new frontier regions. Examples include David Harvey's analysis of the crisis over-accumulation (Harvey 2003) and both the vertical and horizontal expansion into new regions of the planet (Barney 2009, Bennett 2016, Moore 2000a, Kelly and Peluso 2015, Tsing 2003). Stephen Bunker's work on "modes of extraction" (Bunker 1988) is also an example of this in which he shows the transfer of value from peripheral to core regions through resources rather than labour. Alf Hornborg (1998) and James Rice (2007) both argued that extractive regions (in the peripheries) were locked inside extractive cycles for their developmental prospects and Gavin Bridge argued that global production networks of extractive industries provide only limited opportunities for socio-economic development (Bridge 2008, 2004). An analysis of the dialectical relation with the

international division of nature and the international division of labour can be exemplary found in Fernando Coronil's *The Magical State* from 1997. Sandro Mezzadra and Brett Neilson's works also takes place in this context. Their first joint book *Border as Method* (2013) discusses the expansion of capital accumulation linked to the expansion into frontier regions building on the thinking of Luxemburg, Curzon, Marx and Turner. In their second co-authored book *The Politics of Operations* (2019), they interrogate "how particular operations of capital 'hit the ground'" (Mezzadra & Neilson 2019, 38). They are making an attempt at conceptually capturing the working of capital's operations that take into consideration the material aspects of *the ground*. For the Marxist thinkers, those operations of capital are extractive, not necessarily only reducing them to mined goods or raw materials dup up from the Earth's subsoil. "We certainly include such literally extractive activities in our analysis, noting the importance of mining, monocultural farming, and other practices of extracting wealth from the Earth for political and economic gain" (Mezzadra & Neilson 2019, 38). So, extraction, according to Mezzadra and Neilson, can be used both in the literal sense and in the expansive sense which may include the extraction of data as much as the extraction of nickel or coal. Their distinct emphasis rests on bringing debates of the operations of capital together with those of the material world. In this way, their suggestion is very productive for my own research. Also the writings of the Anthropologist James Ferguson on global capital's extractivist spaces and infrastructures in Africa has influenced my theoretical thinking, specifically his evocation of *extractive enclaves*. It is a particularly well-crafted idea that captures the spatial character of global capital seen from the site of extraction in the African context (in the text titled *Seeing Like an Oil Company* from 2005, a twist on James Scott's classic *Seeing like a State* from 1998). Similar to the interests of other anthropologists, also Ferguson was at the beginning of the millennium primarily concerned with the local articulations of the global networks of capital (see also Ong 2006 and Tsing 2003 amongst others). Ferguson argues that despite common belief of Africa being left out of global capital networks, there have been significant investments made into Africa's mineral extraction industries. Those investments have however not created homogenised spaces of capital production – proclaimed by Scott (1998) – but rather have resulted in sophisticated spatially isolated enclaves of extraction such as can be seen exemplarily in Angola's offshore oil drilling ventures. Those territorial enclaves are protected by private armies and security forces, according to Ferguson, next to often employing mostly a foreign skilled workforce and thus,

disconnecting the local population from the production process systematically who are as a consequence little benefitting from the extractive industry, if benefitting from the process at all (Ferguson 2005, 378). Further capital flows bypass local populations. “Capital does not ‘flow’ from London to Cabinda; it hops, neatly skipping over most of what lies in between. When capital is invested in spatially segregated mineral-extraction enclaves, the ‘flow’ of capital does not cover the globe, it connects discrete points on it.” (Ferguson 2005, 379) Fifteen years after Ferguson, also Martin Arbolda thinks anew through the relationship of local and global relations in the process of extraction and asks about the spatiality of extractive capital in *The Planetary Mine* (2020). Working from the exploration and mining of the Atacama Desert in Chile, Arbolda demonstrates across the supply chain how global logistical networks and even urban infrastructures are interlinked with local mines and pits: “the mine is not a discrete sociotechnical object but a dense network of territorial infrastructures and spatial technologies vastly dispersed across space” (Arboleda 2020, 5). The writings of geographer Gavin Bridges have further highlighted in a fruitful way, the material dimensions of resources within resource geographies, considering both the material as well as cultural and discursively constructed dimensions of raw materials (Bakker & Bridge 2006, Bridge 2009, 2017). Similarly, Matthew Huber emphasizes the materiality of the environment in processes of extraction at the nexus of capitalism, resources and the environment (Huber 2017).

In addition to those, there is a wide array of analyses that stresses the external processes for resourcing nature which looks into the materialized local outcomes of nonlocal processes of expert knowledge, market developments, governance and valuation (see for example Barry 2013, Hudson 2001, Li 2014, Kama 2016, Mitchell 2011).

Henry Veltmeyer, James Petras and Veronica Albuja (2014) re-apply the extractivism paradigm within the contemporary context of the Americas in a new way. What they describe as neo-extractivism in Latin America shows, according to the authors, that the arguably sustainable and equalizing mode for social development heralded by neo-extractivists, like the Brazilian president Lula, reinforces predatory forms of capitalism and imperialism. A further spin-off conception is global extractivism. This puts the emphasis on global networks and structures that move material goods, patterns of consumptions, financial patterns as well as biodiversity loss and pollution (Brad et al. 2015, Svampa 2019, Tsing 2003).

To conclude, this is a vast field of inquiry that has shown growing interests over the past decade or so. At the heart of the analysis stands is the quest to put capital and its accumulation into capital's socionatural contexts while pointing towards the uneven relationships laying at the roots and resulting from extractivist processes. Many authors mentioned above point towards the colonial and imperial traditions upon which contemporary extractivist practices and systems rest. I will spend some separate paragraph on this in order to emphasize the importance of postcolonial analysis for my own research of the extractivist conditions of desert politics in Egypt. I employ the lens of the extractivism field in applying it to a diversity of industries and practices – not just to mining – but also for agricultural practices in the deserts and for Egypt's construction sector while maintaining a special interest in looking for who benefits from desert programmes and who does not, asking how resources are deployed and profits distributed.

The Ongoing Aftermath of Colonial and Imperialist Relations

The third theoretical emphasis of the research lies on the importance of tracing desert politics and desert economies in Egypt back historically in order to place and name unjust patterns of extraction, subjection and environmental depletion also in their historical continuity. Within the above presented field of extractivism much emphasis has been put on the colonial systems and relations that are said to lie at the root of our contemporary networks of capital accumulation. Postcolonial scholars, even if not regularly referred to on those more contemporary analyses, have paved the way for our understanding of those links such as Walter Rodney's seminal work *How Europe Underdeveloped Africa* (1972). In this history of capitalism, the pan-African and African diaspora scholar-activist, Rodney, presents the case of Africa's underdevelopment as a product of imperial extraction which, he states, as a practice that continues into the present. Inspired by Marxist and Leninist thought - among other theorists of the nature of capitalism and imperialism together with capitalism's expansionist drive such as Rosa Luxemburg – Rodney interrogates the nature of development, and he comes to the conclusion that development and underdevelopment stand in dialectical relationship to one another. "In the first place," he writes, "the wealth created by African labour and from African resources was grabbed by capitalist countries of Europe; and in the

second place, restrictions were placed upon African capacity to make maximum use of economic potential – which is what development is all about." (Rodney 1972, 30) Spaces of depletion are thus being created across the African continent through exploitation and overutilization of resources that are destined for spaces of production and consumption in European metropolises. (In the more recent literature on extractivism even in direct correspondence to extractivism's colonial roots, there is sadly too little mentioning of Rodney's work despite its relevance and timeliness.) Next to Rodney, another classic informed the ways we think about ongoing workings of extractive imperialism, Eduardo Galeano's *Open Veins of Latin America: Five Centuries of the Pillage of a Continent* (1973, a copy of which was gifted by Hugo Chavez to the US president Barack Obama in 2009). At the core of the book is a dependency theory that similar to Rodney's observations (and published around the same time), emphasized the dialectal character of imperialism between Latin America and Europe and later, between Latin America and the USA. Many other scholars pick up from this discussion of the dialectal paradigm that defines colonial imperialism as capital accumulation expands into new frontier sites (Bunker 1988, Gudynas 2015, Machado Aráoz 2013, Mezzadra & Neilson 2013, Petras and Veltmeyer 2014), for example by looking into the formative core-periphery dynamics (Acosta 2013, Bunker 1988, Hornbourg 1998, Rice 2007). Today, authors still recognize the foundational and ongoing dynamics of asymmetrical power relations between spaces of extraction and spaces of capital accumulation or consumption that were established during the colonial period that last into and have informed the neoliberal period (Acosta 2013, Gago and Mezzadra 2018, Grosfoguel 2020, Patel & Moore 2017). This is a particularly important conceptual anchor for this research; namely, the historical continuity of uneven extractive power relations that originate in colonial world systems/ world ecologies and reach into more contemporary extractivist conditions.

The entangled relations of slavery, forced labour and racial inequalities are another important focus of the work that traces the lasting colonial histories of extraction and capital accumulation (already prevalent in Walter Rodney's work). Anna Tsing's earlier-mentioned proposition of the *Plantationocene* incorporates this exemplarily. Tsing suggests:

> The term plantation for me evokes the heritage of a particular set of histories involving what happened after the European invasion of the New World, particularly involving the capture of Africans as enslaved labor and the simplification of crops so as to allow enslaved laborers to be the agricultural workers. In many small, independent farming situations, dozens of crops are raised that need to be tended by

> farmers who are invested in attending to each one. In designing systems for coerced labor, ecological simplifications entered agriculture. The plantation was precisely the conjuncture between ecological simplifications, the discipline of plants in particular, and the discipline of humans to work on those.
>
> Mitman 2019 in conversation with Tsing and Haraway

For Tsing (and also Haraway, see the same source above) an ongoing condition, the Plantationocene rests upon the subjugation of *some* people – enslaved and coerced labour – as well as ecosystems. Steve Lerner (2010) and following him a number of other extractivist researchers such as Maristella Svampa (2015) and Naomi Klein (2014).

“semi-industrial areas—largely populated by African Americans, Latinos, Native Americans, and low-income whites—where a dangerous and sometimes lethal brand of racial and economic discrimination persists.” The proliferation of sacrifice zones, according to Klein, reveals the impoverishment of a “colonial mind” that fuses progress and fossil fuels with a destructive vision of freedom.

In another context, the historian Gabrielle Hecht displays colonial continuities along racial lines of inequalities, taking the example of gold mining in South Africa. Hecht writes powerfully under the subtitle “That Is Why You Can See Apartheid from Space” about the lasting socioecological effects of South Africa’s Witwatersrand mine. Hecht’s work on the subject takes place within a rather recent review of the Anthropocene discussion that seeks to emphasize the unevenness of today’s climate crisis, environmental destruction and its effects (see also Hecht “Interscalar Vehicles for an African Anthropocene: On Waste, Temporality, and Violence” 2018). Her most recent book *Residual Governance – How South Africa Foretells Planetary Futures* (2023) emphasises “the profitability of racial conditions” (41) and “the systemic, enduring violence of racism baked into infrastructures” (42). Hecht writes:

> That’s why you can see apartheid from space.
> Tailings don’t merely testify to this history: they carry its damage into the present and the future. Their most spectacular violence-tailings dam failures in 1974 and 1994 that released floods of slime with enough for to kill people and destroy homes – were construed as accidents. But their violence operates in slower, more quotidian ways.
>
> Hecht 2023, 45

Convincingly applied by Hecht, the timely conception of the ongoing racial inequalities that are still fundamental to contemporary living conditions in our capital-centred present, is a conceptual tool that we see applied in some of the most evocative and most timely research

on sociometablic injustices and their colonial origins (read for example Bhandar 2018, Ferreira da Silva 2022, Heng 2015, Yusoff 2018). In the follow-up section of this text, I will come back to those *slow* ways of violence that Hecht talks about, in correspondence with some other historians and social scientists (Koddenbrock et al. 2022, Lee 2012, Nixon 2011, Stephens 2018) and that has served as a conceptual and methodological lens for my own work.

To give a little more detail about the ways in which authors link extractivist conditions to racial inequalities and colonial histories, I will exemplarily sketch out the writings of Kathryn Yusoff and Brenna Bhandar on the subject. Yusoff's history of the science of geology shows, comparable to Hecht, a focus on the colonial and racial underpinnings of today's extractive economies. She suggests in *A Billion Black Anthropocenes or None* (2018):

> Modern liberalism is forged through colonial violence, and slavery is at least coterminous with its ideas and experiences of freedom, if not with the material root of its historical possibility… As the Anthropocene proclaims the language of species life – *anthropos* – through a universalist geologic commons, it neatly erases histories of racism that were incubated through the regulatory structure of geologic relations. The racial categorization of Blackness shares its natality with mining the New World, as does the material impetus for colonialism in the first instance… The human and its subcategory, the inhuman, are historically relational to a discourse of settler-colonial rights and the material practice of extraction…
>
> Yusoff 2018, 2

Yusoff argues in depth that, since its origins, the discipline of geology has been implicated in racial capitalism and also the ruining of ecosystems.

The legal scholar Brenna Bhandar is concerned with the modern property laws and processes of racialization in her book *Colonial Lives of Property – Land, Law, and Racial Regimes of Ownership* (2018). She demonstrates a form of historical continuity and foundational momentum of colonial relations informing contemporary systems, in her case, with a focus on property regimes. Bhandar thus reveals how commodity logics of abstraction, that are at the root of modern concepts of capitalist economies, are formed through racial abstractions and in the realm of property through the prevalence of social hierarchies. In her own words, "modern property laws emerged along with and through colonial modes of appropriation" (Bhandar 2018, 3). She continues, "the evolution of modern property laws and justifications for private property ownership were articulated through the attribution of value to the lives of those defined as having the capacity, will, and technology to appropriate, which in turn was contingent on pre-vailing concepts of race and racial difference" (Bhandar 2018, 4). For

example, in South Australia, the *terra nullius* legal doctrine incorporated the racial ascription of indigenous peoples as noncompetent – through lack in civilization – and therefore, as unfit to be the rightful owners of the land, making the land empty and thus ripe for appropriation. The formation of the legal category of property is, according to Bhandar, in a continuity with colonialism, and it marries the production of racial subjects with an economy of private property ownership which remains to define indigenous and alternate modalities of tending to, using and owning land and resources (Bhandar 2018, 7).

To summarize what has been said until now, I repeat, that the central threads are, one, the joint discussion of social together with ecological processes, two, extractivist logics and conditions of the subjugation and the exploitation of nature and (some!) people, in addition to three, a focus on historical continuities of unjust sociometabolic processes and relations. What now further remains to be assessed is how deserts as spaces of extraction and sites of colonial histories and, in many places of the world, as sites an extractivist colonial tradition serve as a ground of analysis. Out of this web of theoretical traditions and discourses the conceptual ideas of the project have been woven. In the discussion above, it was shown that these were never discrete realms of debate but rather intersectional lines of inquiry. Yet, this is not a standardized theoretical approach. My goal was to work out specific accents from these theoretical spaces and seeing them in conversation with one another.
In the follow-up, I demonstrate how these theoretical ideas have translated into the conceptual and methodological approach of the research, applying those ideas and accents for collecting, evaluating and discussing empirical and archival resources. But first, I present an overview of some of the fundamental discussions currently held within the contexts of those theoretical debates that shed light onto deserts as ecologies of the Environmental Humanities, of extractivism and of colonial histories.

Desert as a Site of Inquiry – What Is It Worth?

Alongside the above demonstrated theoretical landscape of research, what equally frames this work is research on our planet's deserts conducted within a context of the relevant theoretical fields of inquiry – as shown above -, namely, the Environmental Humanities Extractivism and colonial histories. I will discuss some of the works of selected authors that

were particularly important in shaping the discussion of deserts as sites of capital and extraction and the environmental imaginaries, including colonial ones, upon which extractive capitalism rests which are central elements of the analysis at hand. This overview is not limited to studies on deserts in the Middle Eastern region and the Sahara of North Africa, even if geographically speaking, this makes the central locus of my research. I will display relevant works on my region of interest alongside discussions that shape desert studies (within the relevant subject fields) as they provide extremely valuable conceptual ideas also for this research. Having said that, literature on Middle Eastern deserts and the Sahara of North Africa in specific are of special importance for my work.

Overall, one can recognize that the field of desert studies in the context of the Environmental Humanities is not a hugely popular field of research when compared to research done on other sociometablic systems. Some emphases has crystallized in recent years that concerns the field of colonial tropes and practices as well as deserts as sites of intensive extractive projects as well as, and linked to the former, deserts as sites of environmental change and crisis.

Diana K. Davis is one of the core thinkers of the subject who with her historical analyses gave a new direction to some of the ways in which the field of desert studies operates today. Her work fundamentally questions core ideas of the field such as *desertification*. She further engages critically with reasons as well as tools of combatting desertification and the spread of deserts. Davis works primarily on environmental imaginaries of arid lands writing about how those discursive ideas of the desert shape political, economic and civil engagements with those regions as well as how they are being shaped by encounters with deserts in return. Her distinct focus, coming from the field of history and writing across environmental history, geography and political ecology, rests on colonial relationships with the Sahara of North Africa and the European view onto those sites (Davis 2016, 2011, 2007). She displayed in *The Arid Lands* (2016) in an incredible account of archival sources how discursive tropes of the Sahara took shape during the French and British colonial projects (while considering the Italian colonies in the area of North Africa to a lesser extend). Davis demonstrates how colonial ideas of deserts and the engagement with those regions diverged from pre-colonial understandings and dealings with those same geographical sites, for example as recorded in travel accounts of Roman or Greek travellers. She also brings the discussion to the contemporary moment, showcasing how those discursive ideas, that took shape through the European engagements

with the Sahara, travelled to other desert regions and other colonial, imperial and extractive projects, such as in the Americas. Eventually, Davis points out the contemporary implications of colonial ideas for development programmes including those that seek to *push back the desert*, to combat desertification or regenerate desert landscapes. At the core of Davis' argument is that the evolvement of a discourse of science and the scientific engagement with the world by colonial travellers, scientists, autocrats, during the eighteenth and nineteenth century, was evoking ideas of the possibilities of human actions fundamentally changing environmental conditions, in Davis' own words: "the idea that humans could improve nature on a large scale, as well as destroy it, was clearly developed by the late eighteenth century" (Davis 2016, 67). Those ideas did not just arise in the scientific encounter with drylands but also through research done on other regions of the planet – such as in tropical islands of the French and British empire – which served as sites of experimentation and for the forming of scientific discourse. This had within the imperial context of the Sahara several consequences. The ecological conditions of deserts started to be compared to forest regions and other native landscapes in Anglo-Europe which led to the popularising of the idea of deserts as deforested, degraded landscapes, wasted and unproductive. Deserts, as much as they had presumably gotten ruined, could, as a consequence of this discourse trope of environmental determinism, also be improved. As a way of contrast, in the early Greek writings, for instance of Herodotus and contemporaries, deserts appeared as wilderness regions which were equal to the description of forests and other uncultivated lands beyond the *polis* (Davis 2016, 33-34). Earlier Christian texts had developed ideas of deserts as site of "punitive drought" of a divine punishment but also a place of withdrawal and of divine testing, thus, as a place of the sublime (Davis 2016, 47). This was later picked up by colonial scholars and administrators in the context of North Africa (Davis 2016, 37). By the eighteenth century, notions of humans as geographic agents were forming in the writings of Montesquieu, Carpenter and others. Soon, native populations as well as local governments were blamed for the assumed degraded and destroyed state of the Sahara, for the infertilities of soils and the assumed loss of rainfalls. Deserts were now associated with environmental decline linked to political and economic decline and false land uses. Within a context of empire, it was the nomads that were to blame. Desert regions needed to be improved through the "human industry" (citing Montesquieu, Davis 2016, 69) through agriculture, afforestation and conceptions of property. Notions of devastation, wastelands and desiccated continue even well into the contemporary

era where nomads are still accused of destroying their environments for example by livestock overgrazing. This is met by local governments and multilateral development agencies with prohibiting of ingenious land uses and the sedentarization of indigenous tribes (Davis 2016, 143-154) together with development and extractive ventures that seek to *roll back the desert* or extract value from it through privatization and investments (Davis 2016, 168). Davis overall gives a rich historical account that is currently unmatched in its detail within the field. It demonstrates in rich detail of through discursive analysis how desert ideas that are still set at the base of governmental programmes and the involvement of a multilateral development apparatus have taken shape at the intersection of military occupation, science and research, extractivist desires and practices and racist discourses.

For an analytical reflection of desert tropes of the Sahara in the colonial context has now been further elaborated on within the field, with many authors paying tribute to Davis' contribution. Samia Henni is one of them. She has presented fascinating input to further think about the discursive foundations of deserts for *coloniality* and also in relation to *toxicity*. In *Deserts Are Not Empty* (2022), the Algerian architect and art historian, argues that "a regime of emptiness" has served as legitimization to transform, manipulate, destroy and toxify arid regions (Henni 2022, 15). Stereotypes of deserts that declare drylands as dead or empty have specifically helped to defend choices of the colonization of territory in the Algerian Sahara. This became enacted for example through the firing of France's first atomic bombs between 1960 and 1966 in their colonized arid territories. Despite the politically widespread acceptance of Algeria's referendum for self-determination in 1961 and the country's factual independence in 1962, France had detonated seventeen nuclear bombs and tested additional atomic explosions underground. Those atomic bombs and explosions caused irreversible spreading of radioactive material across Algeria, Central and West Africa, and the Mediterranean (including southern Europe). Henni argues:

> The *toxicity* and *coloniality* of Frances nuclear program – which severely damaged and contaminated the human, animal, vegetal, and mineral lives of the desert – did not disappear with the departure of the French colonial authorities and with Algerian independence. On the contrary, they are engraved on the particles of the desert for thousands of years, if not forever.
>
> Henni 2022, 15-16

Henni's account is a very recent nuanced understanding of the complexities of colonization and how it acts in and through its arid environments in the North African region. Also a series of other researchers have powerfully shown that the French colonial project was also centrally a project of science, prospecting and data collection grounded in the arid environments which can also be seen in *A Desert Named Peace: The Violence of France's Empire in the Algerian Sahara, 1844–1902* (Brower 2011), *Sahara 1830–1881: Les mirages français et la tragédie des Flatters* (Grévoz 1989), *La conquête du Sahara, 1885–1905* (Pandolfi 2018) and *The Conquest of the Sahara* (Porch 1984). This research attests to the fact that territories of the Sahara were under continues military observation through the expansion of administration and science into regions of the desert and researchers thus focus on the history of science and sociology of science in monitoring desert sites and its inhabitants that became critical tools for the colonization of the areas. Those collected a variety of data starting from the second half of the nineteenth century in the fields of geography, meteorology, botany, zoology, resource and ethnography of the regions, while those scientific missions were meant to territorially connect dryland terrains with French territories in northern, central and western Africa with multiple goals amongst which was the extraction of resources (such as oil and gas), the enlargement of empire and the impeding of British endeavours in the Saharan regions. In *Resurrecting the Granary of Rome* (Davis 2007), Davis adds that strategies of the French colonial apparatus which included programmes to revive desert regions, such as through the Algerian Forest Law from 1903. (A detailed discussion of this will follow in the land reclamation analysis, later in this text). Similar programmes were found within the British imperial contexts, for instance in India and South Africa with afforestation programmes and the criminalization of tree cutting (Davis 2016). British colonial projects and their engagements with desert lands, such as applied in regions in Egypt and Sudan, Palestine, India and South Africa, show a distinct emphasis to manipulating desert regions through colonial irrigation projects which started to become a central practice of imperial administration from the mid-nineteenth century in order to boost agricultural production, enlarge taxable landed properties and thus potential exports in places in India and Egypt (Beinart & William 2007). These practices were based on guiding principles of making a wasteland productive according to European standards (Davis 2026, 112). (This will be at the heart of the analysis of Chapter 1). Researchers in this field work (such as Derr 2011, El Shakry 2007, Satia 2011) also work across the shaping of discursive ideas, bureaucratic

protocols and scientific practices as well as accounting for material infrastructures such as dams and canals. Wasteland ideas were not seldomly connected to biblical notions of deserts, such as in Palestine and Egypt, as a "former garden Eden" whose denudation and abandonment had to be associated, according to the British colonial administration to, with the mismanagement of the local Arab societies. This translated into forms of desert administration and the colonial dealings with nomad societies in the colonized regions which is discussed by Robert Fletcher in *British Imperialism and the Tribal Question* (2015). Also Zionist ideologies and practices were majorly influenced by those imperial discourses and actions build on tropes of deserts as abandoned and ruined wastelands that were the result of the misuse of those former fertile regions (at least assumed as such) by Arab societies, such as revealed in Alon Tal's *Pollution in the Promised Land* (2005) and Eyal Weizman's *The Conflict Shoreline* (2015) (see also Dana & Jarbawi 2017, Jaber 2019, Baroud & Rubeo 2019).

We can see how colonial desert tropes interlink with practices of sciences, military actions, racist categorization as well as practices of displacement and the expansion of empires. Also in the discussions of settler-colonial contexts, such as in Australia and in North America, one can recognize desert discourses of emptiness and wastelands coupled with racist discriminations towards indigenous peoples dominated (Cheng & Lara 2019, Robin & Griffiths 1997). Brahim El Guabli's idea of *Saharanism* (El Guabli 2024, 2023) captures the relationship of the travelling of ideas, practices and things between the colonized world and the so-called New World. What he named Saharanism is "a pervasive ideology that universalises deserts, anchoring them in the popular imagination as empty, exploitable and interchangeable spaces. Since they are seen as *res nullius* (property of no one), states, militaries and venture capitalists lay claim to desert sites for a host of purposes." (El Guabli 2023) Because of imported imperialist constructs of deserts as wasteland and wilderness, a whole array of practices has been realized over the past century ranging from industrial infrastructures to energy harvesting nuclear testing and agricultural production, argues El Guabli. And because of Saharanism, American deserts today are both the cinematic backdrop of Oppenheimer as well as the festival grounds for *Burning Man,* says the literary critic. Also Jospeh Masco reveals indicative aspects of the joint nature of experimentation – both in the militaristic sense and in the sense of experimenting with new forms of society - and desert tropes of emptiness and wastelands, in his case for the example of the Nevada Desert. He writes, "The contemporary

American desert exists as (post)modernist frontier and sacrifice zone, simultaneously a fantasy playground where individuals move to reinvent themselves, and a technoscientific wasteland where the most dangerous projects of a militarized society are located." (Masco 2004) Masco and others (see also Center for Land Use Interpretation 1996, Gilewitch et al 2014, Massey & Nisbet 2021, Kuletz 1998) emphasize that the American West and its deserts have served has ideal ground for military experimentation, including nuclear tests as well as building sites for new desert cities such as Las Vegas. Based on a discursive backdrop of wilderness, Masco states, monumental efforts to create a modern rugged tabula rasa of a "dreamspace for spectacular progress" (Masco 2004). Here, the military industrial complex of the super-secret, the toxic and the deadly exists alongside possibilities of the pristine, dystopian and utopian visions of a modern capitalistic society. Other significant writings of desert imaginations of North American arid regions include *The Invention of the American Desert* (Massey & Nisbet 2021), *The Sacred Desert* (Jasper 2004) and *The Desert in Modern Literature and Philosophy* (Tynan 2020), *Scenes in American Deserta* (Banham 1982) and *Without Form and Void: The American Desert as Trope and Terrain* (Beck 2001).

Deserts as resource reservoirs and sites of extractive missions are central motives of the discussions of deserts' environmental imaginations and the political-economic engagement with those regions for the contexts of South America (Arboleda 2020, Babidge 2016, Babidge et al 2019, Galaz-Mandakovic, et al 2023; Rivera & Galaz-Mandakovic 2023, Weinberg & Figueroa 2023). Tropes of the Atacama Desert as laboratory and also as a sacrifice zone, similar to the discursive ascriptions in other geographical regions, have dominated since the early nineteenth century relying on an entangled history of science and capitalism (Rivera & Galaz-Mandakovic 2023). Studies on the extraction of copper (Acosta 2020, Sapiains 2021), Lithium (Blair et al 2023, Jerez et al 2021, Quevedo 2023, Weinberg 2023) and the mining of water (Babidge 2016, Garcés & Alvarez 2020) are in the centre of the contemporary analysis, again with emphases on colonial links and dependencies as well as the ecological ramifications of the extractive processes. Also the contemporary research on Middle Eastern desert regions is displaying a strong focus on extraction as well as a focus on energy production. Recent research on the contexts of the Sahara and the Negev suggests ongoing forms of colonialism through ecological modernization in those deserts. Especially, the case of the Western Sahara is numerously discussed in this context, next to a focus of works on

Palestine. In *Profit over Peace in Western Sahara* (2018), scholars Erik Hagen and Mario Pfeiffer, classify the country as *Africa's last colony* laying between Moroccan/French and Spanish interests in the exploitation of land and marine-based resources such as phosphate and oil, fishery, agriculture and renewable energy production from solar and wind (Hagen & Pfeiffer 2018). The European Union, argue scholars Joanna Allan and Raquel Ojeda-García, has not acted against the ongoing Moroccan military presence and its direct exploitation of local resources in Western Sahara due to concerns about containing migration, terrorism and the stability of the political regime (Allan & Ojeda-García 2021, see also Allan 2016, Brus 2007, Camprubí 2015, Haugen 2007). The ongoing colonizing actions of the Moroccan state in Western Sahara are further veiled behind developmental ideals of green energy advancements and sustainability, as forms of greenwashing colonialism (Allan et al 2021). It is similar in the Israeli-Palestinian case as discussed by Manal Shquair (Shquair 2023). In occupied Palestine forms of *eco-normalization* and the exacerbating climate and energy crisis are used to justify the massive extraction of resources such as water from the Jordan River as well as ethnic cleansing of the occupied territories. Hamza Hamouchene unpacks some of the complexities of what he terms green colonialism for the Maghreb. Hamouchene states that climate change in this region tends to be represented as something common to the entire planet rather than showing concrete responsibilities of the industrialized West. This translates in practice into green colonialism where with the goal to address a just energy transition in response to the climate crisis for example through green hydrogen which, according to the author, results in neocolonial forms of plunder and dispossession backed by financial and development institutions (Hamouchene 2023, 29-43).

Those very timely and important debates about the more contemporary structures of desert region's extractive politics and industries demonstrate new and old strategies at the same time. Research on extractivism in the Atacama Desert, the Sahara and the Negev has moved those debates forward in particular and they revealed in a nuanced way the convergence of old imperial tropes of deserts together with new protocols and needs for resources, energy and their (cheap) production. My own research takes place within this field of inquiry where more recent discursive ideas of deserts are being questioned by tracing colonial practices – both discursive and materially –into the present as they lay the foundations for extractivist economies, the dispossession of land and resources and thus deeply alter the sociometablic

conditions of the desert regions of concern. Further, as the recent literature in the field powerfully demonstrates, the involvements of the development apparatus, governments, investors, and financiers into programmes that seek to extract or produce value from those regions need to be neatly studied with regards to their goals, ideals and practices. As a theoretical backdrop, the contemporary field of desert studies at the intersection of the Environmental Humanities, Extractivism and colonial histories, provides us a rich repertoire for critically dissecting contemporary desert politics and economies, such as in my case, for understanding changes in desert regions in Egypt.

Core Concepts

The core concepts that carry this research are based fundamentally on the theoretical landscape of works displayed above. They have further concretely shaped the ways in which the research was methodologically conceived and conducted, meaning, what kinds of information and sources were sought after, how the information was examined, evaluated and discussed. The core concepts are captured with the following terms: capitalization, material-discursive and the *longue durée* as well as slow violence and they are presented in this section.

Capitalization

One of the biggest scholarlily inspirations for this research is the work of Timothy Mitchell. His conceptual approaches of bringing together a surprising mix of actors and actions in understanding modern political economic situations and conditions is truly inspiring. That he also has written in much of his work on Egypt is a lucky coincidence for me. In a forthcoming book about the history of the economy and the politics of the climate crisis, Mitchell works through two core conceptions, one being durability and the other being capitalization (discussed in part at an event of the Walter Rodney Collective for Historical Research at SOAS on 15 Decembre 2022). With the term durability, Mitchell puts attention onto the quality of materials of built infrastructures that became important vectors of the economy towards the end of the nineteenth and at the beginning of the twentieth century where materials such steel, iron and concrete were used in the construction of transcontinental railways, oil

infrastructures or for urban growth. Those lasting technical infrastructures promised a much more long-term form of revenue creation over time which was supported and guaranteed by a political and economic apparatus of guarantees, trusts and reliability. Capitalization, according to Mitchell, is a way in which future revenue can be captured and sold in the present, for example through shareholding and the trading of stocks. In contrast to Marxist definitions, his idea is not merely concerned with the relative surplus revenue captured through the exploitation of wage labour – accumulated over the past and present. Capitalization is a form of organizing the present according to the future that is captured through stabilized forms of guarantees, predictability and durable technical infrastructures. This is a daring proposition and one that inspired my approach. Yet, it is not exactly the same emphasis that I seek to make with applying the term capitalization. Mitchell's focus lies on the technopolitical apparatus that organizes time as something inherent in capital processes and central to the political economy of the turn of the century, lasting into the mid-twentieth century. I am centring my analysis not so much on the factor of time but rather on space and the space-time nexus. Yet, what I take from Mitchell, is that specific attention to forms of technopolitical organization. What I am after is to discuss the ways in which capital is produced and captured spatially and how it organizes and is organized through a set of relations.

Much of the before mentioned literature on extractivism already gives us many relevant and powerful examples on the spatial dynamics of capital under extractivist conditions. Departing from research of the earlier twentieth century such as the writings of the founder of the German Communist Party, Rosa Luxemburg, from the "Accumulation of Capital" (1913), the expansive drive of capital into new sites and territories has been numerously highlighted. Mezzadra and Neilson pick up from some of the core thoughts of Luxemburg in which she had argued that capitalist development rested upon a *constitutive outside* of non-capitalist forms of production that capital metaphorically colonizes. Mezzadra and Neilson write:

> Though Luxemburg's emphasis on the role played by a 'constitutive outside' in capitalist development remains important, the literal understanding of this outside in territorial terms did not allow her to grasp the exceptional elasticity of Marx's theoretical framework. The combination of 'absolute' and 'relative surplus value' in understanding the (extensive and intensive) expansion of capital's frontiers opens up a new perspective on the continuous production of this constitutive outside (through the 'production of new needs and the discovery and creation of new use values') that

> can continue well beyond the point when territories literally lying outside the domination of capital no longer exist. Far from becoming only intensive … this process continuously redefines the meaning of space — opening up the possibility of a new extensive expansion of capital's frontiers …
>
> Mezzadra & Neilson 2013, 72

In a comparable way, David Harvey puts at the foundation of his famous idea, *accumulation by dispossession*, that contemporary capitalism derives from the point that capital must look "outside itself" for solutions to crises of over-accumulation in which surplus capital lacks profitable outlets (Harvey 2003, 149). His fellow Marxist economist Jason W. Moore stresses the "profound geographical restlessness" of extractivist economies and companies in specific in order to control new resource deposits (Moore 2007, 130). This spatial expansion of capital into new frontiers, in this space of debate, has been attracting much scholarly attention. The *frontier* terminology in specific is probably the most utilized and sought after concept when it comes to trying to grasp the spatial dynamics of capital accumulation including in the context of empire and also within a context of globalization. The latter has been particularly noticeable in the literature of Anthropology of the early twenty first century. Researchers such as Anna Tsing, James Ferguson, Aihwa Ong and Saskia Sassen are some of the thinkers that paint a picture of localized systems and conditions intertwined with global flows - of capital, labour, goods and infrastructures. Anna Tsing for example wrote to describe the workings of the frontier within the global web of capital with the following:

> Frontiers are not just edges; they are particular kinds of edges where the expansive nature of extraction comes into its own. Built from historical models of European conquest, frontiers create wildness so that some – and not others – may recap its rewards. Frontiers are deregulated because they arise in the interstitial spaces made by collaborations among legitimate and illegitimate partners: armies and bandits; gangsters and corporations; builders and despoilers.
>
> Tsing 2003, 27

What follows in Tsing's book *Friction* are ethnographic vignettes of frontier making processes and their effects in the Kalimantan Forest of Indonesia. Tsing provides us here with an image of how frontiers come about and they concretely operate; a picture that is full with great details and pointed connections. Mezzadra and Neilson's interpretation of the frontier in reference to their key research motif, the border, in *Border as Method* (2013) shows that:

> The distinction between the border and the frontier is undoubtedly important. The former has typically been considered a line, whereas the latter has been constructed as an open and expansive space. In many contemporary contexts, however, this

> distinction seems to dissolve. The borders of the current European space, for example, take on aspects of the indetermination that has historically characterized the frontier, expanding into surrounding territories and constructing spaces according to a variable geometry articulated on multiple geographical scales.
>
> Mezzadra & Neilson 2013, 16

Referencing Walter Mignolo, Mezzadra and Neilson continue to state that categories such as centre and periphery analogue to core and margin are tied to ideas of a colonial frontier modernity (18). Many other extractivist scholars work in a related manner through the spatial differentiations of core versus periphery or metropolis versus colony (see for instance Acosta 2013, Bunker 1988, Gudynas 2015, Galeano 1973).

Jason W. Moore characterized the frontier in a different conceptual way, arguing for *Capitalism as Frontier* (2014). He suggested:

> It was the frontier concept – rough-and-ready as it was – that helped me see that capitalism did not form within a reified Europe and then expand. Capitalism formed through the Great Frontier. Commodity frontiers – above all in sugar planting and silver mining – were the Great Frontier's most spectacular crystallizations. (Others, like the Great Domestication of so-called women's work, were also decisive.) Frontiers, in this rendering, were not about linear boundaries on the edges of a cartographic projection (itself a frontier technology): they were strategies of power, profit and life, and geographical flashpoints of their contradictions.
>
> Moore 2021, 2

The frontier, thus as a specific configuration of the organization of power (that can be spatial or not), does not lie outside of capital (in the not-yet of capital) but rather is inherent to how capital works and thus built into the workings of capital, according to Moore; frontiers as strategies of power.

Besides this rich analytical space of the frontier, other relevant literature seeks to further describe the spatial dimensions through which capital and extractivist capitalism takes place, sometimes with a strong focus on the material and infrastructural means thanks to which those processes can be realized (Barney 2009, Bennett 2016, De Angelis 2004, Mitchell 2011, Moore 2000a). Those discussions have diversified our understanding of what expansion looks like, for instance, looking beyond the horizontal dimension and the horizontal conquest of new lands or expansions of sovereign territories. A new volumetric emphasis on space, sometimes called the *volumetric turn* (Billé 2019 after Elden's *Secure the Volume* 2013), has supported this literature which includes Stephen Graham's *Vertical* (2016), Philip Steinberg & Kimberley Peters "Wet Ontologies, Fluid Spaces: Giving Depth to Volume through Oceanic

Thinking" (2015), Eyal Weizman's *Hollow Land* (2007), and the edited collection *Voluminous States* (2020) by Franck Billé among others. Especially the latter puts an important renewed focus onto the role of the state in securing sovereign rights over three-dimensional spaces in the air, in the subsoil, on land or in the sea.

In this dissertation, I chose not to put the emphasis on working out the frontier dynamics of desert economics and politics in Egypt. Those academic reflections seem saturated and there has been a tendency, despite Moore's intervention, for putting sites of extraction into the periphery. I want to instead, understand changes in arid regions across Egypt as being part of the web of life, as embedded into concrete local and historical sociometablic contexts and conditions while also affecting those in return. To say it differently, frontier concepts that put extractive regions into the margin obstruct the fact that extractive actions – arguably taking place in some remote region of the world, some empty wasteland according to some discursive assertations – change sociometablic contexts and trigger a whole range of ecological and social effects. I am wondering if there is not a way to think about extractivist capitalism in spatial terms thinking beyond the core-periphery binary and from the entangled world of connections and relations and interdependencies?

I want to suggest to work through the concept of capitalization within a web of life because what this project seeks to surface and evaluate are the spatial and spatio-temporal relations of unevenness that create value and are as tradable as assets through power relations, technologies, legal and bureaucratic protocols that benefit some and do not benefit others. Capitalization here is an organization of space within capital accumulation that subsumes relations of power and also works thanks to and with consequences to local conditions in a multi-faceted way, meaning at large and at small scale, far and close, coming from the past into the present and into the future. Here the emphasis is not on discussing the growth of capital markets or the expansion of capitalist relations into *new* regions, bringing in an assumed outside or to making new connections (where arguably before there weren't any) but to describe a form of organization and assessing power relations of different actors involved with a focus on the spatial organization and constructed hierarchies not as an instrument of capital but *as* capital through specific socioecological spatial organizations of specific sites.

I take this from the Marxist geographer Jason W. Moore who himself never used the term capitalization but whose conceptual proposition of capital-nature relations is at the heart of my approach. Moore argues in *Anthropocene or Capitalocene – Nature, History, and the Crisis of Capitalism* (essay collection edited by him and published in 2016) as follows:

> I argue for an interpretative frame for capital's history that builds on Donna Haraway's longstanding critique of 'human exceptionalism'. Capitalism is a way of organizing *nature as a whole* […] a nature in which human organizations (classes, empires, markets, etc.) not only make environments, but are simultaneously made by the historical influx and flow of the web of life. In this perspective capitalism is a world-ecology that joins accumulation of capital, the pursuit of power, and the co-production of nature in successive historical configurations.
>
> Moore 2016, 7

Moore suggests that capitalism is a form of organization of the so-called *web of life*. In this application of Marxist theory, Moore claims that capitalism is not just a world-system but instead, a *world-ecology*. It exists *in* nature and is part of *the web of life*. Rather than seeing capitalism as an economic and social system that is apart from the realm of nature and as a human social organization that might simply use or abuse ecological products and systems, Moore puts capitalism and the history of capital production into the history of the web of life, as something that co-produces and is co-produced by ecosystems and their changes. This is in agreement with Dipesh Chakarbarty's proposal in *The Climate of History in a Planetary Age arguing* for a joint history of nature and of humans (meaning human social actions and human life) (Chakrabarty 2009). Moore epitomizes this convergence of nature and capital in the term of the *Capitalocene* which he proposes as an alternative to describing this new perspective onto ecosystem changes and what affects them and thus as an alternative idea to the Anthropocene (which as displayed earlier puts the *anthropos*, the human, into the centre of the discussion.). To paraphrase Moore, the emergence of capitalism and the ways in which capitalism works are not just merely social categories but rather, they are socio-ecological categories. Capitalism can be seen as a way of organizing socio-nature systems, and it is in turn also shaped by those. Moore further suggests, together with political scientist Raj Patel, that capitalism thrives on the creation and use so-called *cheap* things, such as *cheap nature*, *cheap work* or *cheap lives*. "[C]heapness: it's a set of strategies to manage relations between capitalism and the web of life by temporarily fixing capitalism's crises. Cheap is not the same as low cost—though that's part of it. Cheap is a strategy, a practice, a violence that mobilizes

all kinds of work—human and animal, botanical and geological—with as little compensation as possible." (Patel & Moore 2017, 22) Moore's Capitalocene-thesis locates in this way the origins of socio-ecological crisis in capitalisms exploitative relationship to food, labour, raw materials and energy. The conception makes important connections between capital accumulation resting on forms of extraction and the exploitation of resources, including labour and natural resources, and the ways in which these processes act upon and in the world.

Capitalism as a way of organizing nature as a whole and sociometablic systems in concrete is the guiding principle that I take from Moore. That I tweaked the term for my own conceptual uses into capitalization has to do with the desire to emphasise the processual dynamics as well as the historical dimension of the process (just like stressed by Moore himself) as a way to revealing historical continuities. Capitalization as a spatial and spatio-temporal process of organization sociometablic conditions that is this analysis is about at its core.

To apply this for the here presented research, and to repeat my set of core research question: How are arid regions in Egypt being capitalized? Further, how do desert projects concretely operate and who do they benefit? What is specific about the desert as a space of capitalization? And how are socio-ecological contexts affected?

To conclude this section, to engage with capitalization as a process of organizing spatial and spatio-temporal relations means to see, in the case of this research here, desert lands in Egypt not as distinct regions that are apart from their wider geo-physical, atmospheric and social contexts but as socio-ecologically complex and embedded sites. Geographical and territorial categories such as property or resources can are being reviewed and analysed within this conceptual framework as types of organization that are stabilized through different means, such as infrastructures, legal and bureaucratic protocols etcetera (here also the linkages to Mitchell are visible). Also discursive assertations and environmental imaginaries that treat arid regions as wastelands, empty or desolate sites can being reassessed within a political-economic context of the *cheapening* of nature, resources and communities upon which processes of capitalization fundamentally rely. Discussing instances and processes of

capitalization can therefore depict strategies of power, uneven relations and sometimes violent practices of dispossession, loss and destruction.

In the next segment, I will give some more details about the ways in which the spatial and spatio-temporal organization of relations are being put into the analysis, namely the central methodological lens of the research that has been applied and that is captured in the term *material-discursive*.

Material-Discursive

A number of key conceptual and methodological elements characterize the field of the Environmental Humanities and the study of the Anthropocene. In the introductory volume *Humanités Environnementales* edited by Guillaume Blanc, Elise Demeulenaere and Wolf Feuerhahn, the authors identify five foci within the field which are interdisciplinarity, the centrality of materiality, the challenging of the nature-culture divide, the inclusion of non-scientific actors as experts (such as farmers and indigenous peoples) and a connection to environmental activism (Blanc et al 2017, 15-16). But how does one exactly *do* research in the Environmental Humanities, accounting for those different elements? How does one put this interdisciplinarity into practice and consider the co-productivity of social and ecological processes? Several disciplinary subfields have developed over the past two decades that employ different, yet somewhat related sets of tools and lenses, for example the research in the environmental history, ecocriticism, environmental philosophy, environmental anthropology and speculative environmental research. In terms of conceptual and methodological tools we find some common threads between those. Those include among others the application of actor-network theory together with science and technology studies or technoscience, new materialism, agential realism and even eco-science fiction. At the core of this is a quest to open up research and debate towards the actions and agency of the non-human, sometimes described as the more-than human world.

In actor-network theory, short ANT, the actors, also referred to as agents or actants, “are heterogeneous in that they include both human and non-human entities, with no methodologically significant distinction between them. Both humans and non-humans form *associations*, linking with other actors to form networks. Both humans and non-humans have interests that cause them to act, that need to be accommodated, and that can be managed

and used" (Sismondo 2004, 81). ANT was majorly influenced by the writings of Michel Callon and Bruno Latour who as sociologists and historians of the sciences propose this conceptual framework to capture scientific processes of producing knowledge. ANT's aim is to understand how people, ideas, technologies and ecologies for networks through relations. Those relations are not fixed but rather emerging within the course of network interactions and they require constant repetition (Leslie 2009). At the heart of this social theory is how networks are formed, how they solidify and why they fall apart (Rantisi & Boggs 2009)? The seminal work by Latour and Callon on the subject reaches its peak around the turn of the millennium and it leads to the rise of fields such as New Materialism with their newly set emphasis on materialist theory.

At the beginning of the new millennium, a question plaguing the Environmental Humanities and associated disciplines is *What's the Matter with Matter?*, in other words, how to engage with the social lives of the non-human world, or again, "What does it mean to give agency to the material, to follow the material and to act with the material?" (Lange-Berndt 2015, 13). Scholars argue that the traditional Marxist theories and previous studies of material culture were not sufficiently taking into consideration the lives or specificities of the material world as such "fibres, stones or synthetic polymers are largely thought of as being dead and useless unless human agency activates them" (Lange-Berndt 2015, 17). The sometimes provocative response of this wave of new materialist-thinkers is that materials are *vibrant* (according to Bennett 2010), dynamic and entangled (with other things through relations, according to Barad 2007), never finished or whole (according to Haraway 1988) or have an *élan vital* (an animated, vital spirit, according to Bergson 1907 published in 1998). New Materialism puts materials into action, or better, takes the actions and agency of materials into non-discriminatory consideration. What counts as materials is yet not simply an object. New Materialism is somewhat at odds with an object-oriented ontology. Rather, it considers the material in the sense of non-human or mor-than-human actors that are becoming embedded into the social world. Within a web of social connections, more-than-human activities, such as those done by animals, particles or microbes, are considered producers – not just receivers – of social interactions.

The physicist and philosopher Karen Barad is one of the key figures that influenced the conceptual tools as well as approaches in this space of research that deals with the comprehension and interaction with the material world. Their work evokes the concept of

agential realism as a way to capture the entanglement of both matter and meaning. This is their take on New Materialism and it is sometimes also categorized as feminist New Materialism. It is a way that seeks to grasp the *performativity*, following feminist thought, of materiality. Matter is, according to Barad, dynamic, not passive and "not a thing but a doing" (Barad 2003, 151). Barad draws on the Foucauldian notion of discourse but also critically states that Foucault is "not clear about the material nature of discursive practices" (Barad 2003, 63). They argue for an entangled relationship of both discourse and matter. This stands in contrast to a proposition that seeks to understand how discourse exists *in* the material world, or how discourse is enacted *through* the material world. Instead:

> The relationship between the material and the discursive is one of mutual entailment. Neither is articulated/articulable in the absence of the other; matter and meaning are mutually articulated. Neither discursive practices nor material phenomena are ontologically or epistemologically prior. Neither can be explained in terms of the other. Neither has privileged status in determining the other.
>
> Barad 2003, 822

The physicist-philosopher Barad captures this non-hierarchical relationship in the term *material-discursive*. The entanglement of the material-discursive is in their thinking an ontological category rather than an empirical one, referring to their co-constitutive nature. "To be entangled is not simply to be intertwined with one another, as in the joining of separate entities, but to lack an independent, self-contained existence' (Barad, 2007, ix) This is also described by elsewhere as *agential matter* (Barad 2007, 246) is a way to radically disentangle the matter and meaning binary. Other researchers have proposed reflections that can be seen as in relation or at least in conversation with those ideas such as the proposition of *generative matter*, a concept that Dolphijn and van der Tuin (2012, 93) attributed to DeLanda (1996). Donna Haraway's "material-semiotic nodes" (Haraway 1988, 595) also count to comparable ideas (published in 1988 in *Situated Knowledges*, the concept is almost like a precursor of the later appearing feminist New Materialism of Barad and Dolphijn and Tuin).

In the research, I employ material-discursive thinking following Barad as a leading principle and as a mythological idea as it provides an understanding of *how* discursive practices and materials *intra-act* (to use another of Barad's ideas). Following Barad's lead, I work with this idea of material-discursivity, acknowledging the working of and working *together of* material and discursive actions. For my subject of study, this helps us for example to take notice of

how the proclamation of the desert as empty or wasteland is less of a discursive idea detached from the material world but it is entangled into a web of social relations as a matter-meaning that mutes and invalidates the ecological specificities and the existence of nomad communities with consequential effects (which are in themselves also material-discursive).

To work with this form of New Materialist thinking also multiplies the possibilities of accounting for actors and actions at work in a given process. Now, actors are not just politicians, public servants, farmers, Bedouins, labourers but also the role taken by raw materials, material infrastructures, bureaucracy protocols and laws who play a significant part in the processes and hence in the discussion of a process. To give an example, for the extraction of raw materials from arid sites to take place (such as discussed in Chapter 2 of this text), legal settings and jurisdictions as well as environmental imaginaries inform extractive practices but so does the geophysical condition of the land and subsoil particles, the machines of digging and surveying and the 3D renditions produced of underground properties. These elements work together. Together, they fundamentally affect the process of extraction, its conception, how it is spatially enacted, visually represented and even financially backed. Speculative finance in the realm of mining, for instance, inherently relies on the interplay of geo-physical mapping and all sorts of scientific tools of measuring and calculating the conditions and thus assumed quality and value of underground properties. Those will be measured against the costs of the mining process, comprising of a variety of factors such as labour costs, political stability, technical infrastructural requirements (and their access) etcetera. Political regulations and guarantees put in place through institutional arrangements and insurances further accompany this process. Also the aftermath of the extraction, through the specificities of dust, residues and particles together with atmospheric and other ecological conditions as well as socio-geographical factors that define what communities live in close proximity to the mining site, demonstrate those co-constitutive actions that cannot be disentangled. The formulation of the *material-discursive* allows me to put these different elements and processes into one story. It provides me with a useful kaleidoscopic vision of understanding the complexities of capitalization in Egypt's desert terrains in order to capture and discuss the complex strategies of power that organize spatial and spatio-temporal relations.

Based on this conceptual input, the empirical research was designed and conducted. I will outline in the later section of the research design how this concretely materialized for the three selected case studies. What I want to underline at this point, and as a way to summarize the above, I will say that the research is deeply influenced by New Materialist thought coming out of ideas of the co-workings of the human and the more-than-human world through social relations and connections. Material-discursive thinking represents one of the conceptual approaches that have developed within this context to deal with the active involvement of non-human actors within social networks and social situations. This specific approach concentrates on the impossibility to disentangle matter from meaning or physicality from ideas thus collapsing dichotomies that separate the physical realm from the intelligible realm of discourse or material worlds from social spheres. In terms of methodological approach, to think with the material-discursive diversifies what is being looked and how: legal discourses, labour practices, machines, maps and statistics of productivity, scientific studies etcetera, all count as actors who act in the world and/as they create meaning. Again, this is not about humans animating nature but rather socioecological process and relations of people, things, elements, ideas all being part of entangled, co-constitutive processes.

The *Longue Durée* and Slow Violence

This final section is meant to complete the picture on the conceptual approach that is woven into the whole argument of the thesis before I go on to discussing other conceptual motives that were specifically relevant for the individual empirical chapters how this approach was concretely put into practice in through empirical and archival work. This is a complementary part in reference to the above where I want to stress the importance of the historical dimension of the research, why the writing of history matter and the *how* of the history writing process.

Concerning this historical dimension, the intervention of Dipesh Chakrabarty was previously mentioned in this text. His bold assertion claims that the thesis of the Anthropocene dismantles a distinction between the history of humans and a history of the planet (Chakrabarty 2009, 179). The writing of history, according to Chakrabarty, needs to reflect our daily sense of inhabiting the earth and can no longer externalize or disconnect human

timescales from geological timescales. “[T]he histories of volcanoes, mountains, oceans and plate tectonics” must enter humanities and “critical thought” (Chakrabarty 2009, 181).

A corresponding suggestion for the convergence of human history and non-human history and how to grabble in history writing and its reflection with this convergence comes in the form of the conceptual term of the *longue durée* which is increasingly applied in the context of tracing histories of the climate crisis, environmental injustices and appropriations linked to resource extraction and abuse and hence, it is indispensable for understanding capitalization within the web of life.

The *longue durée* as a concept originates in the writings of the French historian Fernand Braudel. In 1949, Braudel publishes in *The Mediterranean and the Mediterranean World in the Age of Philip II* the thesis of the plurality of social times. The *longue durée* is history of “man in his relationship to the environment, a history in which all change is slow, a history of constant repetition, ever-recurring cycles” (Braudel according to Lee 2012, 2). This form of history exists together with a medium-term history of rhythms and conjunctures, and finally, a history of events, also called “surface disturbances” (ibid). Later, Braudel even adds a fourth time to this differentiation of social times, *la très longue durée*, which knows no ruptures and changes, thus, is eternal. This allowed Braudel to specify that the *longue durée* is not generalized and ahistorical but rather specific, with beginning and end (Lee 2012, 3). Braudel’s historical classifications gave birth to what he himself subsumed as *geo-history*, an approach that pays special attention to the immediate and short-term effect of human’s cultural and political productions onto the *longue durée* of nature and an understanding that considers the ecological conditions with which a given society is in contact (Sawyer 2015, 5).

In recent decades, the term has seen new popularity. According to the historians Jo Guldi and David Armitage, this form of history writing, namely one that is characterized by thinking in much longer timescales, had disappeared between the 1970s and 2000s, after having shown more popularity in the 1950s and 1960s, the time in which Braudel and his contemporaries were majorly influencing the debate’s contours. But now, Armitage and Guldi say, “in many realms of historical writings, big is back” (Armitage & Guldi 2013, 9). The reason for the recent promulgation of these long historical timescales is, according to the historians, that “the longue durée has an ethical purpose,” as “it proposes an engaged academia trying to come to terms with the knowledge production that characterizes our own moment of crisis, not just within the humanities but across the global system as a whole” (Armitage and Guldi 2013,

37). This is exemplarily shown in Sandra Gillman's *Oceans of the "Longues Durées"* (2012), Wai-Chee Dimock's *Through Other Continents: American Literature across Deep Time* (2006) and Edward O. Wilson's *In Search of Nature* (2006). Also in the context of world-systems analysis, like done by Giovanni Arrighi (1994) and Immanuel Wallerstein (2004), the *longue durée* functions as a new guiding principle. From there, it was picked up by Jason W. Moore for his conception of capitalism as world-ecology as a way to study the dialectic of capital and nature over time and within a context of world capitalism (exemplarily shown in "Capitalist Development in World-Historical Perspective" written together with Arrighi in 2001 and "Environmental Crises and the Metabolic Rift in World-Historical Perspective" Moore 2000b[5]). The *longue durée* is sometimes used to emphasize deeply consequential and lasting historical conditions at the nexus of human-nature relations, for instance in the case of colonial histories in relation to extractivism, development and poverty (see for example Koddenbrock et al 2022, Heng 2015, Stephens 2019). In a similar vein, we find recent application in the field of nuclear histories (Boudia 2009, Hecht 2010) and the social lives and histories of waste (Hurley 2017, Allon et al 2021). Also the conceptual propositions about the history writing of the Anthropocene in general has come to incorporate the *longue durée* idea including Braudel's fundamental suggestions which can be found in Christophe Bonneuil and Jean-Baptiste Fressoz's *The Shock of the Anthropocene* (2016) and also in the before mentioned text by Dipesh Chakrabarty *The Climate of History: Four Thesis* (2009). Braudel's *La Méditerranée* is referenced and considered by Chakrabarty but the idea of the *longue durée* does not appear in his proposal. Chakrabarty recognizes Braudel's contribution for the field of history and the relationship of the history of nature and the history of humans saying that in Braudel's ideas "nature played an active role in modeling human actions" (Chakrabarty 2009, 205). At the same time, the pivotal work of Braudel has, according to Chakrabarty, its limitations in understanding humans as a geological force as well. Bruno Latour suggests in his writings on the capturing and discussing of temporalities of the Anthropocene that "through a surprising inversion of background and foreground, it is human history that has become frozen and natural history that is taking on a frenetic pace" (Latour 2014, 12). Latour states that "One of the main puzzles of Western history is not that 'there are people who still

[5] 2001. Capitalist Development in World-Historical Perspective, with Giovanni Arrighi, in Robert Albritton, et al., eds., *Phases of Capitalist Development*. New York: Palgrave, 56-75.

believe in animism,' but the rather naive belief that many still have in a deanimated world of mere stuff; just at the moment when they themselves multiply the agencies with which they are more deeply entangled every day. The more we move in geo-story, the more this belief seems difficult to understand." (Latour 2014, 7) Latour's proposal for history as *geo-story* builds on Braudel's thesis of geo-history. It becomes a central motif for Latour to one his most critical questions, namely the "problem for all of us in philosophy, science, or literature becomes: [which is] how do we tell such a story?" (Latour 2014, 3).

As a concept for thinking through sociometablic relations in and over time, the idea of the *longue durée* provides a helpful base for debate to think with continuities and multiplicities of timescales with regards to the complex relations of humans and the more-than world. As the concept metamorphed through various applications in different scholarly contexts, its accents and its aims have changed. I find it a fruitful lens for considering the temporalities of socioecological processes, such as in the case of this research, the stories of capitalizing desert terrains in Egypt with a specific focus onto spatial and spatio-temporal forms of organizing power relations of unevenness. Taking the *longue durée* dimensions of the capitalization-processes at hand seriously is a methodological proposition and an analytical one that further opens up the analysis. For example, it includes to account for some of the less-immediate and more long-term ramifications of capitalization if seen within the web of life. Therefore, thinking with the *longue durée* of capitalism and capitalization adds a dimension to considering the temporal complexities of uneven and unjust relations and situations. It also, on a methodological level, gives us a tool for "how do we tell such a story" (quoting again Latour) with the goal to account for continuities and material-discursive relations. For the here presented case studies on the capitalization of Egypt's dryland regions and thresholds, one might ask how are relations of extraction and dependencies engrained into the soil and water and air and into the human and non-human relationships within those sites, in other words, how does the desert remember? Reflecting on those *longue durée* timescales makes us think about how to include those parts of the story by looking at information provided from the fields of geology, hydrology, soil studies as well as archaeology, anthropology and legal texts.

Some scholars, who work at the intersection of the humanities and the environment, have further expanded onto those considerations of the *longue durée* pointing towards the challenges of capturing different timescales of human-nature geo-stories and the problems that result from those challenges. The historian of art and visual culture, TJ Demos, for example, noted that "the expanded spatial and temporal scales of geology exceed human comprehension" (Demos 2017, 12-13). A result of this is that those different scales are difficult to communicate, represent and thus to take into consideration. In the media discourse, spectacular images of melting glaciers, flooding catastrophes or of earthquake damage have become more prevalent in capturing the climate crisis but here it is represented as an event, in a single, individual moment and as something spectacular which we are more accustomed to see (ibid). Demos' colleague, the humanities and environment literary critic, Rob Nixon, argued comparably about a crisis of representation facing the issue of climate crises. Nixon notes that we have a bias towards spectacular violence and the temporality of the instantaneous and explosive. In our image-driven world, Nixon states, climate change is represented as disaster. He further writes:

> We need, I believe, to engage a different kind of violence, a violence that is neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales. In so doing, we also need to engage the representational, narrative, and strategic challenges posed by the relative invisibility of slow violence. Climate change, the thawing cryosphere, toxic drift, biomagnification, deforestation, the radioactive aftermaths of wars, acidifying oceans, and a host of other slowly unfolding environmental catastrophes present formidable representational obstacles that can hinder our efforts to mobilize and act decisively.
>
> Nixon 2011, 2

That is why, according to Nixon, there is a difficulty in grasping and representing the multiple and far-reaching repercussions and effects of climate change. Those are often not resulting in direct cause-effect relationships climaxing in a major catastrophe, but they rather consist of many, parallel, sometimes delayed, sometimes conjoint, sometimes disjointed crises. The *slow* forms of ecological devastation are much harder to capture and to represent and then, in addition to that, they are much harder to resist or to plan for or against. Because, how do we even know in these situations of crises, who or what we are up against?

Conceptually and methodologically, what Demos and Nixon halt us to do, is to take notice of slow, incremental, almost mute and invisible changes in the sociometablic contexts and conditions that we study; those creeping but accreditive moments of decay and ruining, toxification, depletion and hollowing out, depriving of access and worsening of living conditions often facing the many (according to Nixon) and not the few. The idea of slow violence adds another dimension to taking notice of the temporal and temporalities in my research. For my case, in the study of processes of capitalization, this adds an additional conceptual layer, which is to grabble with capitalization and its long as well as slow effects. While means of capitalization as such can be fast and sometimes violent, their long-term and multiple effects that they leave behind can be of a slowly deteriorating, depleting and ruining nature.

Overall, as a way of summarizing the conceptual foundations for the whole research, what this research seeks to do is to understand some of the complexities that make up the capitalization of dryland regions across Egypt by engaging with a multiplicity of practices that organize spatial and spatial-temporal relations of capital within the web of life through relations of unevenness. The way in which the research approaches those instances of capitalization is by considering material-discursive practices, namely, practices that inform the process both through material means as well as through the discursive realm of organizing knowledge while those are always already interconnected forms of action. Thus, capitalization as a practice exists through and in the socio-metabolic world. It takes place through relations of power and is enacted on multiple levels and scales. Those concern different scales of space as well as different scales of time. Capitalization lives within sociometablic conditions both in the immediate and in the long-term, in the close and in the far, in the violent event of appropriation and in the slow process of ruining and decay.

Core Concepts of the Empirical Chapters

Underneath this conceptual umbrella, the empirical work takes place. This work is structured into the analysis of three selected desert industries which are land reclamation and corporate agriculture, mining and geological research, and the planning for and building of new desert cities in the context of Egypt. Those industries are looked at in this research as practices of capitalization of Egypt's drylands while also considering their embeddedness in the web of life. In this section, I will shed some light onto these forms of capitalization and how I chose to engage with them conceptually and methodologically by showcasing some of the relevant literature that deals with those industries as extractive practices and in consideration to the theoretical foci of this research, namely the Environmental Humanities, Extractivism and colonial histories. What I am looking for in this section, is to display how other empirical works and theoretical approaches have engaged with the practice at hand, how does the selected practice play itself out in other contexts and what can be said with regards to the tools and ideas of approaching it?

Land Reclamation –Infrastructures Seizing Territory

My first empirical emphasis lies on practices of land reclamation and on the industries of corporate agriculture and monocrop plantation who rely on those practices. Land reclamation, as practiced in Egypt, can be found in many places around the globe and not just at the thresholds of desert and agriculture production. Rather, examples of land reclamation can be found in many places on the globe, such as in Singapore, Indonesia, South Korea, Macao, the UAE or Israel. The island city state of Singapore has since its independence in 1965 grown by about one quarter in land surface thanks to land reclamation.[6] In Singapore, first records of a horizontal landmass expansion go back to 1822, three years after the British East India company arrived in Singapore and established there a trading colony. In Singapore, as in many other places across Asia, land reclamation refers to a practice of sovereign landmass growth along littoral edge of land and sea. Initially, land reclamation in Singapore was based on the movement of sand and gravel from hill to seashore and throughout the nineteenth century, a number of hills in Singapore are lost to coastal reclamation. In 1980 only seven hills

[6] The current target is to grow by 30percent by 2030 in reference to the country's surface area size in 1965. Why? One answer is because they can afford it. The country is ranking number four in terms of per capita GDP in the world.

were left on the island and the state stopped razing hilltops, only to switch to the import (legal, semi-legal and illegal) of the needed building materials – sand and gravel – from neighbouring sites. Now, 24 islands in the region have disappeared. By 2014, the island nation of Singapore had risen to become the world's largest importer of sand, importing from neighbouring countries Malaysia, Indonesia, Cambodia and Myanmar. The country's *hunger for sand* has been so big that Indonesia, Malaysia and Cambodia have banned sand exports to Singapore in 1997, 2007 and 2017 respectively. Anthropologist Aihwa Ong describes Singapore's expansive territorialisation with the term *Blue Territorialization*. Referring to the artwork *Sea State* of the Singaporean artist Charles Lim Li Yong, Ong captures what happens when "a nation-state flexes its muscles beyond its own territorial limits" (Ong 2020, 196). Yet, what Ong describes is more than a volumetric-reading of space. It is beyond bending and stretching territorial limits vertically (stretching underground and above ground) as well as horizontally. Blue Territorialization means that territory – as an expansive space - becomes thought off as a supple space and taking the case of Singapore as an example, Ong shows how land and sea become interchangeable elements of territory. Ong refers for instance to state-initiated plans to install solar panels floating on the sea, building a network of underground tunnels and reservoirs, using garbage as a land fill material. She adds,

> Both by claiming the water, sunlight and rock from the ocean's surface as under its jurisdiction and by physically carving an undersea demimonde of storage tunnels, the three-dimensional sovereignty bolsters its buoyancy in preparation for a perilous near future. Sovereign territory includes a two-hundred-mile radius surrounding a nation-state… Increasingly, the surrounding ocean is being engineered as a *technosphere* [italic by me] that responds to an expansion of sovereign anxiety and opportunistic resilience.
>
> Ong 2020, 195

Ong puts forward a convincing proposition of the geopolitics of a process such as land reclamation. Beyond the mere growth in landmass, land reclamation as a process reveals a geopolitical setting. Not only is it a process of uneven exchange that alters source and destination landscapes alike. Through the mobilization of vast resources, it also renegotiates the relationship of land to sea, of soil to water along geopolitical interests. Further, this is achieved thanks to both physical and legal means. In Ong's account, territory is not a spatially fixed entity, bound to a landed space that can be built up, carved out, horizontally expanded. Territory is rather a supple, amorph space that can be re-morphed through physical and legal-discursive practices. Ocean waters are in this context as much territory as are subsoil storage

facilities and the legally defined sovereign air- or ocean-space. This is an alternative proposition to the idea of a nation-state as a territorially bound space with fixed limits. Sovereignty, as the governance of such space, is, according to Ong, *buoyant*, *floating*. Sovereign interests are implemented (buoying) through the "zonal manipulation of land-sea-air interfaces" (ibid), absorbing and expanding space three-dimensionally, rather than through military means, with *infrastructural prowess* and through capital-intensive means, shaping territory (such as that of the ocean) as a *technosphere*.

I take a lot of ideas from Ong's work. Particularly, the ways of understanding territory (of various geo-physical conditions) as a supple space that can be shaped, informed and thus also appropriated/seized through infrastructural means but also by mobilizing legal tools (discursive means). These will become important conceptual motives that help me to discuss the Egyptian government's desert ventures. Besides, the terminology of the *technosphere* as suggested here by Ong will be further worked with in my analysis.

In the Middle East and North Africa, another form of land reclamation is more prominent than the one practiced in Singapore. While the Singaporean case is witnessing a territorial expansion altering the *land-sea-sky interface*, what is commonly referred to as land reclamation in the Middle East and North Africa is a form of territorial expansion happening along the terrestrial threshold of desert and agricultural soils. It has different tools too and, in some cases, it targets different outcomes. Yet, as a mode of operation, it remains very comparable to land reclamation in coastal regions.

The before mentioned environmental historian of the region, Diana K. Davis, situates land reclamation in the MENA region into an imperial context that she classifies with the term *environmental orientalism* and what that means is described by her in the following:

> Much of the early Western representation of the Middle East and North Africa environment, in fact, might be interpreted as a form of environmental orientalism in that the environment was narrated by those who became the imperial powers, primarily Britain and France, as a 'strange and defective' environment compared to Europe's 'normal and productive' environment. The consequent need to 'improve,' 'restore,' 'normalize,' or 'repair' the environment provided powerful justifications for innumerable imperial projects, from building irrigation systems to reforestation activities to the bombing of 'unruly' tribes to the sedentarization of nomads as a measure to prevent 'overgrazing.' The perceived extreme aridity and the constraints that this was seen to place on 'normal' agricultural production fueled an intense

> interest in hydraulic management by the British and the French. Determined to boost production of economically profitable crops such as cotton, a great deal of energy and resources was spent on dams, canals, and other technologies to improve and spread irrigation infrastructures in most of the Middle East and North Africa.
>
> Davis 2011, 4

What Davis labels as environmental orientalism has different articulations and effects in different places within the region. (How this articulates itself in Egypt will be discussed in detail later.) As I have stated in the above discussion on desert studies, Davis showcases, how the French imperial project in the nineteenth and early twentieth centuries, was fundamentally based on an environmental narrative of the Maghreb of an ancient fertile region, the *Granary of Rome*. Through deforestation, overgrazing and desertification[7] it had declined and was degraded from its former glory, not through *natural* processes but because of the lifestyle and mismanagement of Arab pastoralists (after the Arab invasion in the 11th century). Fears of (further) desertification were during the colonial period extremely widespread, Davis says. This laid the ground for expropriating land and forests as well as other natural resources through an institutionalization of environmental policies and practices counter-acting the practices of those who were – according to discriminatory colonial discourses and practices – to blame for the abandonment and deterioration of the land.[8] Similar to that, fascist Italy that had colonized Libya[9] in the early twentieth century was seeking to connect the fascist present to the Roman past (Troilo 2022). Land reclamation here, a practice seeking to make the desert green *again* was meant to expand areas of cultivation and push back the desert. It had many different motives within the colonial context, one of which – similar to the Maghrebi case – was to restore the area to a form of former fertility (at least according to their assumption) through *proper* management:

> The far-seeing eyes of Mussolini looked way beyond the wastelands that had been abandoned for more than a thousand years by all but fighting Arabs when he made a triumphant journey through the colony […] the frontier of cultivation moved 35 miles

[7] Davis says that "desertification" as a term was not used until 1927, when it was first employed to describe a human act of deforestation of the Sahara by Louis Lavauden. Yet, already in 1880, the idea existed to blame North Africans, and nomadic peoples in particular, to create barren lands due to the burning of wood and overgrazing. (Davis 2007, 4)

[8] Davis terms the colonial narrative a "declensionist" story, following the terminology of William Cronon. It began with the French occupation of Algeria in 1830 but it was quickly also applied in the subsequently conquered territories of Tunisia (1881) and Morocco (1912).

[9] Italy colonized Libya in 1910 and it ruled over the desert country with a Fascist government from 1922.

> from the coast […] acreage of barley has been quadrupled, hundreds of thousands of new olive trees have been set out, bringing the total to about a million.
>
> Milwaukee Journal, signed J.R.W., 8 January 1932, quoted by Weizman 2015, 24

Eyal Weizman compares the Libyan colonial project of the time to the Zionist methods of territorial expansion taking place in the Naqab/Negev Desert. Also, along this desert threshold, afforestation and land reclamation projects were employed as a form of territorial expansion and appropriation based on a narrative of the neglect of Arab peoples, nomadic pastoralists in specific, writes Weizman. According to the Zionist narrative, Arab pastoralists were to blame for the current desolate state of the land.[10] This was captured in the iconic slogan "the Arabs are not the sons of the desert but rather its fathers" (Weizman 2015, referring to Benvenisti who attributes this quote to C.S. Jarvis, British Governor of Sinai). The Zionist task set by Ben Gurion in the late 1930s, to *make the desert bloom* (again), relied on such a narrative. It was pursued in the decades that followed by ways that were meant to "establish a line of agrarian settlements that would push against the line of the desert" (23). The ecological narrative served colonial motives where the displacement of the desert went hand in hand with the displacing of Bedouins. The proclaimed ecological necessity of "rolling back the desert [beyond the threshold of permanent agricultural cultivation along the aridity line, added by me] with trees, creating a security zone for the people of Israel" (Weizman 2015, 25 citing Alon Tal) was thus coupled with a security logic about which Weizman suggests:

> The relation between afforestation and Judaization of the landscape was not confined to the Negev. Shortly after Israel's establishment in 1948, the JNF [Jewish National Fund which has been responsible for afforestation since the early 20th century, added by me] planted millions of conifers in different parts of the country, covering up the remains of Palestinian villages that had been destroyed during or after 1948, pre-empting any claim or possibility to return. This practice still takes place in the Negev, where afforestation is used as a means of erasure of former Bedouin settlements and of preventing their return to resettle these lands.
>
> Ibid

[10] Weizman argues that finding archaeological ruins of ancient, abandoned cities (Halutza, Mamshit, Avdat, Ruheiba/Rehovot and Shivta) in the arid part of the Naqab/Negev Desert was used as an explanation of Arab neglect of the land. These cities were built around the second century BC and they were said to have been abandoned between the seventh and tenth century, which falls under the early Arab period of the area. Yet, more recent archaeological evidence now suggests that after the Arab conquest in 640 and until the mid-eighth century, these cities of the desert were expanded and benefitted the installation of improved irrigation technologies.

After the establishment of the State of Israel most Bedouin tribes had been forcefully displaced from the region, specifically from the fertile northern threshold of the Naqab/Negev Desert, concentrated into purpose-built towns in the desert's more arid parts, making space for Jewish settlements, agrarian industries and forests (9). The elusive threshold of the desert margin (along the aridity line) had thus become a political and juridical tool that served the Israeli state-building and its land seizing methods. A proclaimed ecological necessity (holding or rolling back the desert, fighting desertification) had become a mechanism for dispossession; "ecology as a political tool" (30) according to Weizman. Land reclamation in the Naqab/Negev, largely in the form of afforestation and intensive farming forced the desert to gradually retreat and so did Bedouin communities. Thanks to the introduction of artificial irrigation, new seed types, fertilizers, pesticides, salt-resistant and water-efficient crop, trees and bushes, the seizing of land along the desert threshold could take place hidden behind rhetoric of environmentalism. The effects of this are far-reaching and long-lasting, not only on a political also on a meteorological/climatic level. "The gradient of cultivation that has for generations been slowly and gradually shifting from arable to barren lands has been replaced by a fragmented territory of micro-climatic conditions with interspersed patches of dry land and artificial and intensively irrigated greens." (36) The ecological consequences of this on a local and regional (and potentially global) scale are immense. Since the 1960s the level of the Dead Sea has dropped by one meter each year (!) because of the channelling of water from the Jordan Valley into the Naqab/Negev for land reclamation purposes. As a result of this, Bedouin communities in the region found themselves squeezed between being pushed out of the more temperate areas – from the north towards the south of the desert – as agricultural settlements creep onto their land and on the other side, increasing inhabitability and increased water stressed coming from the desert – as water is being channelled away in large quantities. This is what Weizman collects under the term the "conflict shoreline" (also title of the book); to subsume the politico-ecological friction and violence that takes place/is ingrained in the threshold along the desert.

What these different instances and sites of land reclamation reveal is that as a spatial practice, land reclamation, is way more than bulking up sovereign territory or than re-designing the use of a sovereign ground, or again, simply changing the contours of productive land or state limits. Instead, the considerations above, show that land reclamation can be considered as a

way in which sovereign and colonial rule are able alter the very nature and condition of territory itself and the rule of those grounds. The examples demonstrate that the tools that land reclamation projects use are both of a material – techno-infrastructural as well as ecological – and also of a discursive – legal-bureaucratic – nature. Land reclamation relies on transformative ecological schemes, the employment of infrastructural networks paired with an ecological narrative and discursive tools to that allow to shift and to seize terrain for certain actors in specific ways while often remaining uncontested or hidden altogether. As the texts above also have shown, land reclamation has allowed specific actors (such as governments, including colonial governments) to seize and appropriate lands and resources and dispossess communities through infrastructural and bureaucratic means. This is discussed for numerous historical colonial contexts and in analysis of contemporary practices of neo-colonial forms land and resource appropriation, such as stated above in the context of the Naqab Desert (Baroud & Rubeo 2019, Dana & Jarbawi 2017, Jaber 2018, Shquair 2023). The above texts offer a productive lens through which to look at land reclamation schemes in Egypt. We can now ask about a material-discursive setting of land reclamation schemes, questioning what those projects reveal in terms of discursive conceptions of the desert, productive land, land rights and land uses as well as agricultural production and thus how land reclamation concretely operates as a practice of capitalization?

An Inhuman Environment

The second empirical study zooms in on the field of mining in Egypt's deserts discussed in conjuncture with the institutional setting and scientific practices of geological prospecting and resource extraction. The conceptual lens of this chapter is that of the *inhuman* environment which as a tool for thought I take from the historians and sociologists of the science of geology, Gabrielle Hecht and Kathryn Yusoff. Their work has been previously alluded to in the section of this text that dealt with the theoretical bodies of work in the field of Postcolonial Studies looking at extractivism and the racist politics engrained into it. Kathryn Yusoff is professor of inhuman geography – which seems relevant to mention in this context. Here is what Yusoff writes about her take on the science of geology:

> The human and its subcategory, the *inhuman* [italic by me], are historically relational to a discourse of settler-colonial rights and the material practices of extraction, which is to say that the categorization of matter is a spatial execution, of place, land, and person cut from relational through geographic displacement (and relocation through forced settlement and transatlantic slavery). That is, racialization belongs to a material categorization of the division of matter (corporeal and mineralogical) into active and inert. Extractable matter must be both passive (awaiting extraction and possessing of properties) and able to be activated through the mastery of white men. Historically, both slaves and gold have to be material and epistemically made through the recognition and extraction of their inhuman properties. These historic geologic relations and *geo-logics* [italic by me] span Europe, the Americas, Africa, and Asia through the movement of people, objects, and racial and material categories.
>
> Yusoff 2018, 2-3

Yusoff studies what lies at the intersection of geology, matter and race, proposing that geology is not a *neutral* discipline. Rather, also this field of scientific inquiry is part of a network of unequal relations of extraction, forms of settler-colonial land grab and the exploitation of black and brown bodies. Through the epistemic category of the *inhuman*, she is able to link the denial of personhood for those who have to extract – the subjugated, objectified, ahistorical (72) – and the assertion and extraction of the value of matter happening on their back. Yusoff draws attention to the process of extractivist logics that inherently rely on unequal power relations as well as an indifference towards the *inhuman* – both matter and bodies. Yusoff states, "Who is then objectified by geology's grammar of materiality?" (ibid). The exploitation of earthly matter and that of people go hand in hand in Yusoff's proposal and they determine each other, categorically. They are not only interlinked at the very moment of extraction, in a mining situation, but co-dependent elements which also shows in the *afterlives of geology* through the "racialized impacts of climate change" (3). Yusoff invites us to rethink human-earth epistemes and geo-social formations/categories by looking at the *geo-logics*, meaning at geological language and categories.[11]

For my look at how Egypt's underground is being opened up to specific actors and in specific ways, Yusoff's text allows for a shift in perspective, away from resources (of the desert) to the *making of properties* and *value* while not losing out of site that the *who* and the *what matters* belong together.

[11] This could be compared to Bruno Latour's idea of history writing as *geo-stories* which was evoked earlier as an idea for the epistemic conjuncture of nature and human's joint history.

Complementary to Yusoff's more conceptual reflections linked historical analysis, Gabrielle Hecht offers in her work on mining a more empirically-driven lens. Working on the mining industry of South Africa, Hecht develops the idea of *residual governance*, developed from "colossal wastes – social and sedimentary" (2023, 17). While many elements of Hecht's work are relevant, I just want to highlight one component of residual governance which Hecht describes as a form of "governance that treats people and places as waste and wastelands" (ibid). Also, Hecht works along the racial injustices, particularly with the system of *racial capitalism* in relation to colonialism, apartheid and majority rule in South Africa. She writes about the "systemic, enduring violence of racism baked into infrastructures" (43). Further,

> That's why you can still see apartheid from space.
> Tailings don't merely testify to this history; they carry its damage into the present and the future. Their most spectacular violence – tailings dam failures in 1874 and 1994 that released floods of slime with enough force to kill people and destroy homes – were construed as accidents. But their violence also operates in slower, more quotidian ways. During the winter months of July and August, winds whip across the Witwatersrand plateau, blowing toxic, radioactive dust off the poles into homes and lungs. The voids left behind by extraction also engender violence. Spectacular violence for the *zama zama* [*zama zama* means in isiZulu to try again and again, 41] miners who descend in search of leftover bits of gold risking entombment should an unmaintained shaft collapse on them. And slow violence, wrought be the acid drainage spilling out of abandoned mines. Water rising through the voids acidifies as it reacts with pyrite in the exposed rock face, becoming an eager host for metalloids and heavy metals (including well-known poisons like arsenic, mercury, and lead), eventually decanting onto farmland and seeping into water sources, palpably sickening people. Viewing the Anthropocene from South Africa makes it impossible to disentangle racism from ecocide.
>
> Hecht 2023, 45 (a shorter version was previously quoted in)

Hecht puts an extractivist capitalism into territory and also shows its immediate, spectacular and the slow, residual, almost untraceable, elusive effects for some (and not for others). Thus, she is able to add the important element of temporality to the extraction-process where short-term and long-term effects, the fast and the slow, the spectacular and the almost invisible/untraceable are interlinked. This gives empirical evidence to Rob Nixon's *slow violence* (2011) considerations that I had also mentioned earlier.

Together the authors make us more astute to looking at mining missions and geology, their discursive contexts and material infrastructures, as being embedded into political relationships and also into discursive epistemes that give rights and value to people and

communities that are part of those industries or effected by them - who might be otherwise invisible, or better are invisiblized, by the nature of extractive missions undermining their value or even denying their humanity overall. Besides, particularly Hecht's work emphasizes the multi-temporal aspects of mining and its effects which invites us to look out for the immediate as well as wider circumstances in which those projects take place and which they shape.

Thus, as a conceptual lens, what the *inhuman* environment allows us to take notice of, are the practices of science as well as of the institutional apparatus of geological works that deny personhood, that treats people and sites as disposable by means that obscure visibilities by blurring out the map and obstructing access. It is in this way a useful tool to look at material-discursive formations of extractive sites as exploitable and as sites for capitalization as a means for discussing the ways in which the capitalization takes place based on those material-discursive backgrounds. This of course also results in concrete forms of capitalization that will be discussed in the respective chapter.

The Desert as Real Estate Space

The desert as real estate space is a conceptual tool that I have developed on the foundation of the empirical chapter that addresses the era of financialization as a means of capitalizing desert regions in Egypt. It is an idea of thought that comes from the analysis of sites and processes of capitalization in Egypt that characterize the country's recent real estate boom across arid terrains, on the margins of the Nile regions as well as on the country's coastlines. It meant is meant as a tool to think through the capitalization in the web of life in the sector of urban planning and mass-scale construction. The concept marries two important fields of inquiry, namely that of urban metabolism, sometimes called urban political ecology, and speculative urbanism.

For the subject of understanding the socionatures of cities in the field of urban studies, Hillary Angelo and David Wachsmuth suggested that urban political ecology or urban metabolism has "provided a framework for retheorizing the city as a product of metabolic processes of socionatural transformation" (Angelo and Wachsmuth 2014, 16). On an increasingly

urbanizing planet, this field of research "has the potential to be more than merely the study of nature in the city" (17). It traces resource flows, environmental struggles and the transformation of the nature of urban environments as tied into broader processes of uneven development. Inspiring examples are Erik Swyngedouw' *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain* (2023); *Social Power and the Urbanization of Water* (2004), Matthew Gandy's *Natura Urbana: Ecological Constellations in Urban Space* (2022); *The Fabric of Space: Water, Modernity and the Urban Imagination* 2017), Shannon Mattern's *Code and Clay Data and Dirt: Five Thousand Years of Urban Media* (2017) and Jane Hutton's *Reciprocal Landscapes: Stories of Material Movements* (2020) among others. In the regional context of studying cities in the Middle East, in North Africa or in Egypt in specific, the potential of the approach is still under-explored, specifically with a look at urban development. A recent essay collection edited by Agnès Deboulet and Waleed Mansour under the title *Middle Eastern Cities in a Time of Climate Crisis* (2022) made a great start into the subject. There, researchers like David Sims discuss Greenhouse Gas emissions of Greater Cairo and Ahmed Zaazaa writes about new town construction vis-à-vis emissions of the local construction sector.

Speculative Urbanism was proposed as an idea, in 2011, by Michael Goldman. Goldman works from the concept of global cities (Sassen 2006, 2001, Taylor 2003) which are said to be a unique configuration of socio-spatial dynamics for extending and reproducing power and authority of transnational elites. Speculative urbanism is a mode of urban transformation in which global capital plays an increasingly important role (Goldman 2011). Goldman states that the recent literature dealing with the financialization of the city leaves cities of the global south left to be peripheral phenomena: "The terrain, I find, is more complex: private equity firms based in Singapore, Shanghai, and Mauritius mobilize capital from all over the world to purchase infrastructural assets in Europe, Asia, and the USA. East and South Asian firms are buying up undervalued firms in the USA and Europe as well as land in East African countries and Brazil. This complex map of liquid capital is much more convoluted than an easy portrayal captures of Northern winners and Southern losers." (Goldman 2023) His concept is thus purposefully not limited on focussing on Global Northern cities but rather he works from the view of the south (such as pioneered in the realm of urban studies by researchers Ananya Roy and AbdouMaliq Simone amongst others). Speculative urbanism in his conception describes

the logic of building so called “world-class” urban infrastructures through deploying a spectacular imaginary of the *new* urban form. This spectacular new urban form could be the “shape of the world map in Dubai, China's promise to build 100 global cities, and India's competitive claim to create 100 smart cities” (ibid). In order to be realized, speculative urbanism requires experts and think tanks on global cities and a transnational policy network that works globally for the transnational regulation of those urban sites. It also depends on speculative forms and strategies of finance, according to Goldman. This means that speculative urbanism needs institutional infrastructures for speculative financing, such as through private equity firms, sovereign wealth funds or debt financing mechanisms. Further, speculative urbanism is built upon a central involvement and support of the state that is able to conduct financial reforms where needed with the possibility to incorporate necessary financial infrastructures. Within a contemporary setting of speculative urbanism “it is becoming more difficult to separate the functioning of the state from the workings of finance capital: the state has become a broker and guarantor of public assets and finance capital the new architect and benefactor of public initiatives” (ibid). Goldman continues showing that those forms of speculative finance for urban development backed by the state are reminiscent of colonial infrastructures of finance of the mid-nineteenth century where private firms such as the British East India company were supported by guarantees of the British government that aimed at protecting private British financiers for the financing of the railway system in the colony. Finally, speculative urbanism is characterized by speculative governmentality, which Goldman defines as “the ability of governments to provide services and goods … based on rents from external capital flows, when these flows run dry or reverse course, so does access to public services” (ibid). This means that capital inflows are the premise upon which a state conditions its provision of public services; in other words, the state becomes the foreign funded service provider.

What looks like with regards to the urban form is described by the architect Keller Easterling’s along the concept of *infrastructure space* which she describes not just as an assemblage of roads and cables or housing blocks and broadband network. Instead, infrastructure space is meant to capture, according to Easterling, the workings of standards and ideas that travel and proliferate across the globe and that are shaping the urban form.

> Buildings are often no longer singularly crafted enclosures, uniquely imagined by an architect, but reproducible products set within similar urban arrangements. As repeatable phenomena engineered around logistics and the bottom line they constitute an infrastructural technology… Now not only buildings and business parks but also entire world cities are constructed according to a formula – an infrastructural technology. We no longer build cities by accumulating singular masterpiece buildings. Instead the most prevalent formula replicates Shenzhen or Dubai anywhere in the world with a drumbeat of generic skyscrapers.
>
> Easterling 2016, 11-12

Infrastructure space is thus a spatial formula of design that creates replicable solutions applied in different parts of the world and those are according to Easterling the most dominant influences of new urban construction in the twenty-first century. The free zone model in particular is a spatial solution of infrastructure space within a context of global capital investments. On that, the architect suggests:

> Operating under authorities independent from domestic laws of its host country, the zone typically provides premium utilities and a set of incentives – tax exemptions, foreign ownership of property, streamlined customs, cheap labour, and deregulation of labor or environmental laws – to entice business. The world has become addicted to incentivized urbanism, and it is the site of headquartering and sheltering for most global power players. So contagious is this spatial software that every country in the world wants its own free zone skyline.
>
> 15-16

What Easterling develops is in my opinion a productive proposition towards making the link between planning aesthetics and construction as well as governance and finance. I find this a useful approach that helps me for the fieldwork-segment of this chapter where I discuss some of the material-discursive conceptions of the New Administrative Capital from a planning and design perspective. Further, Goldman's propositions of speculative urbanism adds to the toolkit a lens for capturing the forms of financial speculation that allow for and shape the urban planning and design process, the involvement of the state in it as well as the focus on the relationship between the speculative and the regulatory.

I add to both conceptions, that of speculative urbanism by Goldman and of infrastructure space by Easterling, the urban metabolism layer such as put forward by the above-mentioned scholars. To do this, I bring forward the conceptual idea of the *desert as real estate space* for further understanding connections between urban planning of mass-scale desert cities (in

Egypt) as a form of capitalization in relation to mechanism of speculative finance and its regulation as well as its embeddedness in the web of life. The desert as real estate space is thus a concept that sits at the nexus of speculative finance and urban metabolism. As such it encompasses a number of strategies of capitalization that are indicative of the period of financialization and urbanisation and that is why it will be an indispensable addition to the analysis of the nature of capitalization concerning desert regions in Egypt (given the context of a real estate boom as will be discussed in the respective chapter).

Research Methods, Design and Constraints

Research Methods and Design

In correspondence with the theoretical landscape as well as the conceptual approaches laid out above, the research methodology has shaped as a mixed method approach that mobilizes a variety of sources and materials based on both empirical fieldwork as well as archival work. As presented above, a guiding methodological principle of the research is the material-discursive, namely a New Materialism-informed approach that looks at a diversity of actors and how those act, how they act with and onto each other. This informed both the fieldwork and the archival work. Overall, the research took place between 2017 and 2023 (with some interruptions in between) while I spent the vast majority of the time in Egypt. I was already based in Egypt before starting with the PhD. So while I was technically, in the administrative sense, going abroad to do fieldwork in Egypt, physically leaving my institutional home institution in the UK, I was practically going back to conduct my research in my usual home-environment. The research methodology shaped during those years in a mix of developing a network of research counterparts that relate in various capacities to Egypt's desert economy and politics while also navigating archival material and their access. For my empirical work, I conducted fieldwork in different parts of Egypt's deserts as well as in Cairo. A detailed overview will follow below. As part of the fieldwork, I was set to looked out for putting together a web of infrastructures as well as actions that make up the selected case study. To do that, I interviewed workers and CEOs, bureaucrats and legal advisors and I spoke with planners and engineers but also interviewed botanists, hydrologists and geologists. I also

consulted numerous archives went through online archival material of Egyptian state institutions, multilateral donors and development funding bodies. I also dug through archival materials in the field of science, such as specialist archives on Egypt's mining industries. I went through a large variety of secondary literature in the fields of Archaeology, Anthropology, Political Science, History, Sociology but also through papers of soil studies, hydrologic analyses and geological accounts. The goal was to bring a rich diversity of materials and information into the discussion in order to capture and analyse the forms of organization upon which the process of capitalization rests and to show those concretely at work in the selected case studies. At the same time, the research was set out to be attentive to the *longue durée* and the slow violence of capitalization, meaning towards the multiplicities of temporalities of the process and its effects.

The selected case studies are projects of land reclamation and corporate desert agriculture, geological research and its institutional contexts as well as the mining of gold and finally, the design and construction of desert cities and the local real estate boom in the desert. Each of these instances of capitalization was empirically researched through fieldwork as well as through the integration of archival sources on the subject.

Fieldtrips and Interviews

I visited three different desert farms but chose to focus my fieldwork on the farms of the Magrabi Agricultural Farms (MAFA) in Noubaraya which lies on the western extensions of the Nile Delta. There I spoke with the company CEO (Sherif Maghrabi), the legal office and sales/marketing representative and an agricultural engineer of MAFA's grape farms. I further visited three other land reclamation projects and two corporate desert farms in the western extension of the Nile Delta and spoke there with hydrologists and agricultural engineers as well as agri-processing and marketing professionals.

For the research on Egypt's mining industry, I interviewed a foreign service provider working in Egypt's gold mining sector and I also did an in-depth interview with an Egyptian gold prospecting geologist working on a concession in the Eastern Desert. I visited their mining concession site situated in the central parts of the Eastern Desert at about a two-hour desert

drive west of Gas Gharib where I was able to assist at a private showcasing event of the concession site given to local Egyptian investors in the junior mining company.

For my line of enquire on desert cities, I interviewed primarily architects and planners and chose to concentrate my efforts on studying the planning and design of the mega-project of Egypt's New Administrative Capital. In total, I did nine interviews with urban designers, planners and architects for this research, some of whom were employed in Egyptian firms and some were working for foreign companies (or had terminated their employment prior to the interview) on the New Capital project. I was shadowing a head engineer of an earth moving company for a day on the New Administrative Capital site (in 2020) and visited a brick factory south of Helwan (in 2019).

Besides those fieldtrips and interviews, I reached out to many different professionals whose work relates in one way or another to the selected case studies but not always in a direct way. I also spoke with a lawyer working on land sales and rent and a land rights activist of the Egyptian Initiative for Personal Rights (EIPR). I further conducted interviews with nature conservationists of different initiatives and groups, to learn about their work and about desert botany and ecological changes of the past decades. I had four meetings with Bedouins of the Ma'aza tribe in the Eastern Desert over the years where I learned about their engagement with the local tourism industry. We spoke about changing meteorological conditions and depleting groundwater wells. Their involvement in the local mining endeavours was a difficult issue and one that the sheikh tried to avoid addressing, indicating the complex nature of mining schemes in the area, operating in legal grey zones and leaving local communities vulnerable to evictions or at least condemnations of acting against or beyond the law.

Archival Resources, Institutional Resources and the Media

Accessing resources from governmental institutions, whether it is ministries or other governmental bodies relevant for this research's topic, is a challenge in general. NUCA, the New Urban Communities Authority, for example, a crucial governmental organization with regards to the sale and management of desert land parcels for the development of real estate, does practically not provide any public information upon the land deals that they engage in

and the use of financial resources gained from selling public desert lands. Some ministries do publish regular reports and the following have been relevant for this research: Ministry of Housing, Ministry of Water Resources and Irrigation, Ministry of Planning, Ministry of Agriculture and Land Reclamation. In addition to that development institutions and UN bodies do further provide data and analysis relevant for this research i.e. related to housing, water uses and desertification. Besides, they also give information on subjects related to the economy, measuring import and export statistics or evaluating market changes. Examples that were specifically consulted as part of this research include archives of the World Bank, International Monetary Fund (IMF), Intergovernmental Panel on Climate Change (IPCC), United Nations Development Program (UNDP), USAID, Food and Agricultural Organization (FAO) and the World Health Organization (WHO). An important local source for various statistical accounts is the Central Agency for Public Mobilization and Statistics, in short CAPMAS. The agency publishes public data since 1964 for example on birth rates or employment. Besides these, also archival material of Egyptian governmental institutions were of significance for the research, especially those that relate to the Egyptian Geological Survey. I was able to access those at the British National Archive and at the archive of the Technical University in Delft. Presidential speeches, governmental working/strategy papers and biographical writings are further available and the ones consulted for this project include Gamal Abdel Nasser's *The Philosophy of a Revolution* (1950), Anwar Sadat's *The October Working Paper* (1974), Hosni Mubarak's *Vision and Achievements* (1989), *The National Water Resources Plan for Egypt 2017* (2005), *Sustainable Agriculture Development Strategy Towards 2030* (2009), *Sustainable Development Strategy: Egypt's Vision 2030* (2016).

Further, for the historical perspectives on desert and agricultural land administration during the British, imperial rule in Egypt, I consulted the archive of the Centre d'Etudes et de Documentation Economiques, Juridiques et Sociales (CEDEJ) that also contains a significant collection of maps of the turn-of-the-century period. I further relied on the now publicly available *Cadastral Survey of Egypt 1892-1907* of Henry Lyons (1908) and a number of articles published in scientific journals at the time, such as *Nature*, accessible on the respective online platforms.

For this research, also journalistic publications were used as important sources of information both from local outlets and from abroad. Relevant local newspapers or news blogs include Egypt's oldest newspaper *Al Ahram* (government owned), *Egypt Independent* (*Al-Masr Al-*

Youm, privately owned), the independent news outlet *Mada Masr* and the privately-owned economy and business blog *Enterprise.*

An overview of the subject-related resources that were consulted for this research will follow in the Literature Review section of this text.

Research Constraints Co-Shaping the Research

An important and critical factor of the research design and implementation was to manage the restrictions and security-related concerns associated with doing research in Egypt. Those restrictions are strongly shaped by obscurities, opaque bureaucracies and threats of legal repercussions to the work of research facing knowledge workers.

To date, doing research in and on Egypt, means operating in an environment of fear and self-censorship. Urban researcher Dalia Wahdan reflected on this in a recent interview, saying that " [I] minimize my visibility, but this is not hazard-free. Unlike in the 1990s when religion, sex and the president's family were taboo subjects by law. The post-2011 research environment is dicey; I do not know which subject, topic, approach, or argument would offend who and would not fathom the nature of retaliation" (Wahdan 2022, 8). While foreign researchers like myself and those working in foreign academic institution were before the takeover of the Sisi administration in 2013 given in many cases a pass, while doors remained firmly closed to our Egyptian colleagues, today, we find ourselves faced with similar restrictions even if not to the same extent and not resulting in the same repercussions that local researchers face. Egyptian researchers can find themselves being questioned by security forces, being prevented from traveling abroad or their accounts being frozen. There are a number of intimidation strategies that can affect local researchers and academics. An unknown number of researchers, together with journalists, political activists and influencers are today being held in Egyptian prisons, sometimes for years in pretrial detention. Human Rights Watch estimates the number of prisoners being detained for free speech or political affiliation to be tens of thousands (Human Rights Watch 2023). The NGO criticizes the Egyptian government for withholding concrete numbers of the currently detained population. It assesses however that prisoners detained for political reasons dramatically increased since 2013 (ibid). Foreign researchers especially from Global North-countries have some more

room for manoeuvring and potential missteps/overstepping is allowed more easily. Having said that, in 2023, I presented some of my current research at a conference held jointly by the French Research Institute CEDEJ and the American University in Cairo (AUC) at the AUC Campus in Tahrir Square. In the presentation I spoke about the New Administrative Capital as an example of the government's strategy of *zoning* desert areas. After the talk, that I gave in English at these international academic institutions, I was approached by numerous conference participants asking whether I would not be extremely worried speaking out so publicly about very politically delicate issues. The conference was not open to the general public and only accessible upon registration. But like Wahdan suggests, it seems momentarily impossible to gage what constitutes a political issue and what constitutes a critique towards political themes. Besides, who is speaking (belonging to which nationality) and in what context (academic, foreign institution or local) seems to give less protection or at least less leeway than there might have been before 2013. Listening to other researchers' presentations, I learned that in these contexts, what is perceived as a political matter is extremely vague and shall one want to deliver any critical remarks, it must be in *insiders-only* language. So did for instance one presentation refer to the "run-over of Circle K in Cairo", a hint that was just enough for everyone in-the-know.

This environment of fear and obscurities elementally shaped the research and how it was conducted. Being able to find interviewees and to conduct field visits, in a context of permanent suspicion, is extremely difficult and that would be true for almost any research topic on contemporary Egypt in the current moment. In my case, as I chose to work on Egypt's desert economy and politics, this seemed even more urgent, as deserts are state-claimed sites and almost all desert mega-projects are being managed or at least initiated by state actors. In addition, desert projects such as the New Administrative Capital are intimately linked to the presidency and this project as well as other post-2013 desert development schemes are interlinked with a growing military economy in the country. This makes those schemes seem even more untouchable to any form of critical engagement with them. Further, information about the funding of those schemes, their execution and their results are purposefully publicly withheld. In the end, I made this very inaccessibility and obscuring of those desert projects and desert sites a core issue that the research had to address.

To conduct fieldwork, my approach was then to enter the field through the private sector and not from the entry point of public institutions, precisely because of the safety-related

concerns. Approaching private sector actors in Egypt can be straight forward. I contacted press offices and attachés of companies or reached out to people directly through their online presence on the company's website. In many cases, I was yet only able to get a chance for a field visit and an interview through my own personal or professional networks. This is one result of operating in an environment of suspicion and security concerns. Engaging one's own networks or actively asking for a referral or introduction is common practice in Egypt as it serves as a two-way insurance for interviewer and interviewee.

When able to get an interview, I described my research often as looking to understanding the technical infrastructures of for example desert agriculture or even a mining operation. Introducing myself as a political-economist who also is interested in "cutting-edge technologies applied in Egypt's deserts today" and in some cases, emphasizing my interest in environmental issues, put most of my interlocuters at ease. The set of questions were often very technical and sometimes I focused distinctly on ecological themes. For example, interviewing site engineers of a desert farm, the discussion would first evolve around irrigation networks, water pumps, fruit picking schedules, the use of fertilizer and the trimming of trees. Later on, the conversation could involve more social and sometimes political subjects such as: Where is the plant material bought from? How much does fertilizer cost and how are prices changing? Where do the workers live and what does their living environment look like? What are issues that those workers commonly face?

The biggest challenge with approaching people from the private sector, is that it is now an industry standard for most companies to have non-disclosure agreements (NDA) in place which also apply after employment contracts end. Some of the interlocutors spoke with me despite having signed an NDA and hence they asked for full anonymity. This is an additional difficulty that often also gets mixed with interlocutor's concerns for their safety taken the local context of opaque security protocols and repercussions.

That I was able to do research on Egypt's gold mining sector was because of a lucky coincidence on a flight between Cairo and Marsa Allam in the spring of 2023. I was sat on the plane next to a man with an almost intimidating disposition and a heavy Australian accent who after a bit of friendly chitchat turned out to be working for a Ghanian company that provides drilling machinery commonly applied in the Egyptian gold mining industry. After showing some initial concerns from his side with telling me about his work in the industry, he was kind enough and trusting to share insights of his experience, showed me some pictures

on his phone of open pit minds in the field and later, even put me in touch with other colleagues for follow up questions. His main concern was rooted in the difficulty of navigating the NDA agreements he had made with his company together with the obscure securitization of the Egyptian mining sector. As will be discussed in the Chapter 2 of this text, the industry remains vastly hidden from the public eye and ever changing as well as contradictory security protocols, for example with regards to visiting mining sites, characterize the industry and the geographical regions in which mining takes place.

Chapter Overview and Main Take Aways

The three empirical case studies are represented in the three chapters of the thesis. They each tackle one specific industry of Egypt's desert economy in the fields of agriculture, mining and urban construction respectively. All chapters follow the same structure which begins with the historical view onto the industry followed by a case study discussed in the base of fieldwork done in the sector in different desert locations across Egypt. The chapters reveal moments and processes of capitalization of Egypt's arid regions and they show that those are not discrete but rather interconnected processes. For instance, land reclamation and desert agriculture are linked to the ways in which the construction of desert towns evolved. Same goes for scientific practices in the field of geology and the field of mining which affected the land uses in fertile regions as well. They are multiple interlinkages in terms of the actors and actions involved in the capitalization of desert regions across those sectors especially with regards to public institutions, multilateral donors or financiers of desert programmes as well as joint legal foundations for those schemes. The different desert industries co-shaped the ways in which desert regions are regulated in the legal-bureaucratic realm and of course, together, they influence the sociometablic *longue durée* aftermath of capitalizing dryland terrains.

In concrete, Chapter One on land reclamation and corporate desert agriculture in Egypt surfaces that agricultural schemes in Egypt's deserts have received a governmental push after Egypt's independence in 1952 and after the subsequent construction and finishing of the Aswan High Dam in 1970, especially during the country's liberal economic era. Yet, those more contemporary programmes inherently rely on material-discursive practices of land use and ways of territorial organization of agricultural land and production that predate those

decades. As a means of capitalization, land reclamation in the field of agriculture, in Egypt, has allowed for specific actors to engrain themselves into the terrain with their own strategies and goals; both then and now. Actors were able not just to reclaim arid sites and arid thresholds but rather claiming them. This happened through largely incontestable forms of seizing of territory by means of property and by organizing the access to resources. Through legal and discursive settings such as through the instalment of the *zimam*, the desert's borderline of taxation, that circumvents the stabilized private property regimes of the Nile Delta and Valley, at the beginning of the twentieth century, the Egyptian state institutionalized its arid thresholds and thus arid regions across the country as sovereign territory and as property of the state. Today, only the state is able to oversee and sell desert lands beyond the *zimam*. This has led to a criminalization of artisanal means of land reclamation despite their agricultural productivity. Now, it is mostly state actors and their private allies as well as private derivatives of the public sector including private companies of the Egyptian military that dominate the field of land reclamation and corporate agriculture. The capitalization performed by those dominating actors streamlines the access to resources – such as fresh water, seeds and labour – as well as infrastructures of distribution. Those processes of capitalization have vast effects onto local and wider sociometablic contexts, for instance, linked to the use of fresh water, its predictability and constitution (clean or contaminated, salty or fresh). The majority of agricultural producers in the Nile Delta cannot count on the same predictability of freshwater access as can desert farms. Instead, they have to deal with uncertainties and also changing conditions with regards to the quality of the water and thus the soil (as well as produce) which has a variety of further trigger down effects, demonstrating some aspects of slow violence of a depleting Nile Delta.

Chapter Two works its way through the science of geology and the building of an institutional setting for extractive research and extractive industries as they came to define the search for mineral wealth in Egypt's modern period, looking first, at the colonial context of the late nineteenth and early twentieth century, and from there, across the subsequent century. The study shows that modern extractive mission as well as contemporary ones again deeply rely on a discursive context that treats arid terrains as sites reserved to the realm of science and to the realm of security. Commercial activities in the field of mining developed at the conjuncture laying between those two. Because of that, commercial exploration was

informed by a discourse of an *inhuman* environment – inhuman in the material sense and in the derogatory sense of neglecting or discriminating existing local communities. Based on this discursive foundation of the inhuman environment, ideas of drylands as wastelands, empty or deadlands were projected. Those enabled and licenced, symbolically speaking, the geo-manipulation and forms of extraction that takes place in desert regions. Consequently, the visibility of how those industries, in Egypt, concretely operate remains actively obstructed behind a veil of security threads, science and promises of potential investments, as the case study on the gold mining industry showcased. A side effect is that alongside a newly booming mining sector in this region of the Eastern Desert, such as the case for the mining of gold, that is supported financially by many of the local heavyweights, also an artisanal mining sector is booming in those obscure and invisible grey zones with an assumed involvement of the local authorities in those informal ventures. Capitalization in the field of mining and geological research in Egypt epitomizes some of the fundamentals that define capitalization as the organization of nature-capital relations, namely elite access for some allowing those elites to circumvent obscure security protocols, volatile and often dangerous working conditions for many artisanal ventures, inaccessibility of the public to oversee those missions and critically engage with them and therefore, a vast unknown concerning the gains – such as financial gains – and *longue durée* repercussions of mining schemes in Egypt's arid sites.

The third empirical chapter proposed the idea of the *desert as real estate space*. It is a suggestion that is meant to capture the spatial organization of the capitalization of arid lands characterizing the country's most recent financial era of capital investments. While originating in the field of urban planning and construction, the research shows, desert as real estate space has become spatial formula of the period of financialization and as such it has further permeated throughout arid sites and can now also be found in other industries such as in agriculture and mining. The analysis demonstrates that desert towns were at the beginning of the last century embedded into a political economy that was seeking to expand the productivity of the Nile Delta and also worked thanks to the construction of company towns in the desert, mostly along the coasts, as a means to support the colonial economy. While embedded into a local sociometabolic context, those desert towns were also conventionally managed and governed as decoupled from their immediate surroundings. I argue, they were both a part of and apart from their local contexts in Egypt, benefitting from

cheap environments, resources, labour but regulated and governed by colonial institutions benefitting foreign markets and actors. The analysis goes on to suggest that the more contemporary new towns that were built into drylands beyond the fertile Nile replicated this model in a similar way. Central state institutions oversee and regulate the real estate developments of desert towns starting in the 1980s. Today, over forty new desert towns have been built, with some of them containing unit numbers in the hundred-thousands. Within a global race for attracting Foreign Direct Investments and investments of the local elites, Egypt's real estate sector in the desert has been booming and it has created ever more spectacular urban sites. Because of the distinct governmental focus of the central regime to making those ventures a success story, scarce environmental resources are supplied to those sites at massive scale and with privileged access. Thus, large amounts of fresh water, next to construction materials, labour force and public fundings are deployed on those urban schemes in staggering scale that, so far, have shown little economic returns. The desert as real estate space encompasses the productive encampment of those development sites regulated by the central state, often through specialized institutional apparati seeking to protect and regulate investments. At the same time, those real estate enclaves are built fast and in mega-size to engender speculative desires with the effect of working against any geophysical specificities of the site. This leaves entire desert regions transformed to making way for a form of construction that resembles a marketing brochure with *longue durée* effects for the socio-environmental conditions of desert and fertile sites.

Overall, this research demonstrates that the processes of capitalization of Egypt's desert regions is often an enormous project with a vastly consequential aftermath. Instead of utilizing proclaimed underutilized assets, such as that of desert lands, by rendering those asserted unproductive sites valuable, investigating capitalization within the web of life, within a context of connections and dependencies, reveals dramatic effects of those programmes with regards to the sociometablic contexts that they are embedded in. The research unpacks the material-discursive grounds upon which those programmes rely. As desert regions became a property of the state and one that is discursively characterized as an inhuman site reserved to the realm of science, security and the economy, drylands became the mute backdrop, obscurely regulated as well as policed site of state interventions. As they – state actors and their selected allies – come to reconfigure those landscapes in their own liking and

with their own benefits in mind and backed by an apparatus of development and finance, growing swaths of land have been flattened and built on, reconfigured through 3D renditions and geo-manipulative infrastructures. This happens at the expanse of yet unknown *longue durée* sociometablic dimensions that this re-organization of often extremely limited resources such as fresh water will entail. Because the desert remembers and so do the wider sociometablic systems that served as the ground for the capitalization of arid lands in Egypt.

Literature Review of Desert Research on People, Ecologies, Politics and the Economy in Egypt

To locate this study within the context of relevant literature for the case of Egypt that this text seeks to make a productive contribution to as well as adding to the above laid out fields of theoretical works – in the fields of the Environmental Humanities, Extractivism, Colonial Histories and Desert Research – , I will outline some of the important academic contributions that engage with Egypt's deserts as ground of research. To repeat, this study is concerned with the ways in which arid landscapes in Egypt are being capitalized within the web of life. It asks how processes of capitalization play themselves out, over time and through both discursive and material practices – while those are interconnected. To do this, the research relies on a variety of disciplinary inputs and much of the conceptual and empirical inspiration has been displayed above. For the case of Egypt, currently, there is not one field of study that one could name desert research that is concerned with sociometablic conditions of deserts and their changes linked to desert politics and economics that treats the country's arid lands as an integral part of the wider socioecological make-up of the country. Also within the historical perspective, the role of the country's arid regions specifically with regards to extractivist conditions within modern colonial regimes of the otherwise thoroughly dissected nineteenth century history of Egypt have so far been little recognized. Rather, arid terrains feature as a ground for research across a number of distinct realms of analysis that more often than not have produced = compartmentalized forms of knowledge of the country's dryland conditions. Those fields include Anthropology, Geology, Archaeology, History (especially with a focus on nomads) and a more recent focus on desert development programmes highlighting primarily the post-152 context. What can be noted overall, is that the production of knowledges within those scholarly areas does not commonly intersect. Instead, various timescales separate those fields of inquiry, same counts for different subject foci. Having said that, this can surely be asserted for a variety of subjects in the Environmental Humanities with the field's rather recent distinct focus on converging formerly discrete realms of interest such as studies from the natural sciences and the social sciences (together with the Humanities). For the more contemporary periods, including Egypt's modern period, research covering aspects of the desert or research that takes place with a focus on the

country's arid terrains commonly treats those dryland geographical areas as distinct sites. What happens in arid regions, as considered in much of the literature and especially in the more contemporary discussions, seems to belong to a specific geographical realm, namely that of arid lands, that stands apart from the country fertile regions, the heartlands of agricultural production where the vast majority of the Egyptian population lives and where, at least in terms of their inhabitants, most of the major administrative centres of the country lie. Dependencies, interconnections, networks and relations that exist between arid regions (between each other) and fertile ones as well as connections to global networks have been worked out still to a lesser extent. This is less the case for research on land reclamation schemes and especially for studies on sites that are in direct expansion of the country's fertile grounds along the Nile Valley and Delta. Here infrastructural connections, for example with regards to the management of water and the movement of labour, have been articulated to a good extend but it remains an exception.

What this section does is that it marks some of the contours of the existing desert research for the case of Egypt, highlighting where the current foci lie and what has shaped those fields of interests, meaning who are some of the major voices within the debates and what are the main subjects and some of the tools of research? This will allow me to formulate what empirical and more theoretical works have influenced this research – for the case of Egypt – and how do I seek to respond to it with my analysis.

Studying Drylands in Egypt: People, Ecologies, Histories and Knowledges

Overall, what counts as research that has its focus on Egypt's drylands can be grouped into research on desert peoples, research on desert environments, research on the conversion of the two through human-led practices of extraction with a social focus on ancient and historical practices and research on the histories of desert peoples with a specific focus on the role of nomads within the context of empire and the forming nation-state during the long nineteenth century. For studies that tackle the human-driven practices of the extraction of raw materials and value from arid lands, there are two central camps of research which are largely separated by dealing with very different time periods and working also across different timescales. The first camp, so to say, is the realm of archaeology or ethno-archaeology that

deals with subjects of human-nature stories of desert lands with regards to specific past time periods, such as the Pharaonic periods or imperial eras of Greco-Roman or Byzantine ruling. Those happen largely distinct from more modern considerations of extractive regimes and practices, for instance in the case of the contemporary post-independence era of post-1952. Very active debates have developed in recent years that try to capture multiple endeavours of desert programmes and development schemes covering this rather short timeframe of the republican era in Egypt. Again, these are largely discrete realms of discursive practice.

Desert People –Anthropology of Contemporary Conditions

Anthropologists have provided important pieces of research since the 1950s, many of which cover areas of Bedouin inhabitation in the Eastern Desert and in Sinai. Prominent researchers, Joseph Hobbs and Leo Tregenza, both worked on the Ma'aza Bedouins that live in the central parts of the Eastern Desert (Hobbs *Bedouin Life in the Egyptian Wilderness* 1992, Tregenza *The Red Sea Mountains of Egypt* 1955 and *Egyptian Years* 1958). Hobbs also published on Sinai and the Jabaliyya Bedouins in *Mount Sinai* (1995). When I spoke with a sheikh of the Ma'aza tribe in October 2023, he showed me Hobbs' and Tregenza's books that the researchers had given to the Bedouin community and that they kept in their town-apartment in Hurghada. Sheikh Mar'ay said that he remembers meeting Hobbs in the 1980s in the desert when he spoke with his father who was then the clan's head. Another significant ethnographic study of the Eastern Desert region in the modern era is Barnard and Duistermaat's *The History of the People of the Eastern Desert* (2012). Jolanda Bos-Seldenthuis published in 2007 a noteworthy anthropological study on the Ababda Bedouins of the most southern segments of the Eastern Desert. Additional ethnographic works on the Ababda include Abdel-Qadr et al (2012), Soliman et al (2021) and Starkey (2001).

For anthropological studies about Sinai and Sinai's Bedouin groups a considerable amount of research was done by Israeli scholars such as Emmanuel Marx's *Bedouin of Mount Sinai* (2013) and earlier works such as Avi Perevolotsky's *Territoriality and Resource Sharing among the Bedouin of Southern Sinai* (1987), Arensburg et al's *Southern Sinai Tribes* (1979) and Bonné et al's *Anthropological Studies of South-Sinai Bedouins* (1970) with research conducted while Sinai was occupied Israeli territory. Other anthropological remarks on the Bedouins of Sinai done together with reflections on desert ecologies and botany of Sinai can be found in

Gardens in a Sacred Landscape by Samy Zalat and Francis Gilbert (2008) and ethnographic analysis of forms of representation of Sinai Bedouin's is May Serhan's *The Politics of Image* (2012) as well as on forms of identity belonging in *Bedouins, Not 'Egyptians': Characteristics and Features of the Bedouin Tribes of Sinai* (Moonakal & Sparks 2022), Issa's *New Insights into Bedouin Culture* (2005), *Bedouins and In-Between Border Space in the Northern Sinai* (Görmüş 2019) and *Lifestyle Migration in South Sinai, Egypt* (Karkabi 2013).

One excellent anthropological study was published by Donald Cole and Soraya Altorki in 1998 under the title *Bedouin, Settlers, and Holiday-Makers: Egypt's Channing Northwest Coast*. This research is concerned with the wide-reaching transformation of Egypt's Mediterranean shoreline, the utmost north of the country's Western Desert and home to a number of indigenous Bedouin tribes, predominantly the Awlad 'Ali. It is foremost an anthropological study but also shows legal-administrative changes as well as politico-economic contexts starting at the time of the Mehmet 'Ali rule of Egypt emphasizing the role of land reclamation and the introduction of a local tourism industry on the region and on the life of the local populations. Currently a new study is being conducted by Manar Moursi on the same geographical area. A first publication of the still ongoing work was done in 2022 (Moursi 2022). By now classic studies of ethnography on Bedouin life and culture of the Awlad 'Ali Bedouins with a specific focus on feminist ethnography was conducted by Lila Abo-Lughod and published amongst many other publications in *Veiled Sentiments: Honor and Poetry in a Bedouin Society* (1986) and *Writing Women's Worlds: Bedouin Stories* (1993).

Individual ethnographic case studies feature some of the oases regions in Egypt's Western Desert with research showcasing practices of healing and recovery from spirit possession in the Dakhla Oasis (Rashed 2015, Rashed & Van Staden 2021), experiences of otherness in Farafra (Abdel-Kawi 1988) and linguistics also in Farafra (Woidich 2020) to give some examples.

Deserts as Sites of Geological Timescales and Properties

Chapter 2 of this dissertation will deal with the discursive workings and practices of the field of geology as a practice of science, military surveying and patrolling, and the forming of an institutional apparatus for the prospecting and extracting of resources as well as its

commercial exploitation. To contour what the science of geology has achieved to produce with regards to the knowledge production of arid lands in Egypt, here are the major works that established and characterized the field. As will be displayed in the respective analysis those were majorly conceived through European scientific missions that worked together with the securitization of arid regions through military bureaucrats and military scientists. After Egypt's independence, local researchers started to take over the field, not just majorly shaping its contents (they did that before too) but now also publishing under their own names in major international academic outlets and taking on leading administrative positions.

The field of geology is currently mostly influenced by the writings of William Fraser Hume and Rushdi Said. Hume started to publish the multi-volume opus *The Geology of Egypt* in 1925, volume 2 followed in 1934 and volume 3 in 1962. Each contains several parts and were printed by the Cairo Government Press. Those geological accounts are rich in information on surface characteristics and rock formations of different segments of Egypt's arid lands. Information was conceived and assembled from travel accounts and scientific published works of the then dominating class of foreign scientists who with the support of funding both from scientific and military missions from abroad and from Egypt were able to collect and evaluate geographical data through mapping and sampling. Rushdi Said was an Egyptian geologist and also politician with tremendous influence. He published *The Geology of Egypt* first in 1962 and edited a new version which became published in 1990 and also contains writings of other researchers next to his own.

Today, the field of geology contains a rich variety of research of geological surface data, geo-chronologies, tectonics, seismic data and mineral deposits and their characteristics. This research benefitted from the introduction and spreading of aerial photography and satellite remote sensing. By 2005, three atlases of geology are produced on arid regions: *Geological Atlas of the South Western Desert* (2005), *Atlas of Space Images of North Western Desert, Egypt* (2005) and *Geological Atlas of Sinai* (2004). Satellite remote sensing was introduced in Egypt in 1971 and it allowed for a massive growth of research and literature in the field of geology with emphasis on petroleum (Dolson et al. 2001, Dolson et al. 2014), surface- and groundwater (El-Rawy et al 2020), mineral deposits of metallic ores such as gold (Gabr et al 2010, Salem & Soliman 2015), manganese (El Aref et al 2020) and iron (ibid) as well as non-

metallic ores like phosphates (El-Kammar et al 2020) next to geological accounts of specific regions such as the Arabian-Nubian Shield (Hamimi 2021).

Archeo-Geology/ Ethno-Archaeology – Joint Histories of Deserts and Humans

The field of archaeology is, in comparison to other academic areas for research in Egypt, one very well-funded and equipped field of research with several foreign and local missions working on a large variety of subjects and time periods. Many of those studies focus on the area of the Eastern Desert as a resource-rich site that has been exploited throughout many centuries, dating back to the Pharaonic period. Regarding a historical perspective onto desert life, desert economies and activities within other imperial contexts, such as Greco-Roman and Byzantine, a variety of archaeological studies have been published. Such texts include Brun et al *The Eastern Desert of Egypt During the Greco-Roman Period: Archaeological Reports* (2018), *Rome in Egypt's Eastern Desert* (Cuvigny 2021), *The Red Land* (Sidebotham et al 2008), *Roman State and Red Sea Trade Revenue* (Cobb & Wilson 2022), *Third Century BCE Supply Networks and Ptolemaic Transport Amphoras From 'Abbad and Bi'r Samut in Egypt's Eastern Desert* (Gates-Foster 2022). For the Greco-Roman and Byzantine period studies exit that feature specific ports and towns such as Berenike (Sidebotham 2011). Research on this period also covers other desert regions such as in the Western Desert (Rossi et at 2022, De Troia 2020). Archaeological accounts of the Eastern Desert covering the Pharaonic periods are too numerous to include here. A miniature collection of works from this vast archive includes *A Monument in Desert Lands: Constructing and Transforming Place in Egypt's Eastern Desert during the New Kingdom (c. 1550-1069BC)* (Garnett 2022), *A Governor of Dakhleh Oasis in the Early Middle Kingdom* (Hope & Kaper 2003), *Administrative Control of Egypt's Western Oases during the New Kingdom: A Tale of Two Cities* (Richard Long 2009). Extensive archaeological studies feature specific eco-cultural practices such as the mining and quarrying. Those cover both the Eastern Desert and also include Sinai such as studies on the extraction of gold throughout Egypt ancient history (Klemm & Klemm 2013, Redon et al 2023), the mining for copper (Lucas 1927, Rademakers et al 2018), emeralds (Guzmán 2022) and turquoise (Valbelle & Bonnet 1996). More recent work shows the exploration and extraction of phosphate (Damir et al 2023) or fossil fuels including Sinai's coal (Edress 2020) and of course, petroleum (Dolson 2020). A valuable case are the colonial mining regimes of phosphate from

the beginning of the nineteenth century which have been looked at in some good detail around the mining town of Quseir including ethnographic accounts of the worker's experiences of that time (Cabassi 2022, Damir et al 2023, Pellegrini 2011).

Governmental Approaches to Desert Peoples and the Role of Nomads and Desert Regions for the Forming Nation-State

A number of pieces of research covers different segments of history on the dealings of modern Egyptian governments with its tribal populations and regions. Those cover predominantly the Ottoman periods and Egypt's long nineteenth century and sometimes, they apply a regional rather than Egypt-specific approach. This includes Mahmud Tabo Muhammad's *The Role of the Bedouin In Egyptian Politics in the Period 1750-1850* (1972), Reuven Ahorni's *The Pasha's Bedouin: Tribes and State in the Egypt of Mehemet Ali, 1805-1848* (2007), *Some Aspects of Bedouin Sedentarization in 19Th Century Egypt* (Baer 1957), *Tribes and State Formation in the Middle East* (Khourym & Kostiner 1990), *Tribal Law in the Arab World* (Stewart 1987).

An important and recent publication on the discursive construction of Egypt's national border to Libya during the nineteenth century was done by the historian Matthew Ellis (2018). Ellis gives an insightful analysis on the administration and political ruling in a *remote* (this is his term, used in the book) region in the country, specifically linked to the Siwa Oasis, an area in the northern parts of Egypt's Western Desert that borders to Libya. Robert Fletcher (2013) published an important contribution on *British Imperialism and the 'Tribal Question' – Desert Administration and Nomadic Societies in the Middle East, 1919-1936* which provides a regional perspective for the interwar imperial era on desert administration.

Desert Developments Programmes Post-1952

For Egypt's post-monarchy era, a rich variety of studies concerning desert schemes and desert programmes have developed to this day. This research is further growing in correspondence with new governmental plans and deals for ever larger desert programmes in Egypt. The scholarly dealings with the three main fields, namely land reclamation and desert agriculture, desert cities and real estate as well as extractive missions will be presented in this section.

What should be noted initially is that much of this research begins with the year subsequent to 1952 and does not trace development programmes within a larger chronology of interventions into arid regions. Rather, desert programmes appear as a rather recent focus of the forming independent republic as well as a more central mission starting to gain prominence in the country's liberal reform era of the 1980s. Besides, a cross-sectoral view, that sees connections between different desert industries from agriculture to energy, from mining to city building, has also so far not fully developed for research on Egypt's arid lands. Finally, as mentioned earlier, many of these studies, although adding a great deal to understanding missions, tools and goals of desert programmes, have not been able to sufficiently delineate the connections between what happens in the arid lands and what happens in other sociometablic contexts for instance with regards to the changes in ecologies that desert programmes trigger also in fertile and sea-regions as well as the social ramifications of the movements of peoples and goods. Only in the field of land reclamation and specifically with regards to the reclaimed sites in direct extension to the fertile Nile Oasis in the Delta and Valley those connections have been pronounced with detail and focus.

To start, a fundamental study of desert programmes in Egypt, that has a particular focus on the post-1952 decades, is David Sims' publication *Egypt's Desert Dreams*. It was first published in 2015 and then updated with a new foreword by Sims next to one by Timothy Mitchell following the 2015 Economic Development Conference and republished in 2018. This publication is full of useful information and data while presenting a far-reaching overview of a broad variety of desert schemes ranging from new cities to industrial developments and tourism to land reclamation. It is an impressive inventory of mostly state-run projects and it gives many useful data points to understand how these projects were designed and implemented. David Sims approaches the topic as an economist and development expert with extensive experience in the field of development and urban planning in Egypt as well as in other parts of the world. His previous publications include the monograph *Understanding Cairo* (2010). In his work as a development advisor, he worked with both Egyptian public institutions and donor entities of the UN, the World Bank and European Commission on urban issues such as water and sanitation, real estate, urban upgrading and environmental planning across Egypt for, about four decades. He continues to publish and publicly speak on issues

facing urban Cairo, momentarily with a focus on ecological subjects and sustainability ("Greater Cairo and Greenhouse Gas Emissions" 2022a, "Urbanization in Egypt" 2022b).
Amr Adly's *Cleft Capitalism: The Social Origins of Failed Market Making in Egypt* (2020) gives some nuances on Egypt's contemporary desert economy, laying out legal and institutional aspects (but somehow strangely neglecting land reclamation schemes). Besides the texts of these two authors, there are some relevant writings on different desert industries but these focus on specific geographic regions in Egypt. These include the before mentioned book by Donald Cole and Soraya Atorki *Bedouin Settlers and Holiday Makers: Egypt's Changing Northwest Cast* (1998). This ethnographic study comprises of a great variety of aspects of the region's historical constitution and the evolvement of tribal-state relations as well as the more contemporary changes facing the littoral shoreline of Western Desert and Mediterranean through state-led interventions such as regional administration reforms, land reclamation and tourism. A regional study of desert programmes concerning the Western Desert's oasis is provided by Douglas Gritzinger in *Developing Egypt's Western Desert Oases: Anthropology and Regional Planning* (1990).

Looking at his rather small assemblage of written analysis of Egypt's desert programmes and schemes in a cross-sector perspective, there is plenty of room for further works whether it regards the country's arid regions overall or specific regional parts such as the Sinai region, the Western and the Eastern Deserts.

Land reclamation and Desert Agriculture

There has been a strong recent focus on agricultural production beyond the Nile Valley and Delta with empirical and ethnographic studies of land reclamation as a practice that lays the foundation to desert agriculture. A number of doctoral theses have been written on the issue over the past ten to fifteen years. Those have later been followed up with publications covering for example social aspects of land reclamation schemes ("Grabbing from Below" El Nour 2019), issues relating to finance ("The Land Grab, Finance Capital, and Food Regime Restructuring" Dixon 2014) and urban and rural infrastructures (Acloque 2022, Barnes 2014, Malterre-Barthes 2018a, Shawkat 2020). Saker El Nour, one of the leading scholars pushing the field into novel directions. He demonstrated through an empirical study done in Wadi Al-

Nukra in Upper Egypt (2019) that land reclamation schemes allowed for state land commodification of new frontier regions in Egypt which led to the creation of specific class formations as well as new forms land concentration. He further evaluates that land reclamation programmes accelerate the commodification of state lands for speculative purposes. Marion Dixon adds a dimension of global food trade to the study of land reclamation programmes and the rise of corporate agriculture in arid settings. Her monograph *Frontiers of Corporate Food in Egypt* (2023) demonstrates how monocultural planting of horticulture produce done by large agri-businesses on reclaimed sites helped to incorporate Egypt's desert frontier regions into a global corporate food regime. She further studies the multiple consequences of this, for instance with regards to the quality of foods in Egypt and health issues facing the Egyptian population. Jeannie Sowers' work has made multiple contributions to the field. Her focus on environmental politics, not just with a lens on Egypt but also on neighbouring country's, has added indispensable information onto understanding political-economic circumstances in Egypt with regards to their effects on ecological issues. Her essay, "Remapping the Nation, Critiquing the State" (2011) belongs to the core texts of post-1952 land reclamation studies. It showcases Mubarak's New Valley project that later became known and realized as the Toshka Scheme. Sowers puts Toshka into context, showing how the project started with earlier research from the 1950s for geo-engineering a parallel Nile Valley by connecting the Western Desert's line of oases. She further discusses the contradictions and frictions of discourses between environmental management, scarce water resources, growing population needs, technocratic planning and the Mubarak regime's focus on large-scale investments. In addition to those, a number of studies have been published on specific land reclamation projects also looking at Toshka (Malterre-Barthes 2017, Wahby 2004, Warner 2013), as well as coastal land reclamation on the Delta including Northern Sinai (Rap & Jaskolski 2019, Abd El-Rehim Hasan et al 2002) in addition to the so-called *Graduate Scheme* in Noubaraya (Adriansen 2009, Alary et al 2018, Voll 1980). Further studies stress issues of water consumption (see "Mining for Fish: Privatization of the 'Commons' along Egypt's Northern Coastline" Bush & Sabri 2012), the use of plastics in land reclamation and corporate agriculture in the desert ("Plastics and Agriculture in the Desert Frontier" Dixon 2017) or on the role of Gulf investments into the sector of land reclamation and corporate farming ("How Egypt's Water Feeds the Gulf" Arafat

& El Nour 2019, “The Gulf Arab States and Egypt's Political Economy: Examining New Spaces of Food and Agribusiness” Henderson 2017).

Timothy Mitchell’s contribution in *Rule of Experts* (2002) is very relevant for several aspects of land reclamation and desert agriculture. Important segments of the book deal with the techno-politics of water management on the Nile, agricultural production, the institutional apparati that regulate Nile infrastructures and agricultural production (at several moments in Egypt’s modern history). In the chapter “The Object of Development” (Mitchell 2002, 209-241), Mitchell presents a subversive take on the issue of land reclamation based on a prevalent developmental discourse promoted by multilateral donors to expand Egypt’s agriculturally productive landmass He shows how the development discourse that was prevalent in Egypt in the 1980s and 1990s, evolved around an image of a large and further growing population cramped in in a narrow Nile oasis strip (Nile Valley and Delta). The power of this simple idea of demography (growing/exploding) versus geography (*naturally* limited) was so strong and so effective, according to Mitchell, that it enabled all sorts of development programmes and approaches that were argued and designed to overcoming it. Mitchell’s approach is to *take the calculator* in order to confront this proposition with itself, showing how population figures relate to agricultural land mass and also to the crop yield that this land mass produces. He shows that the increase in grain imports during those decades has little do to with the population increase at the time and therefore it is not the right reason upon which land mass expansion should be based on. Rather this import dependency is linked to changes in food production (with an increase in cattle raising) and changing food markets (local consumption and export markets). The simplicity of the image cannot represent or capture those changing dynamics and it can also not assess differences in food consumption Mitchell states, “The answer is to be found by looking at the kinds of food be eaten, and who got to eat it” (213). In order to address issues linked to food import dependencies and growing food needs of a growing population other suggestions should be made that have for instance, so Mitchell suggests, to do with a different kind of land management (in the already existing agricultural areas) addressing land access inequalities.

Various development actors and international donor agencies are covering local land reclamation projects, being themselves central to the conception, funding and implementation of those schemes. Examples include World Bank reports, reports done by the

Food and Agriculture Organization (FAO) or the United Nations Conference on Trade and Development (UNCTAD). Their online archives have served as sources of information for this research.

When compared to the analytical efforts put on similar issues within the geographical context of the Nile Basin, desert agriculture remains a marginal topic. But this has to do with the historically seen rather new occurrence of large-scale land reclamation programmes in Egypt drylands. When compared to literature and debates on arid programmes in Egypt, this is probably the most popular field of interest.

What the research on land reclamation benefits from is work on water management and land use in Egypt that has developed hugely with a focus on the Nile Delta and Valley. For example, anthropologist Nicholas Hopkins who wrote extensively on Nile agriculture in Egypt, irrigation infrastructures and agrarian reform (Hopkins 1987, 1999, 2003 among others) and the political-economic and development scholar Ray Bush who published numerously on agrarian practices, development and political economy in Egypt often linked to questions of food (Bush & Ayeb 2019, Bush 2014). Jessica Barnes' research *Cultivating the Nile* (2018) reflects on issues relating to political ecology which she builds on an in-depth ethnographic and empirical study in the Fayyoum region. Besides these, there is a wide array of studies of specific irrigation sites or hydraulic infrastructures, for instance studies on the Aswan (Low) Dam (Derr 2011), the Aswan High Dam (Little 1965, Lytle 1977, Mossallam 2015) or the Delta Barrages (Mazanec 2017). An important historical perspective of the issue in relation to Egypt's Ottoman period was done by Alan Mikhail in *Nature and Empire in Ottoman Egypt* 2011. Jennifer Derr's *The Lived Nile* (2019) is research on Nile infrastructures and bureaucracies of the late nineteenth century, as it relates to the making of a colonial economy linked to the engineering of local sites through technocratic water management.

This list can be expanded by a large number of studies on the environmental impact of those water-management infrastructures. To just name one study (critical for my research), *Nile Delta in its Destruction Phase* by Daniel Stanley and Andrew Warne from 1998. Jeannie Sowers published several important considerations on environmental protection in Egypt and its institutions and limits in *Environmental Politics in Egypt* (2012) that specifically highlights the work of local activist groups and the study also sheds light on discursive understandings of the environment and environmental issues within local politics (see also "Nature Reserves

and Authoritarian Rule in Egypt: Embedded Autonomy Revisited" 2007, "Environmental Activism In The Middle East And North Africa" 2018 and "Allocation And Accountability: State-Business Relations And Environmental Politics In Egypt" 2003)

Desert Cities

Next to land reclamation, the construction of cities, especially linked to the direct outskirts of the capital, Cairo, have found major academic attention in recent years, again, over the past decade or so. There has been even a bit of academic momentum for the research on desert cities since the 2015 Economic Development Conference and the there made announcement of the Egyptian government building a New Administrative Capital. This has brought some international news attention to the topic of desert cities in Egypt and within this context, we find academic and more journalistic reviewing of the construction of housing and urban development in locations beyond the Nile Basin. Connected to that, there are a number of research-activist and also research-practitioner collectives engage with the issue of housing at large. Their work provides important data as well as analysis to understand the nature of urban construction in arid lands. Examples include 10 tooba (run by Yahia Shawkat and Ahmed Zaazaa), Cairobserver (curated and run by Mohamed Elshahed), CLUSTER (headed by Omar Nagati and Beth Stryker), Takween Integrated Community Development (CEO is Kareem Ibrahim) and Tadamun (that works across the Middle East but with a focus on Egypt). I am myself invested in one collective on the issue, as a founding member of the Network of Urban Studies in Egypt. With not a single urban studies-department or even programme in Egyptian universities and with the much wider limitations of academic funding available in Egypt at large, these initiatives make invaluable contributions to the analysis of the issue. They publish studies, maps, provide statistical overviews and also legal context, next to designing concrete interventions into urban improvements or providing consulting services for development or donor agencies. Especially, in the aftermath of the Arab Spring and the Egyptian Revolution of 2011, urban discourses for reviewing public spaces and the urban form, also with regards to newly built desert extensions and gated communities, were a large part of the debate both in academic fora and in urban research collectives. During those years right after the revolutionary moments in Tahrir, funding was more readily available from development agencies and multilateral donors both for research and practice. But with time passing and the heat of social uprisings cooling down, financial support started to decrease and many

research initiatives and collectives (such as in the urban field) suffer today from the consequences. Because of that, a number of urban researchers have left Egypt in recent years. Some also moved away in the light a tightening security apparatus challenging the work of urban activism and research tremendously.

In terms of research outputs on the subject of desert construction and housing important contributions are from Marc Angélil et al's *Cairo Desert Cities* (2018), Davis Sims' "Urbanization in Egypt" (2022b), *Egypt's Desert Dreams* (2015) and *Understanding Cairo* (2010), Timothy Mitchell's *Rule of Experts* (especially the chapter "Dreamland" 2002) and Dalia Wahdan's *Planning Egypt's New Settlements* (2014). What this list of studies has particularly helped to illustrate are the political and political-administrative as well as political-economic structures upon which desert town planning is conceived and implemented. They also include useful information on the urban form that those governmental plans have resulted, namely the gated community structure. Within this research, the focus is clearly on Cairo and its urban desert extensions. This also includes urban studies views in Eric Denis' "Cairo's New Towns from One Revolution to Another: From Emptiness to Emerging Urbanity Passing by Exclusionary Urbanism" (2018) and "Cairo as Neo-liberal Capital? From Walled City to Gated Communities" (2006) as well as Petra Kuppinger's "Exclusive Greenery: New Gated Communities in Cairo" (2004) and "Globalization and Exterritoriality in Metropolitan Cairo" (2005), next to Yasser Elsheshtawy's "From Dubai to Cairo" (2006) and Momen El-Husseiny's *Compounds of Modernity: National Order and the Other in Egypt (1940-Present)* (2015). A number of anthropologists and sociologists ask about questions of identity and belonging in newly built urban sites, again with a focus on Cairo's periphery, such as Khaled Adham's "Globalization, Neoliberalism and New Spaces of Capital in Cairo" (2005) as well as "Cairo's Urban Deja Vu: Globalization and Urban Fantasies" (2004), Anouk de Koning's *Global Dreams: Class, Gender, and Public Space in Cosmopolitan Cairo* (2009), Noha Roushdy's "International Schools and the Production of Elite Non-Belonging in Cairo's Satellite Cities" (2023) and Mona Abaza in "Violence, Dramaturgical Repertoires and Neoliberal Imaginaries in Cairo" (2016).

What this research is currently leaving under-explored is a focus on the materiality of desert urbanization and the sociometablic conditions of desert cities. Only very recently, researchers started to touch upon the intersection of desert urbanization and ecology, for example David

Sims who wrote about greenhouse gases and Ahmed Zaazaa about the role of the cement industry in Cairo's urbanized desert periphery in Agnès Deboulet and Waleed Mansour's essay collection *Middle Eastern Cities in a Time of Climate Crisis* (2022). There is surely room for more, especially for studies that highlight the use of water in desert cities as well as the deployment of labour and the use of other building materials. A PhD dissertation is currently conducted by Corten Pérez Houis at University Paris 1 on the subject of bricks in a comparative study between Egypt and Sudan. It will be a great addition to this field.

There has also been much less acadmic focus on making analytically productive links between desert cities and the country's coastal touristic ventures while the latter in themselves can be seen as a large part of the country's overall real estate industry. Egypt's tourism industry, despite making a significant contribution to the economy, is overall strangely little studied. Rare contributions here are for example Leïla Vignal's "The New Territories of Tourism in Egypt: A Local-Global Frontier?" (2010), Mohamed Sakr et al "Tourism in Egypt: An Unfinished Business" (2009), Steiner's "Tourism, Poverty Reduction and the Political Economy: Egyptian Perspectives on Tourism's Economic Benefits in a Semi-Rentier State" (2006), Richter and Steiner's "Politics, Economics and Tourism Development in Egypt: Insights into the Sectoral Transformations of a Neo-Patrimonial Rentier State" (2008) and Manar Moursi's "Concrete Shores" (2022).

Further, with the urban field's distinct focus on Cairo and by extension, the centrality on desert urbanization on the Cairene dryland peripheries, more research could be done with regards to other new town construction in arid or formerly arid regions. Some of this work is done in connection to the field of land reclamation, such as Yehia Shawkat's chapter "'Model' Villages for 'Model' Citizens" in *Egypt's Housing Crisis* (2020). But studies on Sadat City, for example, one pioneering attempt for new town planning in an arid periphery (of the Delta), remains less looked at. One example is "Sadat City, Egypt and the Role of New Town Planning in the Developing World" by Salah El-Shakhs (1994). Also the construction and current state of the Canal Cities along the Suez Canal which I count as desert cities in my analysis (see chapter three of this text) should be more scholarly reviewed and assessed within the light of desert urbanization in Egypt. Good studies on the construction of the towns during the colonial era include "The Canal

Towns: Port Said, Ismailia" (Bayoumi & Bennafla 2018) and "European Construction Companies in the Towns along the Suez Canal" (Piaton 2012).

Overall, what I would wish for this field of analysis on Egypt's desert cities to do, is to better ground the analysis of planning, designing and building new towns into (and out of!) arid thresholds into the sociometablic contexts of the construction business, for instance by working out connections to the below outlined field of Extractivism. Despite the many important advances that have been made in the urban field, especially in terms of assessing politico-economic conditions and issues related to identity and belonging, understanding what desert construction is literally made off, can help to see its goals and tools in a new light and lead to novel understandings. Further, studies of the relation of speculative finance and desert construction, desert real estate and desert infrastructures will benefit the analysis of the contemporary era tremendously. Dalia Wahdan and Tamer Elshayal have made an excellent start into the subject with their text "Dissonant Times: The Land–Infrastructure–Finance Nexus in Post-Mubarak Egypt" (2024). I hope it will be followed up by more works of that calibre in the future.

Geological Research and Mining in Egypt

What counts as Extractivism in the field of prospecting and mining especially in Egypt's modern period is to this day a field that I find largely neglected in the context of studies on Egypt's contemporary political-economy as well as in the Humanities as well as Social Sciences overall. Where are the ethnographic studies of mining industries and mining sites? Where are the political-economic studies of Egypt's today booming construction sector, for instance in connection to the above-mentioned construction boom taking place in the Greater Cairo periphery and along the country's coastlines, with studies on sand, aggregates, gravel, iron, steel, water, labour and finance? Where is a historical analysis of Egypt's hydrocarbon industries that critically reviews actors, financiers, labour practices and ecological ramifications of prospecting, drilling, transporting and refining and that puts local extractive industries in the oil and gas sector into local, regional and global networks of consumption? And what about other currently very active extractive industries such as the prosecting and

mining for gold, copper, iron and steel? Besides, where are the regional studies on Sinai or the critical considerations of the extractive missions shaping the still ongoing border dispute along the southern edges of the Eastern Desert? Only a hand full of papers have so far discussed the military closed off zone of the Halayeb-Shalateen Triangle that has been a disputed territory between the Egyptian and the Sudanese Governments since the British colonial occupation[12]. It is known – and shown in those few studies – that the territory remains disputed and militarily closed because of the resource rich nature of this terrain – both in the desert and in the adjacent offshore regions in the Red Sea. Yet, a scholarly discussion of the subject is far from exhaustive.

As demonstrated above, research on Egypt's extractive industries of ancient historical periods is created a vast archive of works with abundant funding opportunism for archaeological missions both from foreign institutions and Egyptian ones. More recent works, even in the context of Egypt's modern history, for instance on coal and petroleum industries, deal with their subject more as an issue of geology within a discourse that centres on improving efficiencies and economic outputs of the prospecting and mining process (see for example Edress 2020 on coal and Dolson 2020, Dolson et al 2014, Dolson 2001 on petroleum). Those researchers often work closely with industry actors by providing research and consulting services for extractive missions. Hence, there is a real gap in the research that considers the socio-ecological dimensions of the current mining and drilling practices and of the science of prospecting and extraction and that evaluates market dynamics critically as well as assessing the role of public institutions and private financiers.

For the more recent studies that consider the subject of mining with a critical understanding, the before mentioned study by Ahmed Zaazaa (2022) on Egypt's cement industry is one great but a rare example. The construction of the Aswan High Dam has of course featured in numerous studies and some of those take into active consideration the material infrastructures that make up the dam and the deployment of labour in the extraction and construction process. Nancy Y. Reynolds wrote in "Building the Past: Rockscapes and the Aswan High Dam in Egypt" (2013): "The colossal environmental manipulation demanded by

[12] Those papers include Serag 2023, Mohyeldeen 2020 and Ghafoori 2024.

the High Dam prompted a rewriting of geological time that paralleled and supported the achievement of 'national birth' and development in this new geography of the nation." (Reynolds 2013, 182) She follows the extraction of the Aswan granite that was used for the first Aswan Dam and for the Aswan High Dam, displaying in a compelling mix between ecological aspects, labour practices (and abuses), building infrastructures and identity politics (of nation-building and racist discriminations against Nubian people) what characterizes the more literal and the more symbolic nature of the High Dam. Another research on the Aswan High Dam that is relevant for the field of Extractivism is *Pillar of Sand: Can the Irrigation Miracle Last?* (Postel 1999).

Rushdi Said, the geologist and bureaucrat, published in 2004 an autobiography with the title *Science and Politics in Egypt: A Life's Journey*. It gives a solid account of extractivist industries in Egypt looking back at respectable career in the field lasting almost sixty years. The book especially gives insightful details about the institutional apparatus of geological works, its connections to foreign research missions and also private funding ventures. Yet, the text is far from a critical study of extractive industry. It is rather a colourful account filled with anecdotes about scientific practice and its institutional backdrop as seen from the perspective of a leading bureaucrat and scientist himself.

To summarize, the field of mining and geological research in Egypt currently leaves a lot of room for imagination. While rich in scientific accounts of geological data retrieved from remote sensing technologies, scientific practices and in conjunction with a large archive of extractive works that have taken place in Egypt for millennia, the politico-economic conditions, social and ecological character of extractive industries in Egypt still has to be addressed in a comprehensive and critical way. Even studies concerning specific extractive regions or the extraction of prominent raw materials, such as fossil fuels, metals and the raw matter for urban construction awaits deeper and more critical academic considerations that evaluate the extractive process, actors and beneficiaries, financiers and institutional apparatus as well as accounting for the ecological ramifications triggered by the business with the subsurface as well as its effects onto the lives and rights of nomad communities.

To conclude this section on the state of desert research in Egypt and how this study seeks to situate itself within the existing landscape of works, this research relies fundamentally on many academic reflections that have come to promote the desert as an important site of research in Egypt. Especially the fields of Anthropology and Geology have been leading the way, yet they are rarely in close dialogue with one another. While anthro-geological studies are more common practice when looking into the country's more ancient past, research on the country's modernity has yet to catch up and still needs to provide important interlinkages of colonial rule and post-colonial political economies as well as their relation to desert industries and ecosystems. Especially, the area of Extractivism in the field of prospecting and mining need be further elaborated on, to understand the sociometablic make-up of local industries such as construction. As regions across Egypt's arid lands are becoming capitalized – as we will see in the following chapters in great details – it will become ever more urgent to understand the socioecological mechanisms of these processes, seeing different desert industries in their ecological contexts and also with regards to the social conditions of those programmes. This is what this study has to offer. Instead of working through separate camps of analysis, studying urban construction OR land reclamation, this project offers a view into multiple locations and instances of desert programmes to see interdependencies and links. Further, this research highlights in particular the ways in which specific desert schemes operate in and through the web of life. What happens to arid regions as they are being manipulated through material-discursive interventions and what happens also to the wider metabolic contexts of fertile and sea regions? What my research does is to interweave many of the above presented discussions, showing historical linkages and roots as well as cross-sectoral oscillations.

1. Claiming (Arid) Land

Our only trouble is that we haven't land enough. If I had plenty of land, I shouldn't fear the Devil himself.

Leo Tolstoy, *How Much Land Does a Man Need?,* 2002
(first published in 1886)

The important part which modern science can play in the economical development of natural resources is generally recognized to-day, but nowhere may this be seen more clearly than in Egypt, with its subtropical climate, its controlled water-supply, and its immunity from the vagaries of the weather which affect more norther latitudes.

Col. Henry G. Lyons, *Science in Egypt*, 1922

1.1. Fruits of the Desert

"What are fruits of the desert in Egypt?", I asked my friend Dina last year. Dina lives high up in the mountains of Sinai, near the town Saint Catherine where she rents a house that is part of a group of four houses within dry, rust-coloured mountain ranges among them the highest peaks in Egypt. She works there together with some Bedouin families of the Jabaliyya tribe who own ancient orchard gardens dating back to the first centuries AD (see Zalat et al 2008, on the history of orchard agriculture in Sinai, including an overview of plant species). Some gardens have laid bare for long time. Others are planted with fig trees, almond, olive, plum and pear, wheat and barley or tobacco providing self-sustenance for the families and income when sold in nearby tourist-markets or shipped over to Cairo. Dina founded the company Be.do that helps restore the ancient gardens through permaculture and does logistics and marketing to sell produce in Cairo. "Fruits of the desert", she says, "balanites, dates, thistles and quite a few desert berries grow on shrubs like *meshwak* or *nabqa*, an orange berry with a big seed growing on christ-thorn trees. And prickly pears of course!" I asked about *tut*, the fruits of the mulberry trees, a treat that we picked together once hiking through Sinai longing for sweet refreshment in the summer heat. "Yes, you find them in the desert here but they were cultivated unlike the other fruits. Those all grow naturally, wild", she says.

Another answer to the question, "What are the fruits of the desert in Egypt?", could have been the Valencia Orange of the variety Olinda grafted on a Volkmeriana rootstock, planted along meticulously surveyed horticulture production lines of Egypt's new agri-tech-industries in the desert. This is a fruit that either multi-national corporates or family-owned agri-businesses exporters will ship to super- and hypermarkets in Europe, Russia, Saudi Arabia or they will be sold open-air market stalls in China and India between the first week of February and the second week of May. Valencia is thin-skinned orange variety, full of juice, first bred and planted commercially in California in 1875, giving the Orange County its characteristic colour[13]. Over the past years, Egypt has risen to become the third largest exporter of oranges worldwide, catching up quickly industry-rivals Spain and South Africa[14]. Those oranges from Egypt will not come from farms of Egypt's *old*, *traditional* agricultural fields, amongst which some areas have been under continued cultivation for about 5,000 years. Naval oranges, Cara Cara, Fremont, Murcot, Ortanique and others – to name them by their industry names – come out of the country's desert. Next to strawberries, grape, and cut flowers, these horticulture products are the literal and symbolic fruits of Egypt's move into the desert, of about two centuries of public works, land reforms and hydrological innovations, changing environmental imaginations and discourses along with the introduction of new seed and tissue culture varieties, fertilizers and pesticides, new energy infrastructures, administrative reforms, financial aid and development treatise.

The relationship between desert land, agricultural soil and the Nile has changed throughout history; it is a joint *sympoietic* story, to use Donna Haraway's term (2016), full of leaps, skirmishes and discontinuities. A lot has been written about agricultural production in Egypt, from the time of the Pharaohs (Eyre 1999, Westermann 1919, Rolfe 1917), Ptolomaic (Manning 1999, Thompson 1999) and Roman period (Rowlandson 1999), Byzantine (Banaji 1999) and Coptic era to the importance of Egypt's agricultural bounty for the Arab-Islamic empire (Frantz-Murphy 1999) and later for the Ottoman empire (Mikhail 2011, Cuno 1992,

[13] Suggested by Phil Bigrandi (Orange County Historical Association) at https://www.orangecountyhistory.org/wp/?page_id=231, accessed on 8 November 2023.
[14] According to Chatham House data from 2020, Egypt's share in the global orange market is 12% for fresh oranges. In the year 2000, it was 2.6%. https://resourcetrade.earth/?year=2020&exporter=818&category=407&units=value&autozoom=1, accessed on 8 November 2023.

1999). Also, the role of Egyptian cotton-fields as a fundamental resource of the colonial textile industry of Manchester has been numerously studied (Earle 1926, Jakes 2020, Owen 1999, Derr 2019). More recently, the study of agriculture, food production, peasantry studies and rural life has put a lot of attention on uncovering injustices and issues within local food production systems as linked to global markets, investments and development focussing on food security, food riots, food dependencies, development studies and agrarian reforms (Mitchell 2002, Bush 2009, 2023, Dixon 2023). Once, the most profitable agricultural province of the Ottoman empire, its breadbasket, today, the world's largest importer of wheat. Connected to that, discussions on bread – the staple food of the local diet – as well as the bread subsidy programme have been important both within academic and public debates. Looking at bread in specific has served as a prism through which researchers like Jessica Barnes (2022) study questions linked to public policies, trade agreements, development issues and agrarian change and hence also social justice. The chants of the 2011 revolution, *'Aīsh, huriyya, 'adāla igtimā'iyya* (Bread, Freedom and Social Justice), are still emblematic for those issues and they still echo through this field of inquiry. Will we hear them again soon? The bulk of Egyptian wheat imports come from Russia and Ukraine[15]. The at the time of writing ongoing war between the two countries, has had dramatic effects on the local food market with stark food price inflation.[16] It put the Egyptian government under severe pressure to being able to continue to provide subsidized bread upon which the majority of the population rely (Barnes 2022).

Over the past fifteen years, we can see a growing academic focus on studying those *new lands*, those new agricultural sites on formerly arid terrain. This research has helped to trace and map out where new agricultural fields have appeared where before there was desert. Research for instance from Charlotte Malterre-Barthes demonstrates for the post-

[15] Russia exported in 2020 USD 3.4bn-worth of wheat to Egypt, making it the largest wheat trade on the planet that year. Ukraine sent in the same year USD 1.3n-worth of the grain to Egypt, according to Chatham House data published at https://resourcetrade.earth/?year=2020&importer=818&category=52&units=value&autozoom=1, accessed on 8 November 2023.

[16] "Food price inflation hit a fresh all-time high: Food and beverage prices — the largest component of the basket of goods and services used to calculate inflation — soared 62.9% y-o-y in March, up from 61.8% the month before." Published on the Egyptian economics blog *Enterprise* on 11 April 2023 https://enterprise.news/news/story?storyId=fed48338-9c78-413e-93c0-e2bc59f52ec4, accessed on 3 January 2024.

independence period, in the decades after the 1952 Free Officers' revolution, how the Nile Delta was horizontally stretched to the west and to the east. The ruling regime at the time under military general Gamal Abdel Nasser was invested in increasing local food production through mechanization, new rural models and also the expansion of the domestic cultivated area, so Malterre-Barthes (2018a, 353-354). Existing literature shows that there were a number of reasons for which respective modern Egyptian governments have turned towards its sovereign arid lands. Reasons include of course the increase in food production, as stated above, but also the creation of new (rural) sites for a growing local population (Shawkat 2020, chapter *'Model' Villages for 'Model' Citizens*, 85-113) as well as opportunities for testing out and implementing new forms of agricultural production (Dixon 2017) and finally, for the sake of selling those sites as areas to individuals or corporates (El Nour 2019). The published research further highlights a number of hydraulic infrastructures that are employed in those processes of rendering formerly sandy soil into fertile grounds for planting, such as water pumps (Barnes 2014, Malterre-Barthes 2017, Rap et al 2022), canals (see for example Geriesh et al 2015 on Es-Salam Canal) and dams (Malterre-Barthes 2018b, Mazanec 2017). Those writings reveal important aspects of what was techno-politically needed to expand the local cultivated landmass, specifically focussing on hydraulic infrastructures as well as water-management policies. Those studies also include governmental strategies and goals as well as infrastructures (again, predominately hydraulic ones) and to some extend also economic factors involved in the horizontal expansion of the Nile Valley and Delta. Jeannie Sowers shows for instance how the mega-project called the Toshka Scheme was a central project for the administration of Hosni Mubarak in the beginning of the new millennium. This scheme was planned to newly cultivate an area of 540,000 acres (the size of over 400,000 football pitches) inside the Western Desert made possible through the installation of a mega-size pump (with twenty-four turbines), close to Lake Nasser, an infrastructure that the ruling regime had prided itself with also being the largest on the planet (Sowers 2011, 158). The water pump is able to lift about ten percent of the volume of Lake Nasser into the 70 kilometre-long Sheikh Zayed Canal and from there the water is further distributed into agricultural rondels where centre-pivot irrigation systems spray onto newly cultivated plants (El Baradei & Al Sadeq 2019). Today, despite being much smaller than initially intended,

Toshka is a site for the planting of dates and the animal fodder alfalfa (a kind of clover)[17]. It is majorly funded and run through foreign capital investments from the Saudi Arabian Prince Al-Waleed bin Talal (funded by the prince's Kingdom Agricultural Development Company, in short KADCO). Researchers Nada Arafat and Saker El Nour asked in extension of Sowers' work if it was not the rare resource of fresh water in Egypt that now *feeds the Gulf* through the virtual import of fresh water from corporate desert farming (Arafat & El Nour 15 May 2019)? In a very recent publication (from November 2023) Marion Dixon adds to this literature a new, additional perspective that demonstrations how those new agricultural lands relate to global food systems, focussing on where those newly planted fruits, vegetables, grains or animal products are sold in global markets and how this happens. David Sims delivers a detailed overview of post-Nasser schemes (until 2018), revealing general and concrete administrative structures as well as funding. Sims assess achievements of those state-directed schemes measured along agricultural productivity and in terms of their contribution to the local GDP (Sims 2018, chapter *Greening Egypt's Desert*, 117-175).

What these researchers have achieved to demonstrate is a multi-perspective investigation of the emergence of new agricultural sites that have appeared over the past sixty years beyond the *traditional* Nile Basin. While this research is an active space of debate with number of voices looking at the subject from diverse viewpoints, I believe that it leaves some more fundamental considerations underexplored. In my view, the research would benefit from a *grounding* of contemporary desert planting programmes into their material-discursive contexts. On which pre-1952 infrastructures, engineering and agricultural practices are those schemes built? Besides, what is their discursive background both in the legal and administrative sense but also in the sense of a popular politico-ecological imaginary as well as in reference to the role of environmental engineering programmes and ways of manipulating/reconfiguring *socionature* environments (using the term *socionature* in reference to Jason W. Moore 2015, as suggested in the introduction)? And finally, very importantly, what is the role of the desert in the conception, design and implementation of

[17] According to Jeannie Sowers' presentation "The 'New Valley' Project, Again and Forever?" held at the CEDEJ roundtable *Egypt's Hunger for the Desert: Food, Agri-Capitalism and the Environment in Egypt* from on 18 April 2023. I co-organized this event together with Delphine Acloque.

those schemes? What does land reclamation in turn reveal about the role that the desert plays as well as the ways in which the desert is being organized?
Particularly the last points on the desert in specific are so far widely overlooked in the discussion of these schemes, other than the quick referral to the argument that desert lands are state property. But making the desert part of the debate, we can better see how this even came about and what that does/enables? Besides, within the current debate, it seems unquestioned what even constitutes the *traditional*, *old* plains of the Nile Basin which those new schemes aim to further expand?

This research therefore studies the expansionist drive of agricultural production in Egypt increasingly venturing out into the country's desert regions. The question is: Why planting (in) the desert? Who plants there and how? And what are the consequences of that? What will help me to that is to understand, how does land reclamation actually work? What does it mean to reclaim formerly non fertile sites for the planting of produce? What infrastructures are required both in the material and in the discursive sense of prtocols, laws and bureaucracies? In other words, how does land reclamation act as a practice of capitalization? What characterizes this practice and what are its effects? Based on what grounds can it even take place?

In the year 1990, a World Bank report suggested the following with regards to agricultural development in the Nile country:

> Developing water resources and reclaiming land have long been important components of Egypt's agricultural strategy. Since the 1952 revolution, over LE 3.0 billion (nominal) have been expended on land reclamation, and some 1.6 million feddans of land have been reclaimed for agricultural use. Land reclamation continues to receive the largest share, about 40%, of the sectoral investment budget… To expand the agricultural sector, Egypt must, to a large extend, rely upon expanding its land base. Productivity (yields and cropping intensity) is relatively high on the traditional agricultural lands of the Nile Valley and Delta, thereby limiting the possibility for growth in these areas… In addition, rapid population growth combined with a relatively small cultivated area has resulted in one of the world's smallest arable land:man ratios. Adding to the land base is seen as a way to alleviate some of the social pressure of urbanization and high population density.
>
> World Bank 1990, preface

The Bank argues that in order to keep up with social pressures of a growing population and to achieve "sectoral growth" in agriculture, Egypt "must" expand its land base. The way in

which this is supposed to be achieved is through land reclamation. Land reclamation in this context means the increase of agriculturally productive area through horizontal expansion of productive sites onto formerly not cultivated ones. Land reclamation will be the focus of this chapter but before laying out my strategy for how I am going to study land reclamation in the Egyptian case, first, a few more remarks on this World Bank report from 1990.

The Bank is an active development-agency in Egypt, invested in numerous projects as well as financial commitments since the 1980s. Its suggestions and discursive framings have weight and influence for the local context (next to co-shaping governmental programmes directly through funding and consulting). It is telling that the Bank does not mention that those reclaimed areas are meant to feed a growing population but rather the economic argument of "sectoral growth" is put forward as well as the idea to "alleviate some of the social pressure of urbanization and high population density". What social pressure exactly means in this regard can only be speculated about but it seems to suggest that there is pressure rising based on *too many* Egyptians depending on *too little* land. How this sectoral growth is going to effectively improve the life situation of this growing population and thus alleviate some of that proclaimed social pressure are however not clear. The report asserts that productivity in the Nile Valley and Delta regions is already (relatively) high, so in order for productivity (in the agricultural sector) to increase, the land base needs to grow horizontally, in quantity. We can already see in this text many elements that are at the core of land reclamation in Egypt: the aim to have more productive land in Egypt is one of them, that the desert sides are not even mentioned but merely constitute the backdrop of development is another and a horizontal landmass expansion of agricultural areas is yet another. Further, that the Bank sees this large share (the largest!) of agricultural investments coming from the government and going into land reclamation as something unquestioned and uncriticised – and hence arguably justified and maybe even suggested – is another telling feature of land-management in Egypt at the time and it still has relevance to this day. We will see in the following sections, how mega-land reclamation schemes are developed in Egypt's desert subsequent to and as a result of those kinds of reports, trying to follow this formula of horizontal expansion of productive land

mass equals sectoral growth, justified on an arguably geographical/*natural* limitation that needs to be overcome. [18]

For this chapter, my goal is to approach the issue of land reclamation in Egypt as a means of capitalization. The question is: How does land reclamation that is today taking place predominantly in the country's arid lands, inform and alter those sites? How does it operate as a way to organize spatial and spatial temporal power relations at the nexus of nature and capital? Based on what assumptions, practices, ideas and tools do those projects (land reclamation schemes) appear? How do land reclamation schemes operate concretely material-discursively and what can be said with regards to their eco-societal aftermath?
In the text, the order in which I will be addressing the questions will be different. I will first look for the historical material-discursive underpinnings of modern land reclamation programmes, to then, secondly, look at the issue from the vantage point of a concrete case study, discussing the ways in which land reclamation schemes and desert agriculture farms (that rely on those schemes) operate today, further asking how they working in and through territorial negotiations between irrigation infrastructures, land holding agreements, governmental development programmes, food standardization processes etcetera.

First some more context on the issue of land reclamation seen within Egypt's geography and also as treated in the currently existing scholarly literature. Agriculture is one of Egypt's dominating industries, contributing 13% of the local GDP. It is the largest employment sector in the county, with about 24% of the population working in that sector, amongst which are many women[19]. Egypt is largely an agricultural economy and it can look back on an agricultural history lasting over five millennia. The Faiyoum oasis, a lake oasis close to the Nile and just two driving hours south of today's Cairo, is recorded as one of the world's very first agricultural settlements dating back to the twelfth dynasty (about 4,000 years ago, Tvedt

[18] Timothy Mitchell offered a subversive take on the issue of growing Egypt's landmass for agricultural production, as previously pointed to in the Literature Review, with reference to the chapter "The Object of Development" from *Rule of Experts* (2001).
[19] Numbers refer to the year 2020, derived from CAPMAS, referenced on the website of Egypt's General Authority for Investment and Free Zones (GAFI), https://www.gafi.gov.eg/English/Sectors/TargetedSectors/Pages/Agriculture-and-Land-Reclamation.aspx#:~:text=Agriculture%20is%20the%20mainstay%20of,considered%20the%20highest%20income%20crop, accessed on 15 November 2023.

2021, 8). Desert agricultural practices exist in various shapes across the country's deserts, from the ancient orchard gardens in Sinai to oases' plantations or agricultural production along the country's Mediterranean coastlines and the numerous individual, temporary instances of agriculture and planting using well-infrastructures or seasonal precipitation. But the lion share of agricultural fields are found along the Nile Valley and Delta. The Nile is a central lifeline for the country and Egypt and the Nile River seem to be a co-depended unity of sorts. Before arriving in Egypt, the river passes through Eastern Africa, for thousands of kilometres through desert territory. The Nile enters Egypt from the geographical south, coming from Khartoum in Sudan where White and Blue Nile joined their paths. From there, water (together with microbes, plants and fish) is further flowing through the desert of Sudan and through all of Egypt (from south to north). The river splits up into its two main arteries and smaller estuarian branches like smaller veins that makeup the Delta (just after today's Cairo) before finally arriving in the Mediterranean Sea. The Nile Valley is a fertile riparian plain. The Delta was in those earlier centuries of cultivation more of a swamp land containing an archipelago of cultivatable sites in seasonal metamorphosis (Tvedt 2021, 14). With practically no significant rainfall in the entire country[20] and no other freshwater river or lake, the agriculturally productive land of Egypt is primarily linked to the Valley and Delta and it is hugged to the east and to the west with deserts.

A Google Earth perspective on Egypt today shows that its geobody has morphed compared to the earlier NASA imagery of the 1980s, the time that those images were first made available to the public. The Nile Valley and Delta appear in the shape of a green lotus blossoming in the desert; a motive that is part of the country's popular imagination of itself. But now, the lotus has gotten new extensions and its general layout has started to reshape. The world's largest artificial lake, Lake Nasser, appeared in the 1970s with the closing of the Aswan High Dam in the Nubian lands of the Western Desert. Over the past twenty years, a new sprinkled carpet of farming activities is sprouting out of the artificial water reservoir reaching far into the Western Desert regions. New frenzied out contours have given an altered appearance to the lotus blossom, the Nile Delta, with new agricultural additions on both sides. The Delta in

[20] Rainfall in Egypt is extremely low and at an average rate of about 21-25 mm per annum, making it overall a hyper-arid country, according to World Bank data cited by Trading Economics at https://tradingeconomics.com/egypt/precipitation, accessed on 2 January 2024.

specific grow in size during the last three decades and about one third of its current productive area was not under cultivation just about sixty years ago (according to graphic shown in Dixon 2013). Besides, the Nile Valley, the stem of the lotus if you like, got thicker, new agricultural planting on the western and eastern fringes of the Nile Riverbank with new branches creeping out into the Eastern and Western Desert sides. Besides, entirely new green areas are now mushrooming from deep inside the Western Desert, in *Sharq Ouweinat* (literally, East Ouweinat) on a desert plain, close to the geo-political border with Sudan in the south and also Libya in the west is not far, just a few hundred kilometres away. Large industrial farming extensions can further be found on the Western Desert's oases, in Farafra and Dakhla. In addition to those, new continuous fields of agricultural production along the Mediterranean shorelines are now reaching all the way east towards Gaza and Israel in northern Sinai as well as elongating the Delta coastline towards the west.

Particularly, the past sixty years were a period of massive engineering projects in Egypt that were seeking to alter the country's geobody by changing the flow and (bio/chemical) constitution of its central water body, the Nile. Between the year 1960 and 1971, the government together with foreign financiers and technocrats, predominantly coming from the political ally of the time, the Soviet Union, built and financed the world's largest river dam of that period, the Aswan High Dam. This massive construction is 3.6 kilometres long and 111metres high above the river's water level. It stretches along the entire width of the Nile south of Aswan and south of the first Aswan Dam (from 1902). It lies at one of Egypt's most southern points and therefore functions almost like a tab that regulates the inflow of water for most of the country. Now, fifty-five billion cubic metres of water run each year through the dam, passing through twelve generating units producing electric power in a massive hydro-electric power plant (Sowers 2011). The water that the dam withholds and stores has created an entirely new water body, Lake Nasser, called after the president under whose auspices the dam was erected. The lake is an incredible 550km long and its volume is equivalent to about two years of Egypt's water consumption and because it lies still within Egyptian borders, it acts like a water bank for the desert country[21]. The Aswan High Dam, epitomizes the period's focus on massive-scale engineering projects that defined Egypt at the

[21] Terje Tvedt, film River of History, episode 'The Nile Quest', 22:06-22:32min, https://www.youtube.com/watch?v=lE_b8iN_FAw&t=1555s, accessed on 23 May 2023)

middle of the twentieth century. In connection to the dam, respective Egyptian governments of the decades following the country's independence from monarchy rule in 1952 designed and implemented government-initiated projects whose goal it was to increase the agriculturally productive areas, foremost those connected to the banks of Nile, again, the vast majority of the overall planted landmass.

The current research on land reclamation and corporate agriculture in Egypt that has been presented in the literature review chapter of this text has been very successful at describing individual instances of land reclamation projects while unpacking how these are planned, how they are executed and also assessing how they are managed and run (whether they add to the productive territory successfully or not). Further, the research shows what respective political regimes intended with designing and implementing those schemes. In this way, scholars like Jeannie Sowers (working on the Mubarak years) demonstrated effectively, how land reclamation schemes were a central tool of the respective political-economic system of the time, embedded in development discourse and financial deals.

I am arguing that looking at land reclamation schemes as a spatial practice of capitalization that re-configures territories in the web of life and at the nexus of capital and the sociometablic, we are able to notice three new elements that I will focus on in this chapter. One, is that current desert agricultural schemes inherently rely on material and discursive practices of land use and ways of organization of territory that predate the 1952-era. Second, we can see how land reclamation works across different scales, from the territorial scale to the cellular scale of biological material. And three, land reclamation schemes allow for specific actors with specific strategies/goals to engrain themselves into territory, thus not just re-claiming desert thresholds but rather claiming them in the form of largely uncontested seizure of sovereign territory.

My proposition is to say that *moving out* of the Valley and Delta does not only depend on a system of irrigation infrastructures and political initiatives that want to increase food production or achieve *sectoral growth* (like suggested in the World Bank extract quoted above). It also depends on a specific material-discursive organization of territory that works as a means of capitalization. Land reclamation rather than being *just* a way of expanding

existing productive areas, is a spatial operation it re-organizes territory by means of scientific research and engineering as well as through forms of land surveying and discursive land organization. This mirrors conceptions of land reclamation that have been discussed from the works of Aihwa Ong, Diana Davis, Eyal Weizman and others (discussed earlier) who have shown effectively that land reclamation re-organizes territory. While arguably being a *neutral* tool for growing productivity, it is a political instrument of acquiring land and shaping socionatures in specific ways. Land reclamation relies on a discursive framing of productivity that is achieved through stability and predictability, thus it re-organizes space and also time in a way that the spatial and temporal configurations of territory('s productivity) are measurable, tweakable and predictable. In this way, land reclamation schemes of the past 150 years and particularly of the post-Nasser era, informed and transformed Egypt's geobody *from within*. Specific government-favoured actors were able to benefit from these schemes, to claim land and thus co-shape local territories in widely consequential ways (and this is particularly true for the country's liberal era). The socio-ecological aftermath has however largely to be paid by others, specifically farming and fishing communities as well as urbanites in the Nile Delta.

To come this conclusion, I will be discussing in the following section I will lay out the historical context of hydraulic engineering in Egypt. I will be working my way through the legal contexts of *wad' al-yadd* as well as through irrigation schemes and geo-political negotiations over water, questioning what productivity means and the socionature of rendering (arid) landscapes productive. Finally, the last segment of this chapter, will be based on a discussion of the liberal era corporate food production in the desert in reference to fieldwork done in reclaimed agricultural farms laying in the extensions of the Nile Delta. Here, I will look at with the multi-scalar ways in which desert farming affects its immediate as well as wider politico-ecological contexts. Final remarks will be made on the socio-environmental aftermath of those deep geo-engineering schemes.

1.2. Algorithmic Governance

In Egypt, there is not one foundational moment of land reclamation. Despite much attention within academic publications being put on the decades subsequent to the socialist era under

Gamal Abdel Nasser and the erection of the Aswan High Dam during his rule (built between 1960 and 1971), it was not the High Dam that enabled land reclamation projects in the country with the dam's providing of an increased and steady water supply. If anything, it was the other way around. One could say that it was land reclamation, as a material-discursive practice, that enabled the (conception, design and construction) the dam. Because for land reclamation projects to promulgate today across Egypt's desert territories, especially those linked to the fringes of the *traditional* Nile Basin, land reclamation as a spatial practice had to be conceived as a specific way of techno-materially treating and discursively dealing with the Nile River system. This is what this section will be about.

Before modern governments would venture out into the country's sovereign arid lands, land reclamation, in Egypt, was first and foremost a practice that took place next to and inside cultivated areas. It happened in swamp lands and on salt marshes, on fallow fields and on sites where predominately the flow of water was interrupted in some ways, be it because of the absence of drainage facilities or clogged waterways. Or it was related to challenging topographical features of the ground that made the extension of waterways otherwise difficult into those areas (that could be reaching through levelling the ground or with the help of water-lifting pumps). Or again, it was because of seasonal or meteorological changes that had decreased the availability of fresh water. Land reclamation happened along the fertile river plain in small or medium-size but scattered and often individual instances where people (farmers or Bedouins for instance) expanded agricultural fields and crop production through techno-social interventions, maintenance and repair or the use of seasonal floods. Diane Davis wrote "Land reclamation, making uncultivatable land cultivatable, in Egypt is perhaps as old as irrigation technology itself" (Davis 2011, 7). There is however a fundamental difference between these kinds of land reclamation practices and modern land reclamation schemes that started to take shape from the middle of the nineteenth century in the ways in which they intervene in their socionatural contexts and in the ways in which they discursively operate, for example upon which discursive treating of nature they rely? The practices described above co-exist alongside modern ones and they have built their foundation of the modern schemes in some ways but they also deeply diverge from each other.

Before unpacking those difference, first, what is the relationship between irrigation, agriculture and land reclamation in Egypt? Does land reclamation simply mean to expand the Nile watershed by expanding irrigation networks onto formerly not-irrigated, barren sites?

Agriculture in Egypt has always depended on forms of irrigation. With no significant precipitation, farmers heavily relied on the Nile River ecosystem which this small description of the Nile historian Terje Tvedt exemplarily illustrates:

> In the pharaonic era, projects to control the river were being implemented and pyramid texts document the digging of transport and drainage canals. Accordingly, the branch of the river [the Canopic] was destroyed, not only due to its own relentless ecological logic, but also because the Egyptian rulers dug the Bolbitic canal around 3000 BCE. The canal's water carrying capacity meant there was less water left for the Canopic, something that finally finished it off.
>
> Tvedt 2021, 14

Human agricultural systems developed in accordance with the river's rhythm and flow. Its ecosystem was in continuous motion and metamorphosis. The Nile is an inundating water body, so during the months of August, September, October and November, the water level would swell up to sometimes 400 times its size (Tvedt 2021, 11). When the flood arrived, water was reaching over the riverbanks on each side for a few dozen kilometres. The Nile's riverbed is a characteristically flat land bank and thus the flood plain constitutes the fertile Delta and Valley. Delta and Valley are the result of a millennia-long ongoing exchange/conversation between the seasonally inundating river ecosystem and the riverbank's soil (and atmosphere) along the riparian seam. The banks of the Nile are said to be among the richest soils on the planet, filled with sediments[22] that the river had collected

[22] Before arriving in Egypt, the Nile has been collecting rainwater from highlands in Ethiopia, especially in autumn when the river of the Blue Nile would swell up the river and replenish it. As water levels of the Blue Nile sink towards the spring, the other Nile tributary, the White Nile, takes the overhand in supplying the fresh water with a more constant, continuous flow until they both merge in Khartoum (Arabic, "the Elephant's trunk" or the "hose"). Both Nile tributaries are sourced in very distinct ecosystems, providing important microbes, bacteria, sediments, fish, algae, river animals and the eventual human traveller contributing to the fluid mix of life. Now they will travel together for thousands of kilometres down the riverbed, passing through one of the hottest regions on the planet and for about 2,700km without any significant new water supply. Water will be diverted and extracted along the way. Exchanges between river and riverbed geology, air atmospheres, riparian ecosystems (incl. plant, animal or human life) and hydrological infrastructures are taking place and give shape to the river's path. Eventually, the river and the complex ecosystem of travellers that it includes will pass through Egypt. The result of these many geo-bio-chemical-zoological-ornithological-human exchanges is 125 million tonnes of sediments flowing out of the river into the Mediterranean Sea (Smith & Abdel-Kader 1988, 249). (How does one measure that?)

on its journey through Africa and spread out over the fields. Human agriculture has adapted to the rhythm and conditions (bio-chemical-physical) but they also manipulated the river, altering its flow and thus were co-shaping the land-river threshold. Human life and human activities were not only adapted to the Nile, they were part of, their practices built into it, were shaping and informing it. And not just with the beginning of modern infrastructural systems and bureaucracies.

Humans intervened in their ecosystem with building irrigation infrastructures meant for cultivation or to protect their settlement infrastructures thus altering the river's path and its constitution. Alan Mikhail wrote "No land ever depended on water management more than Egypt. Its irrigation system is among the world's oldest. When the Ottomans conquered Egypt in 1517, they inherited a complex system, the result of millennia of careful trial and error, accumulated knowledge, and hard labour." (Mikhail 2011, 38) Within this world-ecology of an inundating river and seasonal agricultural practices, also forms of land reclamation existed all over the Nile Basin. Such an instance is described by the Ottoman-Egypt historian Mikhail in the following:

> In a case from the southern city of Asyūt in the year 1657, we see how water and the proper function of irrigation works were used in the reclamation of agricultural lands. A group of diggers and reinforcers (*al-hufrā' wa al-mudamasīn*) who regularly worked on a series of three canals in Asyūt came to the court to testify that they had cleaned, dredged, and reinforced them as required and that they – along with the people of the fifteen villages along the canals who were represented at court by the elders (mashā'ikh) of each village – remained responsible for the upkeep of the waterways. The elders of the fifteen villages also reported to the court that, by actively maintaining the three canals, they had been able to increase the overall area of agricultural land in their villages. Where previously there had been only 25 *ardabbs* of arable land, now these peasants had 37.5 *ardabbs* on which to plant and harvest. This case was followed by a nearly identical one the following year in which the same workers were identified as working on the same canals with the same results: an increase in the amount of land under cultivation and improvements in the irrigation system that fed water to the lands. These cases, not only exemplify, yet again, the influential role of local knowledge in the management of irrigation works in rural Egypt but also clearly show how irrigation created new environments, new worlds, new ecologies, new planting and work opportunities, new crops, and new physical and natural spaces. Improvements to the irrigation network in this area led to a 50 percent increase in the area of agricultural land made available to the peasants of fifteen villages.
>
> Mikhail 2011, 67-68

What Mikhail labels here as the creation of "new environments, new worlds, new ecologies" through land reclamation is true if we take that land reclamation is the addition of productive ground to the existing agriculturally used sites. But I am not sure whether that is the case. Is the ground really re-defined as such? Is it a "new world"? A "new ecology"? What if those farmers were to move somewhere else or simply to ignore the maintenance of the canal in subsequent years? Would the fields not fall fallow as the canals fill up with sediments, clogging the waterways? What Mikhail describes is, in my view, much better captured within a world ecology of agricultural practices embedded in but also co-shaping an ecology in flux. The instance in Asyūt that Mikhail exemplarily lays out belongs better to a form of agricultural expansion that in the Egyptian civil code still exists to this day and refers to the so-called *laying of the hand*, *wadʿ al-yadd*. This is a practice of cultivation applied to otherwise/formerly uncultivated areas and it is a millennia-old form of land reclamation. It usually relies, as the example above shows, upon a way of organizing/directing the flow of water to, through and out of an area; a sort of orchestration of the water-land nexus, achieved through means of levelling the ground, or extending irrigation/drainage canals or also through the repair or maintenance of existing waterways. *Wadʿ al-yadd* is a legal category of land occupation and it can result in forms of land acquisition. It can be applied to arid lands, as much as to salt marshes or swamp areas or fallow fields or arid areas. It is still part of the classification of land occupation in the Egyptian civil code and as a legal concept, it goes back to the first centuries of Islam and was later also applied in the Ottoman land typologies (Ziadeh 1978, 240) which then also informed modern Egyptian land laws and thus can still be found in the civil code today. Land holdings in the Egyptian civil code, following the Ottoman land laws, are essentially three different types: first, private property holdings held in full ownership; second, charitable lands, *waqf*; third, state-owned lands (which can have various conditions of tenure) (ibid). This classification of land was in its inception less intended to regulate land ownership *per se* but rather to create a classification of land to determine revenue accruing to the state. State owned lands could be both cultivated and uncultivated areas.

> The uncultivated parts of the state domain were generally referred to as *mawāt*, or dead lands. They comprised much of the lands of the Islamic empire and were mostly desert lands. Although jurists speak of the lands as ownerless, ownership was deemed to be vested in the state. Such lands could be acquired by private individuals either by obtaining a licence from the state or by reclaiming the land through cultivation according to the provisions of the *sharīah*.
>
> Ziadeh 1978, 241

Wad' al-yadd acts as such a provision of cultivation of dead lands according to *sharīa* and it is thus a form of land acquisition through the act of cultivation linked to a specific consideration of the practice and continuation (temporality) of cultivation which is taking into consideration forms of change and also time. *Wad' al-yadd* does however not automatically lead to a land title (in the form of an inheritable land holding). It is part of the legal-discursive realm of usufruct rights. At the base of the *wad' al-yadd* as a practice, is usually the involvement of hydraulic infrastructures that regulate the inflow as well as drainage/outflow of water to enable cultivation. The Egyptian civil code from 1949 states in this regard "If however, an Egyptian cultivates or plants uncultivated land or builds thereon, he becomes forthwith owner of the part cultivated, planted, or built on, even without authority of the state, but he loses his ownership by non-use for five consecutive years during the first fifteen years following his acquisition of ownership." (Civil Code Art 874, quoted by Ziadeh 1978, 253). According to the legal historian Farhat Ziadeh, this modern Egyptian conception of land acquisition by appropriation, elsewhere also referred to as *adverse possession* (and existing as such in many other legal contexts as well), is based on Islamic principles of *mawāt*, dead lands, being subject to the authority of the state, that can be acquired for ownership through cultivation and squatting and thus can be claimed/acquired. If *wad' al-yadd* claims are being put forward in case of a land dispute over a specific area and the *wad' al-yadd* claims are approved (by a court or public office) then a compensation will be paid in order *to lift the hand*. What is important is to remark that it relies on a specific form of continuity. Land ownership can be discontinued or denied if cultivation is interrupted for a period of time. *Wad' al-yadd* is in this sense very much part of a Nile ecology and we could say of a Nile-based socionature being in movement and of an elusive threshold of agricultural production, land holdings and taxation linked to an ongoing but temporarily defined forms of cultivation. Ownership claims expire, cease to exist and cannot be claimed, when cultivation is discontinued for at least five years within fifteen years.

Wad' al-yadd loses its relevance or rather it becomes a less favoured as a formal way of land acquisition by the centralizing, modern government as the alluvial flood plains of the Nile become more stabilized and more consolidated along lines of productivity (which will be discussed right after). Law 143 of 1981 finally declares *wad' al-yadd* as illegal. Article 10 of the law states:

> It is prohibited for any natural or legal person to possess, seize possession [*Wad' al-yadd* in the Arabic original] of, or trespass on any part of the lands subject to the provisions of this law.
> The law, except for what the armed forces carry out in implementation of the state's defence plan, prohibits the conduct of any business or the establishment of any facilities or facilities planting or works in any way, except with the permission of the authority.
> Any disposition or determination of any original or accessory real right, leasing or empowerment in any form on those lands shall be null and void.[23]

This law is part of a new discursive context of liberal land reforms in Egypt that will be discussed in detail in later sections of this chapter. It shows the specific role that the military plays in ruling over and claiming the country's uncultivated lands and the article also makes it clear that those traditional forms of land acquisition have little place in Egypt's recent politico-economic development of desert sites. Today, acquiring a land title by claiming *wad' al-yadd* will usually lead to a lengthy and costly bureaucratic procedure that few can afford and therefore exert. Especially Bedouin communities, for instance those that inhabit the Mediterranean coastal regions as well as tribes of the Delta's edge (particularly on the western side of the Delta) can solely rely on *wad' al-yadd* claims. This makes it difficult if not impossible for them to oppose any government or private sector directed projects (that specifically started in the Mediterranean coast and western Delta areas in the 1950s) in order to retain their lands. *Wad' al-yadd* is thus being largely ignored or criminalized as an illegal form of land occupation (and a basis to acquiring a land title), despite it being an effective practice of small-holding cultivation expansion that still happens throughout Nile Valley and Delta, especially on the fringes of cultivation. Jessica Barnes even argued that w*ad' al-yadd* has been the most effective form of land reclamation in Egypt, yet it is largely unrecognized by the state (Barnes 2014, 109).

Modern land reclamation practices operate differently and they take shape in a very specific context. These are largely state-run or state-facilitated large schemes. But they do not just differ from *wad' al-yadd* practices in terms of who runs them or even just in their scale. They

[23] Law No. 143 of 1981 regarding desert lands published in Arabic by the Food and Agriculture Organization's legislation database FAOLEX at https://www.fao.org/faolex/results/details/ar/c/LEX-FAOC208069/ accessed on 11 October 2023.

are not simply a magnified *wad' al-yadd*. Land reclamation processes today and corporate desert farms that rely on them, happen within a very different conceptions of land development, namely material-discursive systems that have allowed to re-engineer the Nile River system in a deep way. Land reclamation in this context and in contrast to *wad' al-yadd* means that land productivity can be measured, tweaked and re-configured. This is what land reclamation schemes as a form of capitalization that organizes spatial and spatio-temporal relations in specific ways are made off. They are embedded into an archaeology as well as discursive system of the Nile River that is managed through hydrological engineering, land holdings as organized around surveying, property regimes, taxing and debts, the employment of *cheap* labour, *cheap* land, *cheap* resources (*cheap* employed in Patel and Moore's sense of the term, 2017) that managed to consolidate and expand the Nile watershed along conceptual lines of productivity. The flow of the river became increasingly orchestrated from central means of administration (from Alexandria and Cairo), production multiplied by new ways of organizing the working together of water, land and agrarian systems. This also happened largely at the expense of the local ecosystem and the people who had to work in relation to those schemes and/or who rely on those very same ecosystems.

Throughout the nineteenth century, the instalment of hydraulic systems together with administrative practices and geo-political events went hand in hand in order to alter Egypt's geography from being in seasonal variation and flow to being administrated and infrastructurally engineered as a more predictable and calculated, stable space as well as space-time relationships. Egypt's water-land interface, to use Ong's words, is henceforth more centrally managed and it is those central forces to allow to further expand their sovereign territorial outreach – again staying in the vocabulary of Ong – to seize territory through infrastructural means together with legal-discursive tools. Before saying more about the consequences of this and how this really materializes concretely along Egypt's Delta's littoral edge, let us now unpack how this happened and what this looked like?

Throughout the nineteenth century, Mehmet 'Ali Pasha (1805-1848) and his successors (a ruling dynasty until 1953) shifted the terrain from seasonality and an agricultural process in an environment in flux to (more) predictable productivity (resulting in modern land reclamation). 'Ali Pasha was an Ottoman viceroy but he was seeking to disconnect his territory

from the realm of the empire and gain political and/through economic autonomy. He established new sources for capital accumulation independent from the sultan in Istanbul. Wheat exports within the Ottoman empire were decreasing and the export of cotton, an agricultural product that had been planted in Egypt for long time, gained economic importance, especially going to Great Britain (Derr 2019, 4). The production of long-staple cotton meant a new independent revenue stream for the increasingly financial (and trade) autonomy of the province of Egypt. By 1823, 76% of Egyptian exports were going to Europe (Richards 1977, 17). Historian Khaled Fahmy suggests that Mehmet 'Ali was building up a war economy in the face of encroaching European colonialism and to fund this economy: cash crop production, selling wheat, tobacco etcetera (Fahmy 2002). To grow cotton at large scale, 'Ali and the rulers that followed him in his lineage, needed to shift the cotton production from one that was marginally happing on the Delta fringes (because of the ways that cotton is planted[24]) and only linked to the summer months (before the flood), to the Delta's primary fields and as a year-long crop in order to multiply the yield. The Delta is Egypt's most productive area and cash crop production started therefore there.

With the outbreak of the American Civil War 1861-1865, British textile manufacturing businesses were in great demand for cotton as raw material. Egypt became its major supplier and hence experienced a cotton boom – that would quickly bust and yet changed territory in a lasting way. Under 'Ali about thirty thousand kilometres of new canals were installed in Egypt, and old ones were deepened (Cole & Altorki 1998). According to Khaled Fahmy, 'Ali was the first Ottoman viceroy who stayed in power for a long period of time – his predecessors only stayed for a few years -, this allowed him to invest into mechanisms (such as built infrastructure) to expand revenue streams (Fahmy 2012). The viceroy installed a new, now more centralized administrative structure focussing specifically on the instalment of public works along the Nile and new forms of taxation and crop collection, such as the Department of Public Works, one of the largest and one of best funded public entities at the time.[25] The first large-scale canal in the Delta, the Mahmoudeyya Canal, was finalized in 1820

[24] Cotton plants stay in the soil throughout the seasons and could not be planted inside basins (Derr 2019, 4).

[25] New administrative posts were created, such as the Chief Engineer of Lower Egypt (Nile Delta) in 1818, filled with French engineer Pascal Coste. In 1831 Linant de Bellefonds (a Belgian engineer) took on the same post for Upper Egypt (Nile Valley). Five years later, he also headed the newly established Department of Public Works. Under Pascal Coste, the Mahmoudiyya Canal, was finalized in 1820 (initial drawings came from Shakir Effendi, a Turkish engineer). Linant de Bellefond's engineering career in Egypt would last for decades and he would

(construction lasted for two years and the name was given to honour Sultan Mahmoud II, sultan of the Ottoman Empire). The canal connects the Nile with the Mediterranean-Delta metropolis and harbour city Alexandria, expanding the Nile watershed and allowing for a smoother passage for maritime transport (rather than the more difficult passage between Rashid and Alexandria) (Tvedt 2021, 38). The canal proved his control and his brutal rule over a large portion of the local population. Alan Mikhail commented on the Mahmoudiyya Canal, saying that the execution of this project shows a shift in territorial rule as linked to shifting labour regimes. While during the Ottoman years/centuries in Egypt even larger-scale irrigation works such as canals were managed by local peasants (local to the canal site, Mikhail 2011, 38-39), *fellaheen* (farmers) were now taken from all over the Delta away from their fields to work as *corvée* (forced labour) also outside of their localities and they were also recruited as conscripts for the new military. About 300,000 workers are said to have been employed in the canal's construction (employed in the sense of used rather than in the sense of a paid employment) and about one third (!) of those deceased in the process because of the inhuman work conditions, dying from a mix of exhaustion and the lack of food and medical provision (Fahmy 2012). Thousands and thousands of nameless bodies are now buried and have disappeared behind the infrastructure.

In the following decades, physical infrastructures meant to regulate and control the flow of the Nile become more and more important and they started to emerge throughout the Egyptian territory, all over the river. A series of barrages were erected along the Nile and many on the Nile canals and the most important one at the early/mid-nineteenth century is surely the Delta Barrages, finished under 'Ali's grandson, Abbas Helmy Pasha, but initiated during 'Ali's own rule. The barrages' construction happened between 1833 and 1862, with a 10-year interruption period in between because of a plague that lead to a worker shortage (Mazanec 2017, 25). Works on the Delta Barrages happened at the natural division of the Nile between the Rosetta and the Damietta river branches, just north of Cairo. Head engineer of the second construction phase was the French Eugène Mougel who would also become influential for the Suez Canal construction It is sort of the first point of the Nile Delta that the Nile water will pass through before branching out into the Delta's waterways. Goal of the

occupy many influential posts within the country's administration linked to hydro-engineering projects, one of them being the Suez Canal.

barrages was to resist the Nile flood, raise the river's water levels (through gravity) and to store floodwaters in reservoirs to be used throughout the year (ibid). For about 300,000 hectares within the Delta, fields were no longer irrigated through flood or basin irrigation, which was the dominant form of irrigation in Lower Egypt (Malterre-Barthes 2018b, 343). They switched to perennial irrigation, namely a continuous water supply that allowed to multiply crop production (from one to three harvests per year!) and also to move cotton-fields from the margins to the much larger central areas of planting. 300.000 hectares (that are now under perennial irrigation in the Delta) is an enormous amount of land, considering that Egypt's entire agricultural surface spanned about 840.000 hectares in 1820 (about two million feddan, Achthoven et al 2004, 3). While it would soon become clear that the Delta Barrages could not withstand the Nile floods, having considerable construction flaws, they still marked the beginning of now large-scale interfering through techno-administrative means into large tracts of land[26]. Shifting from seasonal irrigation to perennial water flows, re-organizes the largest segments of Egypt's most productive agricultural region. This is modern land reclamation in its birthing stage. While it was maybe not directly the goal of the barrage's designers to consolidate the Delta as to lay political claim over it but rather the boost in productivity, shifting to cash crop production (of cotton for instance), multiplying harvesting cycles, it however shows, how controlling the bottleneck resource of water together with administrative tools and ways of employing (exploiting) a local population, organizes this territory in specific ways and gives specific power of the Delta's rulership. Now, increasingly larger public works appear in Egypt, with top-down directed large-scale geo-engineering schemes re-configuring the Egyptian geobody. The foreign expertise that the khedival rulers brought in first predominately from France later from Great Britain. They were often employed in several projects (in Egypt and in other colonial contexts) and held both engineering and leading administrative roles. While the Khedival focus lied on the Nile, also other public works started to materializes in the middle of the nineteenth century, such as the construction of the Suez Canal (1858-1869), together with the construction of the fresh water Ismailia Canal from the Nile going towards the Suez Canal, providing the water needed for the Canal's construction and later operations (built 1861-1863) and it was the beginning

[26] The Delta Barrages had to be repaired in several stages and they continuous repair ended up costing the Egyptian government millions. In total the overall costs of the Delta Barrages are estimated at 10 million Egyptian Pounds (Mazanec 2017).

of the railway (the connection between Cairo and Suez, under Egyptian engineering supervision and not European, was finished in 1855, extensions will follow over the next fifty years). Together, they show how heavily the local government together with foreign expertise, was invested in reshaping Egypt's geography from within, re-organizing territory, transport, access and connections through massive engineering works and technocratic forms of administration.

A series of barrages and canals will follow in the second half of the nineteenth century, such as the Ibrahimiya Canal (on the khedival sugar estates in the central Nile Valley, finished in 1873). Despite the assumption that the British colonization of Egypt in 1882 (after a military invasion) brought modern hydraulic-infrastructures to Egypt, colonial hydro-politics and hydraulic-engineering had built upon an already quite large existing network of infrastructures and expertise– whether successful or not. Under British rule and with the aim to make debt-repayments to European banks that were a consequence of the construction of the Suez Canal, infrastructures along the Nile increased to ensure an export-oriented cotton economy[27]. A significant new Nile-technology is the dam in Aswan built at the turn of the century (inaugurated in 1902). It will be followed by new dams/barrages in Assyut (1902), Zifta (1903), Nag Hammadi (1930), and the northern delta canals (after World War II) at Edfina and Faraskour Sudd. Thus, they form an apparatus of infrastructures (both physical infrastructures and forms of administration) that increasingly allow for a more centralized regulation of the flow of water, regulating amounts as well as timings and directing the river's discharge.

At the peak of the second wave of cotton-boom years in Egypt, from 1893-1907, the colonial administration was seeking to consolidate land in the form of large landed estates called '*izba* and their monocrop production of the cash crop, cotton, for export to Europe. To do this, the colonial administration worked on three fronts largely at the same time. One, was the construction of the above-mentioned dam in Aswan. Two, are geo-political negotiations and invasion of the British colonizer further upstream that were meant to stabilize Egypt's water intake. And three, is that it conducted a cadastral survey (including maps based on

[27] For an extensive analysis of the financial background of this rise of large-scale public infrastructures and issues related to the country's foreign debts more widely, read Aaron Jakes' *Egypt's Occupation: Colonial Economism and the Crisis of Capitalism* 2020.

triangulation and thus mathematical abstraction/measuring of territory) that would span the entire cultivated area (and even also include some parts of the Eastern Desert – further discussed in the next chapter).
Together, they mark was a turning point for land reclamation linked to the working of productive lands as embedded into property regimes, scientific research and engineering.

Under British supervision, the first dam in Aswan was completed in 1902. The dam that is later also called the Low Dam in reference to the later constructed High Dam, was designed and built within that framework of colonial technocratic vision of the Nile and its riparian land threshold.[28] The aim of the dam was to store the Nile in a way that water can be released during the dry and hot season. "The Low Dam entrapped the receding phases of the annual flood, but allowed the bulk of flood discharge to pass through the dam sluice gates and flow northward to the Mediterranean. Thus, the Nile barrages and Low Dam provided partial flood control and a much-improved water supply during the dry season by the turn of the 20th Century." (Stanley and Warne 1998, 810) The dam allowed for a shift from a three- to a two-year rotation of the cotton production (Dixon 214, 234) and in many places along the Nile Valley and Delta instead of one annual harvest, three harvests were from now on possible[29]. Crop production in the country multiplied and so did the demand for (Nile) water!
For the British colonial administration to ensure that enough water – again, its vastly dominant source being the Nile - is reaching those now centrally-managed hydro-infrastructures in Egypt, a series of important geopolitical moves had followed. After their military invasion into Egypt in 1882, they also went upstream to the Great Lakes region in Central Afrika and colonized today's Kenya and Uganda. Then, the colonial project moved further north, following the Nile into Sudan, colonizing the country in 1896. During that same period, London made agreements with all Nile Basin rulers, the Ethiopian Emperor, King Leopold colonial ruler over Kongo and French and Italian colonizers of Eritrea. According to the agreements made during that period, none of these countries were to dam or alter the

[28] Built by British contractors and with an Egyptian labor force and capital, the dam was finished in less than three years. In the subsequent period, the structure had to be raised twice (1912 and 1933) after the river overflew proving insufficiencies in the construction.
[29] Taken from the film *River of History*, episode "The Nile Quest" by Terje Tvedt.

river without British approval. “The Nile had become a British river.” (Tvedt film *River of History*).

In the time of the first World War dissent against the British widely arose in Egypt (1919 Revolution), the country gaining nominal independence and becoming a British Protectorate (ending in 1922). The British influence on the country stayed however (to keep the overhand of the strategically important Suez Canal and also some local military posts) with their biggest card being the control of the Nile upstream. [30]

> In 1929, London, on behalf of its East African colonies, entered into a Nile Agreement with Egypt whose significance would be felt to our day. The agreement, recognized on the one hand that the Sudan needed some more water for its development, and on the other, and more importantly that Egypt had historic rights in the Nile waters and that the East African territories did not need Nile water for their development. The agreement took the shape of two letters: the first was addressed to Lord Lloyd, the British High Commissioner, by Muhammad Mahmoud Pasha, President of the Egyptian Council of Ministers; the second was the High Commissioner’s reply. But most importantly: in practice, the agreement gave Egypt rights to veto over any water projects upstream.
>
> Tvedt 2021, 64

Until this day, Egypt refers to the colonial period Nile Agreement from 1929 in international legal disputes over the river’s uses along the Nile Basin. To control Egypt’s water supply, geo-political moves were made that still hold relevance today.

Together with the construction of a network of hydro-infrastructures and in addition to the geo-political securing of water inflow, the other important factor of consolidating Egypt’s productive areas was the surveying of land done in the Cadastral Survey by the British colonial administration between 1892-1907. While Egyptian villages and towns were already mapped, street by street, by the Egyptian engineer and bureaucrat ‘Ali Pasha Mubarak in *al-Khitat Al-Tawfiqiyah Al-Jadidah* (a twenty-volume record), the Cadastral Survey of 1908 achieved to delineate practically all agriculturally productive areas in the country, feddan-by-feddan. Other survey works existed according to the Cadastral Survey publication of “Muallim Ghali and M. Masi, 1813-1822, of Mahmud Pasha el Falaki, 1861-1874, of the Cadastre of 1878-

[30] Under the British large-scale hydraulic infrastructures were also installed in Sudan, such as the Sennar Dam in 1926. The so called “Gezira Scheme” (Island Scheme), the reclaimed land between the two Nile tributaries - about 1.2 million hectares – was also primarily designed for the cultivation of cotton (see, “The Sennar Dam and the Gezira Irrigation Project” in *Nature*, 1926). It was the result of the failure of Egyptian cotton crop in 1909 and at a time of a semi-famine in the area in Sudan (Tvedt 2004, 93).

1888, of the Hydrographical Survey of 1889-1898" (1908, 1). Timothy Mitchell discusses in *The Great Map* (section in *Rule of Experts* 2002, 84-93) the issue and he writes,

> The great map of Egypt was not just a new way of representing an existing object, private property. The map helped to constitute and consolidate the new institution of private property and the forms of debt, title, dispossession, and violence on which it depended. Ordered by the Debt Commission, the maps in particular enabled the commissioners to re-establish boundaries for the hundreds of thousands of acers of state domain, many parts of which had been encroached upon, or reclaimed, by local farmers, and to begin auctioning these former khedival estates to private investors. The mapping played a role in producing the distinction between land as 'mere object' and the abstraction of law, taxation, and title.
>
> Mitchell 2002, 93

I believe that Mitchell underestimates here the (material, physical) effects of such discursive organizers such as maps like those of the Cadastral Survey. As he says himself, putting different cultivated or reclaimed tracts of land in relation to one another and by means of determining them from the surveying-practice itself, allowed to make ownership claims or to impose taxes on formerly undeclared land. This does not create a separation of the realm of representation and that of the ground but rather shows their convergence. The Cadastral Survey of Egypt includes a largely encompassing map that first starts in areas of the Delta and then further expands towards all of the Delta's productive area and further down into the Valley[31]. It is absolutely relevant that the surveying of the land happens at the same time as the construction of the first Aswan Dam and not only that. It is also the same imperial technocratic personnel that works on these very schemes[32]. Their goal was to achieve a consolidation of private property for the sake of collecting tax, enforcing debt and maximizing the yield of the cash crop cotton. The survey states that:

> The re-assessment of the land-tax was of primary importance, since as a result of the local administration having been practically uncontrolled for many years, the rates of tax imposed did not in many cases correspond with the fertility of the land… In 1895, however, Commissions were appointed to assess the rental value of all lands on which fixed rates of tax were being paid, but the re-assessment of the tax to be paid by each landowner could not be taken up until the limits of the village lands and their subdivisions – 'hods' – had been mapped as well as the properties belonging to each individual. Some seven million feddans of agricultural lands had, therefore, to be

[31] In the Cadastral Survey publication, maps are included that show where the triangulation mapping the cultivated area started (and when) and how it expanded throughout the cultivated geo-body of the country.
[32] I will emphasize this point again in the next chapter on mining and geology in Egypt. There, we will see how colonial technocrats like Henry Lyons majorly informed the administration of mapping those areas and thus were extremely influential in the discursive shaping of Egypt's cultivated contours at the turn of the century.

> measured, each holdings had to be located, its area determined and the owner recorded…
>
> Lyons 1908, 3-4

To do that, the British administration created a base and a socionature environment of sorts (for production) that was largely *stabilized, measurable and predictable*. Through engineering works together with those forms land administration based on means of calculation, especially the Nile Delta was turned into a highly productive arena that can be manipulated and exploited quite centrally, from those that manage the construction and maintenance of the major hydraulic infrastructures. Through the organization of the land-water nexus along productivity lines and thanks to the employment of forced labour (*cheap* labour) and largely dispensable raw materials (because how the ecosystem would be affected by those forms of geo-engineering was much less relevant), the Nile River system was being re-engineered and land reclamation within this context plays a role in this consolidation process as well as in the productive expansion of already cultivated sites.

To summarize, not only salt marshes and swamp areas or sandy patches of soil are now being reclaimed in individual, scattered instances by ways of expanding the cultivated area. The very grammar and syntax of land productivity are being reconfigured. The interplay of water, land, fertile material (that will now increasingly be added additionally), plant seeds (that are further being tested, bred, and manipulated) increases productivity and allows for an expansion of productive areas (through means of calculation, engineering). But this does not just mean that productiveness increases. Because of the new property regime, expanding cultivated areas meant to expand property holdings. It increases land tax revenues and allows for a further expansion of debt-able assets which demonstrates capitalization. Land reclamation here as capitalization refers to both the *interscalar* ways in which more cash crop can be produced (from introducing new seeds to the expansion of irrigation networks) resulting in more harvest and higher yields as well as the increasing in assets in the form of land – both for the state and for foreign and local rural elites.

It is majorly within a discourse of science that these forms of land reclamation are to be achieved. Colonial technocrat William Willcocks (together with James Craig) for instance describes in his multi-volume publication over hundreds of pages, how the Valley and Delta

as a whole and in various regions in specific can be improved through land reclamation efforts. He writes for example:

> To divide the districts into zones, and economise capital expenditure and maintenance, and at the same time have perfect irrigation and drainage is the true scientific solution to the problem. It involves having a large number of pumping stations, but a modern pump by a good maker is as safe as a good watch and as easy to keep going…. There are very many of these pumps now working in Lower Egypt and revolutionizing land reclamation.
>
> Willcocks & Craig 1913, 457

Works like Willcocks' illustrate, how the colonial administration deals with cultivated lands as a means of calculation working across scales in conjoint ways. Similar to this, British military geologist and technocrat Henry Lyons said in the article in the *Nature* journal the following (I opened the chapter with this quote):

> The important part which modern science can play in the economical development of natural resources is generally recognized to-day, but nowhere may this be seen more clearly than in Egypt, with its subtropical climate, its controlled water-supply, and its immunity from the vagaries of the weather which affect more norther latitudes.

He further continues with:

> … for much of the area, which was formerly flooded annually and then furnished a single crop after the river had fallen, is now under perennial cultivation with a supply of water at all seasons, and consequently up to five crops in two years are taken from it. Under these conditions the most economical use of the material resources that science can devise, and all the improvements that it can suggest, are of the utmost importance in the country.
>
> Lyons 1922, 283

Under Henry Lyons (who works under Lord Cromer), Egypt becomes a laboratory for science and techno-utopian visions of productivity through geo-engineering. A number of research and scientific institutions will be formed during those early decades of the twentieth century, from the Helwan Observatory with its time and meteorological services next to the services of weights and measures, to the Desert Survey, topographical survey, geological reconnaissance as well as Cotton Research Board studying hybridisation, serf-fertilization, fungoid and bacterial diseases of Egyptian crops and flowering-curve methods (Lyons 1922).

To repeat, land reclamation as a practice of capitalization operates across scales and within a context of expanding the productive land mass by means of calculation, measuring and engineering but also through the consolidation of space-time regimes that allow for a

predictable cultivation process – at least to a large extend – and is based on a setup of a stable material-discursive property regime. I want to add one last element here that further manifests the interplay of these elements and that is the desert borderline as legal-discursively defined by the *zimam*.

The Cadastral Survey introduces the administrative border of the country's overall productive area, called the *zimam*. Colonial administrator Henry Lyons, main author of the Cadastral Survey, and head of the Survey Department, wrote, "the cultivated area throughout Egypt has been contoured at 50 centimetre intervals" (Lyons 1922, 284). The administrative limit made the legal foundation not just for the area of taxation linked to (at the time) cultivated plains along the Nile Valley and Delta but also for delineating the beginning of state-owned desert lands. Beyond this meticulously demarcated line (at 50-centimetre intervals!), state property began and this is an extremely consequential event. The *zimam*, this desert borderline, is still the legal foundation upon which all state-actors, including the General Authority for Rehabilitation & Agricultural Development Projects (GARPAD), determine state property, set on the fixed contours of taxed cultivation from the turn of the century. It is what from now on forms the discursive (legal and bureaucratic) definition and placement of the *traditional* Nile Basin. The *zimam* is not an *abstract* line as it is sometimes described as in the existing literature on land reclamation – if it is mentioned in that literature at all. It is a very concrete, discursively performative and consequential administrative tool that acts in and upon space (arid or cultivated)[33]. Based on this discursive consolidation of Egypt's agricultural landmass, delimited by the *zimam*, land reclamation projects that exceed the so-framed area can be either asserted as illegal (forms of squatting, regulated under *wad' al-yadd*) and thus they can be demolished at any time or fines can apply, or they can be ignored as effective ownership claims all together. Areas that lie beyond the *zimam* - as property of the state – will later form the basis of state-initiated investment deals. This institutional instalment of the *zimam* thus marks the advent of Egypt's arid thresholds and also the vast arid regions between *zimam* and national geopolitical borders as well as littoral shorelines to become a

[33] There is in general very little academic reflection done on the *zimam*. Malterre-Barthes makes reference to the *zimam* in a footnote and describes it there as "an abstract border between cultivation and desert, with lands cultivated inside the *zimam* taxed by central powers and land outside considered state property or public land" (Malterre-Barthes 2018b, 373, footnote 4).

property of the state, under special supervision of the country's military apparatus that is meant to oversee and survey those regions. Now, it is exclusively state institutions that can manage, sell and police those dryland regions and we will see in the following sections, how this legal exclusivity of arid regions not just as sovereign territories but as property of the state play itself out through means of capitalization.

With hydraulic infrastructures further developing, particularly the wide proliferation and accessibility (including affordability) of water pumps that can lift the water in order to direct it further away from existing irrigation canals, agriculturally cultivated areas expand to the east and to the west of the Nile Basin into formerly arid sites. Specifically, the land right beyond the *zimam*, the land on the fringes of the cultivated Nile banks that from the beginning of the twentieth century irrigation networks can be (more or less easily) extended towards, is now becoming a major resource for the state as potentially productive areas. These become increasingly targeted for economic purposes and with an intensive employment of hydraulic technologies as land reclamation sites are starting to vastly grow in the middle of the twentieth century and this will be the focus of the next sub-chapter.

Looking back at the turn from the nineteenth to the twentieth century, at the interplay of physical infrastructures and administration together with geo-political agreements, we can assess that Egypt's geobody is being altered *from within* through an algorithmic governance. Land reclamation as a means of capitalization meant to organize the very syntax of territory and its productivity in specific ways and it does not simply refer to the adding of newly cultivated sites.

After nominal independence from the British colonizer in 1922, there was some renewed focus in Egypt on industrial ventures, with the establishment of the Bank Misr that gave loans to investors from the land-owning elites or to foreigners. Yet, agricultural production of cotton and sugar and the commercialization of cultivated/cultivatable lands remain of central importance for the local economy. Land reclamation now in this modern form of land productivity linked to property will again prosper in the last two decades of the twentieth century. This time it will be fully focussing on arid sites. In the middle of that century, with the national movement of the newly forming post-monarchy state, a new expansionist era beyond the *zimam* begins. It reaches out into the country's desertscapes with large-scale geo-

engineering schemes. These will be the *new lands* that so much of the scholarly literature today is based on. What is shown above, demonstrates however, how much those new schemes are grounded in already existing material-discursive condition that characterize land reclamation from now on.

1.3. "When you plant a grapes-plot you position the shoots in a way that makes it easier to perform the operations"

Starting in the 1950s, the edge of Nile Delta becomes a major focus of action and development by the ruling government. Following a military coup in 1952 against the ruling monarchy (still belonging to the lineage of Mehmet 'Ali Pasha), Gamal Abdel Nasser, a general from the south of Egypt, became prime minister. It is the beginning of a series of Egyptian leaders coming out of the country's military ranks that will rule the country from now on (with only a brief interruption by the Mohmmed Mursi government of the Muslim Brotherhood, elected subsequent to the 2011 Arab Spring and in office from 2012-2013).

In this section, I want to discuss how land reclamation materializes in the post-independence period. This is the beginning of major interventions by the state into what we can call desert development projects. Other than the extraction of raw materials, desert sites gain little attention from the state outside of security related purposes during this time. This will be discussed in detail in the next chapter. Here, in this chapter, I will focus on the first strategic integration of the edge beyond the *zimam* for the nationalizing new regime and what will follow as the *Ghazw es-Sahara* (Desert Invasion) in the late 1970s. Now, the riparian threshold of cultivation will become an increasingly important site for the politico-economic efforts of the state that claims ownership over those arid regions. We will see that now land reclamation schemes become a major tool of the ruling government to capitalize (on) the country's arid landscapes while claiming those sites in modern material-discursive ways. Land reclamation schemes are now allowing for state-favoured actors (including state-actors themselves, amongst which is the military) to gain exclusive access to desert sites and to inform/shape them in long-lasting ways.

This section is mainly based on fieldwork that I conducted on desert farms in reclaimed areas in the western Delta. Before going into the field, some historical context.

Shortly after taking political power (just two months after the coup), the Nasser regime was set out to a large land reform, aimed at restructuring land ownership in Egypt through Agrarian Reforms. Those reforms would for example limit land ownership per individual up to a maximum of 200 feddans. The new socialist government aimed at breaking up the existing large land holdings of the Egyptian rural elites. Foreigners were from now on prohibited of owning land within the *zimam* area and whatever land holdings foreigners had were expropriated (Law 15/1963[34]). The land that the state acquired in this way was redistributed to landless farmers in small holdings of five feddan.[35][36] Parallel to those reforms targeting land holdings in the traditional Nile Basin, the government also ventured out into the desert fringes of the Nile Delta with a number of pioneering projects that now were large-scale state-run schemes of land reclamation meant to expand the cultivated area of Egypt by means of expanding irrigation networks and reforming agrarian practices. The first of those projects was *Mudiriyyat al-Tahrir* (Liberation Province) and it started in 1953, so right at the beginning of Nasser's rulership. It is located at the western threshold of the Nile Delta and encompasses the planned reclamation of an incredible 1.2 million feddan (just as a way of comparison, the total cultivated land surface of Egypt was about six million feddan at the time according to Richards 1982). The project was also meant to include the construction of eleven model villages. In order to be selected as a farmer or farming family to join the Tahrir Scheme, applicants had to undergo a six-month training period and a series of social, medical, and psychological tests upon which their fitness to become *model citizens* of a new rural citizenry was to be determined (Voll 1980, 129). Researcher Sarah Voll writes about the Tahrir Scheme that "It was envisaged as not merely an agricultural project whose scale was ambitious in itself but as an entire social experiment, the nucleus and vanguard of Egypt's new rural society" (ibid). The Tahrir Project was the first large state-directed land reclamation scheme outside the *zimam* and it shows well how desert sites start in this time to become laboratories

[34] Published under" Land and Real Estate Ownership Laws" by General Authority for Investment and Free Zones at https://www.gafi.gov.eg/English/StartaBusiness/Laws-and-Regulations/Documents/LandandRealEstateOwnershipLaws.pdf accessed on 4 January 2024.

[35] *Waqf* land was nationalized and leased or redistributed, according to Waterbury 1983, 266.

[36] The ceiling for private land ownership was further lowered to 100 feddans per private person ten years later (Waterbury 1983, 266).

for testing out not just technological innovations but also new economic models as well as ideas of organizing society and everyday life. Financing for the project was provided through the sales of royal properties and also from Soviet funding (Malterre-Barthes 2018b, 370). The Tahrir Scheme was quickly followed up by a number of other state-directed programmes both on the western and on the eastern sides of the Nile Delta and also by another grand vision scheme that will however not materialize until almost forty years later (*al-Wadi al-Gedid,* the New Valley project). By the late 1950s and based on hydrological surveys done by the US Foreign Operations Administration in Cairo (Commissioned by the Egyptian Ministry of Agriculture and drafted by George Taylor 1976) another techno-utopian desert vision arose meaning to re-engineer Egypt's geography towards the inside of the Western Desert. Nasser announced in a speech in 1958 to create *al-Wadi al-Gedid*, an entirely new Nile Valley, running parallel to the existing one to the west. It was supposed to depart in the south of Egypt, starting from the Nile, south of Aswan, to then connect the Western Desert's oases – from Kharga to Dakhla and further up north from Farafra to Bahariyya - for thousands of kilometres through the desert. The New Valley was aimed at expanding the cultivated land mass of Egypt by an additional three million feddan. The idea was based on a geologic assumption of an ancient Nile arm existing in the area, leaving the chain of oases behind. Irrigation water was to come from the boring of thousands of wells reaching into the Nubian Sandstone Aquafer, a fossil groundwater body; the largest in Africa. The project was deemed as uneconomic by the Ministry of Planning during the 1950/60s however but it was later picked up again by the Mubarak regime in the 1990s when it became realized though in an altered version (Sowers 2011, 165-169).

The centrepiece of that mid-century period was however the conception, design and construction of one of the world's largest river dams, the Aswan High Dam, an engineering venture whose implementation lasted over a decade and would change the flow of the river forever (construction lasted from 1960-1970).

The period of the 1950s and 1960s is a pioneering era of the intermingling of a celebrated image of geo-engineering and large public works bound up in the configuration of new economic and social models for a newly consolidating nation-state. The Delta's edge in specific became what we can describe using the vocabulary of Aihwa Ong, a *technosphere* of development (2020), where – again in the terminology of Ong – the state bolsters its

sovereign outreach through an infrastructural prowess rather than through other means, like military force for instance, through the re-negotiating sea/water-land-sky interfaces.

How this materializes concretely, we will see taking the example of one large desert farming corporation as a case that illustrates how land reclamation schemes work on the Delta's edge, looking at how such a scheme plays itself out on that frontier of agricultural base and state-claimed desert sites. We will see what makes this one corporate desert farm so successful and what makes it so difficult if not impossible for small-scale producers to benefit from land reclamation schemes? The farms that I visited lie mostly in an area called Noubaraya which is another, further west-laying extension of the western Delta, in the direct neighbourhood of the Tahrir Scheme from the 1950s. Since that time, a number of land reclamation waves have heavily intervened in this area, extensions here happened in the 1980s and 1990s and again in previous years. A new focus on private-sector involvement in land reclamation appeared in the decades following Egypt's market liberalization reforms of the late 1970s and this has significantly informed land reclamation in Egypt in general and also in Noubaraya. This period that economists and political analysists describe as the *Infitah* (the opening, in reference to the opening of the market through the focus on private investments both from the local and foreign private sector) has added new actors and new forms of agricultural practices to the desert and agricultural frontier. After the finishing of the Aswan High Dam, reclamation projects particularly in expansion of the productive Nile Delta sites grew massively. First, they did not because of financial challenges to further implement land reclamation schemes. But with the 1980s, a period of large private-sector investments has led desert farms to promulgate on the eastern and western fringes of the Nile, next to a number of state-initiatives (those include specific development programmes targeting small holders or also numerous desert farms that state-actors run themselves). I visited Noubaraya in 2021 and went to a number of private corporate desert farms there, most importantly the Magrabi Agricultural Farms, short MAFA but also some much smaller desert farming complexes. Going there, I was set to specifically look out for the complex technical infrastructures that are today being employed on those farms, asking what does the cultivation process look like and how do farmers or better farm owners position themselves and their produce vis-à-vis (local and foreign) food markets and in reference to agriculture in the old and the new lands?

Looking through the prism of what I found in Noubaraya, I can state the following: Land reclamation practices, policies and schemes of the past six decades have allowed for specific actors to claim arid territories in specific ways. These are highly capital-intensive schemes and it is mostly state-favoured actors – favoured by the respective political regime of the time – and also state-actors themselves that benefit from these land reclamation programmes. The ways in which those actors took onto those sites with the goal to reclaim them and to gain returns of their (reclamation and production) investments, relies on interventions/infrastructures that operate across different scales and it is follows intensive ways of calculation/programming and engineering; geo-engineering and bio-engineering go hand in hand in those schemes. Because of this interscalar mode of operation, those schemes also affect the immediate and wider ecosystems that they are embedded in on multiple levels. So while only a small fraction of society benefits from these schemes, it is a much wider socio-nature that has to bear the consequences.

My observations are part of a larger scholarly discussion that is happening on land reclamation schemes in Egypt at the moment, asking whether those projects – of the *new* (agricultural) lands – can solve issues from the *old* (agricultural) lands – whether this has to do with improving food sovereignty or local food production in general, an increase of agricultural value adding to the local GDP (primarily through exports) or solving issues with regards to the availability of farming land for farmers (improving the *land:man ratio* in the face of population growth and urbanization, see World Bank claim above). I want to add to this debate my take on the issue, seeing those schemes as part of Egypt's government's strategies to capitalize the desert, asking how do those land reclamation schemes and the desert farms act and operate through organizing nature/capital relations spatially and spatio-temporally? How do they inform territory and what are their consequences?

The Magrabi Agricultural Farms are a prime example of corporate desert agriculture in Egypt today that happen on and give shape to reclaimed lands in the country. Those farms are first and foremost businesses and I can add here referring to a statement given to me by the CEO of MAFA, Sherif Maghrabi, that their business is *land development*. The farms of MAFA span over 9000 feddan. These are large industrial farming sites. Just as a way of comparison, the agricultural reforms of the Nasser years measured the land needs of one farming family to be at about 5 feddans. The MAFA farms largest plots (about 7.500 feddan) lies in Noubaraya, in

the Western Delta's land reclaimed sites, so almost half way between Cairo and Alexandria. Most of the farms are on either side of the Cairo-Alexandria desert road, a transport route that was first built in the desert, outside of the Delta, by the Dutch petroleum company Shell in the 1930s and it was later extended during the Nasser-years in 1959, surely in direct connection to local land reclamation plans and vision.[37] MAFA's farms were accumulated over a number of decades and they are not all in one geographical area. The biggest plot is MAFA 4 and 5 (now one connected land plot). It is the centre of the second land reclamation phase of an area called West Noubaraya that was planned and reclaimed in the 1980s. MAFA's land plot lies amidst a carpet of much smaller land parcels of new agricultural cultivation. When looking at this farm from the Google Earth perspective the difference between the large MAFA site and the surrounding area is staggering; one large complex surrounded by slithers of fields in the *usual* feddan shape. (This *usual* shape is the result of the patterning of the irrigation systems that have given a characteristic grid-layout that appears practically in all of Egypt's agriculturally productive areas. It is also a consequence of the specific ways in which Egypt's cultivated lands were consolidated throughout the nineteenth century and reaching into the middle of the twentieth century, in a mix of irrigation systems and cadastral surveying – see previous chapter-section.) Today, we can also see from the Google Earth view a number of circle-shaped reclamation plots that rely on centre-pivot watering systems which appeared in later reclamation phases in the area. The MAFA plot is located inside a reclamation phase of West Noubaraya which was initially planned to be the site of the 1987 launched Project for Developing and Serving the Land Allocation to Youth Graduates (short, the Graduate Scheme). The Graduate Scheme was a significant development programme of the Mubarak era. The plan was to allocate small parcels of reclaimed land, 5 feddan per person, together with a house and a small stipend for the first four years to young graduates of agricultural programmes in local universities (Malterre-Barthes 2018a, 372-373). Hydrologist and development analyst Yomna El Sharony argued recently that a critical issue of the Graduate Scheme was that the government did not provide adequate drainage networks for those reclaimed lands which she says is catastrophic for those agrarian sites[38]. Without proper

[37] According to Manar Moursi, the road was "touted as their accomplishment", referring to the relatively new Nasser regime (Moursi 2022, 289).

[38] El Sharony gave a presentation of her doctoral research on the West Noubariyan Scheme at the CEDEJ roundtable *Egypt's Hunger for Food* on 18 April 2023.

drainage systems, an issue called *water clogging* appeared all over the fields, making farming impossible. In response to requests and complaints put forward by the new owners of those reclaimed Western Noubaraya fields, that were presented to the government, the government represented by the General Authority for Rehabilitation & Agricultural Development Projects (GARRPAD) suggested to find a private solution for the issue, referring to a private investor. This was the entry ticket for MAFA. The company had first acquired land in the area from a GARPAD-run auction in the early 1980s according to a statement of MAFA's CEO. He told me that the land was practically for free at the time of the auction. MAFA was able to expand their existing land holding significantly by acquiring land from the nearby Graduate Scheme's small-parcel owners while providing additional drainage facilities for the area. Since then, many of those former graduates now work as wage labour in corporate farms, especially in MAFA, instead of farming their own lands.

A few more words on the Maghrabi family and how they were able to buy land in the first place in the areas designated for reclamation in Noubaraya in the 1980s. The question is, why can it be assumed that they were a favoured entity to acquire new lands from GARPAD – in contrast to others including small-holders? The Maghrabi family together with the Mansours, their cousins, are among the richest and most influential people in the Egyptian business and political landscape. That these two sides, the political and the business side, are interconnected in Egypt's liberal era (at least until the 2011 revolution) is exemplified by the Maghrabi-Mansour case. MAFA CEO's brother, Ahmed Maghrabi, and his cousin, Mohamed Mansour, held numerous ministerial positions in the Mubarak administration. Ahmed Mansour was Minister of Housing and later also chairman of Egypt's main governmental body regulating real estate in the desert (New Urban Communities Authority, short NUCA). The Mansour brothers, Mohamed and Yasseen, made it to the Forbes list of billionaires (Dixon 2014, 239). Together the two families invest and back each other's businesses, give each other board-memberships and also facilitate financing and make market connections. For instance, a financial breakthrough for MAFA came with being the exclusive provider of lettuce, tomatoes and other fast-spoiling produce to McDonalds Egypt[39]. From there, they established exclusivity with a number of other fast-food chains as well as flight service providers, such as

[39] CEO Sherif Maghrabi said in the interview on 25 October 2022 "the deal with McDonalds, it's a money maker."

Egyptair. This was arguably only possible because McDonalds Egypt belongs to their cousins, the Mansours[40]. Together the two families lead an interwoven business and finance conglomerate and their markets span real estate, tourism, telecommunication, food retail and agriculture. Within this family context, it is of course easy to imagine how one gets selected and favoured when it comes to auctioning state-claimed desert lands and being included in benefitting from state-supported reclamation schemes.

Back to MAFA and its land reclamation strategy. Other parts of the MAFA company lie in segments of the Western Delta's reclaimed lands that appeared later (an area called Tanboul) and were bought by the company in subsequent years. This site for instance and in contrast to the Western Noubaraya segment, relies exclusively on well-irrigation infrastructures and not on Nile-water canal-extensions. Further, MAFA also expanded with buying land parcels further in the south of Egypt, in reclaimed areas that lie closer to Minya and in Aswan. This diversification strategy of having farms in various geographical sites can have a number of reasons. Some might relate to attractive, low land prices and to being able to make those deals easily, thanks to political connections. Some also relate to the intention of filling additional market windows. For instance, MAFA sells a variety of citrus fruits as well as grapes and strawberries to super- and hypermarket in Europe, Australia and other parts of the world (in total to 66 countries[41]). One of their primary selling points when approaching retailors in Europe (including Germany, Switzerland, UK, Italy and even market competitor Spain) is that they can deliver those produce earlier in the year than their market rivals. So buying up plots of lands in regions in the country that can allow for further shifting seasonality even earlier in the year, can enlarge their sales window[42]. Food market sales and marketing inform in this way local geographies, as producers such as MAFA would invest in the strategic development of specific production sites in the country.

Back in the 1980s, when those sites in West Noubaraya were being auctioned to private investors, Sherif Maghrabi lived in Saudi Arabia which is where his family, according to his own statements, made their money, mostly, according to him, in real estate. And it was with a real-estate land development mind-set, again according to Maghrabi himself, that he

[40] McDonalds Egypt was initially co-owned with Nasif Sawiris who later left the business, according to interview with Sherif Maghrabi.
[41] According to interview with MAFA's director of sales and marketing from 9 December 2022.
[42] This was suggested to me in an interview with MAFA's director of sales and marketing.

entered the business of farming in Egypt. Therefore, back in the 1980s, the first thing that the new company did, before starting to plant even one seedling, was to hire a number of business and sector specific consultants: the San Francisco-based engineering, procurement and construction firm Bechtel and the land reclamation specialist from Israel Agridev. (That the company hired consultants from Israel in the early 1980s, in a period that political relations with Israel were still extremely sensitive, is speaking volumes about the differences between public discourse, real politics and business). From its beginning, the farm was conceived as a profit-maximizing engine, and again in the words of Maghrabi, they worked with a land development-mindset. The question then was how to maximize profits for investors and how to elevate the land value, next to maximizing the profit margins from selling the agricultural produce itself? From the start, the idea was never to contribute to Egypt's food sovereignty. Rather, they positioned themselves as targeting an export market and also – though to a lesser extend – high-paying local market segments, such as the sales to fast food chains and local hyper- and supermarkets. Here, we can see many elements that echo the land reclamation ethos of the turn of the last century, namely the deep relationships between property value and expanding property assets as well as the interplay of maximizing profits through interscalar forms of engineering and manipulation. Desert farms like MAFA flourish under conditions of a controlled or at least controllable/fixable ecological-discursive environment throughout the entire value chain – from purchasing plant material to sales – by either having independent in-house setups (plant nurseries, breeding labs, packaging stations) or by having streamlined, fast connections/relations to providers and licencing and certifying entities. Finally, these farms are more likely to succeed (compared to smaller ones) because they can play the long-game, meaning that they are able to invest over a long period of time (at least ten years) before expecting high plant performance and thus reaching more significant returns on investment.

Let us unpack these elements a bit. MAFA's largest farming and production site lies in the Nile extension areas where successive governments have extended irrigation – and to a lesser extend drainage – canals throughout the area for reclamation purposes since the 1950s. A central feature that allows for the flow of Nile water away from the main tributaries into the secondary and tertiaries canals are pumps. This is largely due to the topological elevation that

appears further out of the Nile Basin.[43] The canals and the pumps are managed from the Ministry of Water Resources and Irrigation that sits in Cairo and a civil employee of the ministry opens the canals manually, following irrigation schedules that are drafted in Cairo. As the watershed of the Nile expands to either side of the Nile banks and so also in the area of the western Delta, water levels can remain low and thus entire irrigation canals can stay closed, sometimes for days on end.[44] In order to however ensure a continuous inflow of water, farmers or farming engineers in the area also rely on groundwater wells that they dig and operate with diesel- or electricity-operated pumps. The groundwater body that these farms in the Noubaraya area access is part of the Nile ecosystem, it is the Nile aquafer whose water level and water constitution is directly linked to the flow of the river. Yomna El Sharony stated for the Western Noubaraya province that all farms there rely to same extend on this subsurface water, in addition to or complementing the Nile water coming from the canals[45]. The problem with the groundwater is however its costs. These are the costs that are associated with purchasing diesel or buying the electricity from the government in order to operate the well-pumps. Further, the digging of wells is legally limited per agricultural area by the local governorate and in this case, it is the governorate of Baheira that is meant to control groundwater consumption. Licences for new wells are costly and shall the local governorate officer of Baheira find illegally dug wells (which they find either because of the high electricity bills or because of Google Earth imagery) an expensive court case will follow with high fines and it can even result in a criminal penalty (not just civil).[46] From an interview with MAFA's legal department, I know that for a company like theirs solutions in those cases can be found easily, either by paying the fine or by using local or ministerial connections to handle the well-issue. Shall farmers not have those connections or shall they not be able to pay the fines, the wells will be demolished by the governorate's office (in addition to potential other legal repercussions). Depending on canal water is on the other hand much cheaper

[43] While the Nile Basin itself is largely a flood plain, towards the desert fringes land elevation make the extension of waterways more difficult and hence pumps are being employed. At the turn of the nineteenth to the twentieth century, the colonial administration invested in levelling out the cultivated area and also mechanical infrastructures, called *sakia* rings, were traditionally used to lift the Nile water called and distribute the water into canals (Hopkins 2005).

[44] Jessica Barnes shows this in a very concrete and detailed manner for land reclamation sites in the Faiyoum Oasis and she also describes for the area around Faiyoum the political ecology of water pumps and farming as well as *the everyday politics of water* (Barnes 2014).

[45] According to El Sharony's roundtable presentation from 18 April 2023.

[46] This was reported to me by a legal representative of MAFA in an interview held on 22 October 2022.

because the canal infrastructures are paid by the government. Yet, as mentioned before, the water inflow might simply stop because of Nile uses upstream or even depending on meteorological factors. MAFA CEO Maghrabi told me that when he acquired the land:

> Sherif Maghrabi: We were supposed to get water every day, 365 days of the year. Apparently, when they reclaimed the land, they reclaimed more land than they have water for. With more developments, we were given water just 6 days per week – which is dangerous. Then just 5 days per week and at one point they decided to make it 4 days. Then I had to take a stand and threatened them to go to arbitration and they would have lost the case for sure. They went back to 5. This is really a very naïve management of water.
> *Vanessa: Which government entity did you talk to for this, the local governorate of Baheira?*
> Sherif Maghrabi: No, it's with the Ministry of Irrigation in Cairo, not with Baheira.[47]

In addition to those political negotiations of the Nile water flow, wells, allow for a regular and predictable inflow of water into the MAFA farms. In MAFA 4 and 5 they operate eighteen wells (according to Sherif Maghrabi). But even beyond the immediate influence over the management of water, corporate actors such as Maghrabi, even have much wider-reaching influence in orchestrating Egypt's Nile water, far beyond their immediate farming ventures. The CEO told me about a flight over DR Congo together with his family friend Youssef Boutros Ghali, Minister of Finance at the time (2004-2011), as a scouting mission and part of negotiations done together with the government of Burundi and Rwanda about using water from the Congo River to join up with the Nile into Southern Sudan through a 600km long canal. These negotiations happened within a context of other major Nile schemes further down the river, especially the construction of the Grand Ethiopian Renaissance Dam (GERD), that are said to be affecting and potentially diminishing Egypt's intake of Nile water as whole.

The case of water shows exemplarily how ecological-social injustices manifest on the desert's threshold. With an unpredictable water intake and recurring water reductions lasting many days, agricultural yield will be drastically affected, or at least it will be less predictable. This will be largely affecting the many small-holders. Large corporate farms can navigate, circumvent or influence potential water issues a lot easier. It is through material and discursive means that the flow of the water can be engineered by some and not by others.

[47] Interview from 25 October 2022.

This practically controllable socio-environment is ideal for horticulture planting. Horticulture refers to the specialization of the production of fruits and vegetables as well as so-called ornamentals for corporate food retail and food services (Dixon 2017, 87). The citrus food production at MAFA, for example, is streamlined and predictable to such an extent that oranges that will leave the farm in December are already sold to retailers in export-markets by September. So months in advance, it is clear what the yield will be and of what quality. The farm has its own plant nurseries, its own tissue culture lab and numerous agreements in place to source plant materials (from providers like Sun World, sitting in California). During my visit, I saw some visiting experts on the farm coming in from Australia and South Africa, seconded for a few months, sharing their expertise. The production of grapes on the Tanboul farms of MAFA (Tanboul is an area even further west of West Noubaraya, on the western side of the Alex-Cairo desert road) shows exemplarily a meticulously measured and defined process, from the layout of the fields to the pressure of the watering system, the distance of the plants to the plant production cycle and from fertilizing to trimming schedules. Describing the grape planting process at MAFA, the local agricultural engineer Samir Aouwad said the following:

> Samir Aouwad: Before planting anything, you make sure to level the surfaces of the earth/land, you plough out the soil 120cm to air out the soil, and you add compost and your nutrients to the soil because you can find patches of very sandy soil that won't retain water and you need the soil to be more compact, especially in the sandy patches. After that you monitor and add fertilizer. These are irrigation pipes that were bought abroad. They are high quality and manage to have the same pressure at the beginning as well as at the end of the irrigation line. The idea is to have equal pressure throughout the line.
>
> When do you think these ones here were planted?
>
> *Vanessa: I'd say, they are maybe 2-3 years old.*
>
> Samir Aouwad: They were planted in February, this year. Before we had a different variety of grapes here. Grapes have different varieties; some are ready earlier and have different characteristics and those make different financial returns. We want early the window because for Egypt you want them ready early [because of the marketing and sales abroad]. You could keep the same plant for up to 15-20 years. Then productivity goes down. When a better variety becomes available you replant. We are constantly renewing plots, changing plants, depending on marketing and sales.
> We have special machines that check the soil humidity level once a week. In plots where there is a lot of drainage, we add a lot of mulch – here we use leftover from

> rice cultivation leaves – which have bought from other farms. Also old leaves from the grape vines are used, shredded and then used as mulch but it's not enough…
>
> You have two major operations throughout the season that are very high labour intensive. First, the thinning to improve the yield. A plot like this can make 15 tonnes of grapes – but bad quality grapes. So thinning means to cleaning out the vine, then the grape is better. You take about 30% of the crop. And that is a manual job. Second, the harvest. These jobs are done by men and women some are mothers [meaning women that are not very young]. Where the trees are lower – depending on the kind – you find mostly women working.
> There are different systems to place the wiring that the plant is creeping on. When you plant a grapes-plot you position the shoots in a way that makes it easier *to perform the operations* and to protect the plant from the sun and from other factors and that make the harvesting easier. The idea is that the wiring and planting is done in a way that you can perform the operations in the best way.
> We have a different plot of land that had different elevation – in one of the other farms – that is currently being releveled. It had up to 6m height difference. Perhaps you can take a look.
>
> *Vanessa: What about pests and plant diseases? Are there any new pests that came during the last years?*
>
> Samir Aouwad: It's not that there are new kinds of pests but the issue is that with the rise in temperatures the lifespan of these pests has decreased, bugs are living shorter and are replicating quicker. And I have also noticed an increase in fungus because of the relative humidity rising with the temperature. [48]

Farming here, is an operational process where ecological matter is a largely calculated factor. Changing needs can be mitigated through breeding, an adaptive use of synthetic materials and the convergence of the two. The use of fertilizer for instance has dramatically grown. Already with the closing of the Aswan High that now prevents the passage of the Nile's fertile silt, fertilizer had been vastly employed throughout Egypt's agricultural areas (of course already before that but not across the board). In those newly reclaimed sites, the use of fertilizer and other enhanced biomaterials is absolutely common practices and it is part of a calculated planting approach. For the planting of the grape vines, those synthetic and organic liquids are added directly into the irrigation network, at the beginning of the irrigation line.
Further, marketing strategies will influence planting process as such. For example, one might need to improve the transportability of the produce. In that case, seeds are selected and plants are bred that have thicker skins. Some goes for other produce-characteristics like

[48] Interview from 25 October 2022.

sweetness or juice-content. The marketing and sales responsible at MAFA told me that Asian markets like sweeter grapes whereas for European markets the look of the produce as well as the fact that it complies to the EU's hygiene, phytosanitary and food standards are the most important criteria. For a corporate farm, next to the agricultural process, also trade and sales systems need to be managed and processes need to be streamlined. To ensure this at MAFA, government representatives from the phytosanitary authority as well as a trade and a customs representative live on the farm all year round. Besides, independent food licencing entities come and visit the farm regularly.

What we can take from this case study is that corporate desert farming based on land reclamation is a process of land development that operates across scale. It works through creating of practically operational landscapes that can rely on stable and predictable conditions through the discursive-material organization of ecological resources.

With regards to the effects of those schemes both for the immediate as well as wider socio-environmental contexts, we can further evaluate that as a profit-maximizing business it relies on *cheap* labour that they can source relatively easy because of their proximity to the Delta and *cheap* land that they have gained through fast-tracked access to political figures and because of being able to making large investments. Further, such an enterprise also gets prime access to otherwise heavily disputed and often scarce resources such as water. For the wider geographical area in which also MAFA's grape farms lie (Tanboul), I have learned from Mahmoud El Khafif, who is also a farmer and who used to own a smaller parcel of land there in the early 2000s, that the water table in the area has drastically sunken. This area was only made available for reclamation in the last thirty years and the whole site depends exclusively on well-infrastructures. In the early 2000s diesel was so cheap that "people were pumping like crazy" said Mahmoud El Khafif who is also a professor of civil engineering at the German University in Cairo[49]. Khafif stated that the water table was at 136 metres when he started and ten years later, it was at 148 metres. The Nile's groundwater aquifer, that these farms in Tanboul depend on, is replenishing a lot slower than in other areas that lie in closer Nile proximity. But even in those areas, according to the same farmer, water levels have been

[49] Interview from 6 December 2022.

changing. And as the water table lowers many other changes will appear. With more groundwater resources being pumped up to the surface the salt concentration in the remaining aquifer rises. This can have the result that farmers will increasingly have to employ desalination treatments which are vastly unaffordable to non-commercial or smaller-size actors. Or small-scale farmers have to do like Khafif who has stopped planting on his farm completely and now invests in another desert farm together with other family members.

The aftermath of those horticulture production systems on corporate desert farms on the Delta's moving thresholds has wide-reaching effects and those are surely only going to increase as land reclamation projects further seek to expand the Nile's watershed (including those linked to the Nile aquifer). The depleting groundwater level is diminishing Nile water quantity and this changes the composition of soils leading to an intensified use of fertilizers, pesticides and plastics. Already in 1998, paleobiologists Daniel Stanley and Andrew Warne attested that the Delta is now in its *destruction phase*. They argued:

> Symptoms of the destruction phase of the Nile delta include accelerated coastal erosion and straitening of the shoreline, reduction in wetland size, increased incursion of saline groundwater, and buildup of salt and pollutants to toxic levels in wetlands and delta plain. Without seasonal flushing by floods, the former delta plain surface is now incapable of recycling and/or removing agricultural, municipal and industrial wastes generated by Egypt's rapidly expanding population. Moreover, the remaining capacity of the system to regenerate itself will further diminish as water is diverted away from the delta for new irrigation and municipal projects in the Egyptian desert, and water allocations to Egypt are decreased by upstream countries.
>
> Stanley & Warne 1998, 794

As a consequence of the deep re-configuration of the Nile River system in Egypt, specifically linked to the Aswan High Dam, according to the researchers Stanley and Warne, the Delta has been debilitating in several ways, whether it is related to soil or water quality (and toxicity) or related to the conditions of the Delta's Mediterranean shores or that of its wetlands. Geographers Ray Bush and Amal Sabri attest specifically for the lake area of the Delta a dire situation that among other reasons arose (and is further intensifying) because of land reclamation activities.

> [T]he Mediterranean Delta coastline and the four lakes act as pollutant 'sinks,' receiving a large proportion of persistent pollutants generated throughout the Nile Valley and flowing through the Delta's terminal drainage network. Water pollution from local and upstream wastes has steadily increased as a result of the intensified multipurpose use of Nile waters, and the once-annual Nile flood no longer flushes the entire system… Land reclamation decreased overall lake surface area, and fish yields

> were reduced by the closure of sea-lake inlets through siltation. The reduction of the river's outflow, which once deflected offshore currently, together with a lessened silt load reaching the sea, means that sea currents produce net erosion along the delta's coastline, altering coastal configuration and wetland channels to the sea.
>
> Bush & Sabri 2012, 243-244

This is a process that the land reclamation schemes of the past sixty years have stipulated and the situation is worsening through new schemes that access the same rare fresh water sources that the rest of Egypt farming population also relies on. Specifically, for the ecosystem of the Delta, multi-layered and each other effecting ecosystem changes are the result, affecting the base of life of millions of people, especially the fishing folk on the lakes but also coastal populations and farmers from the Delta's inland.

Land reclamation as we have seen is a deeply transformative process that acts upon and through the capitalization of socionature systems. Egypt's geobody has changed *from within* in the process. Land reclamation schemes have created operational landscapes of capitalization through an algorithmic governance that can rely on a largely controllable socio-environment. Those schemes flourish on the availability of *cheap* labour, *cheap* land and *cheap* resources and this has been true for both historic practices as well as more contemporary ones. Within both a colonial regime of land organization as well as in post-independence settings, land reclamation practices have allowed for a top-down re-negotiation of the land-water interface along a spatial organization of productivity and property/land development. With the institutional instalment of the *zimam*, the desert's borderline and the administrative limits of agricultural production from the early twentieth century, land reclamation has become a process of capitalization that has allowed for more centralized powers of the state and its private allies to appropriate new land, instead of more small-scale, localized interventions. Land reclamation seen within the web of life is a process that happens across scales and that affects both the immediate as well as the broader socionatural contexts (of land reclamation projects) also in the *longue durée*. While few will enjoy the fruits of those capital- and resource-intensive programmes, many will have to bear the consequences, for instance with regards to the availability of fresh, clean water demonstrating the slow violence effects of capitalization over time.

Land reclamation is thus one fundamental strategy to capitalize the desert in Egypt and we will see in the following chapters, how it relates to other processes and mechanism that seek to turn sand into profit.

2. The Desert's Underground

> *Raised in tents made of the fronds of the doom tree, tents open at the sides to valleys and skies and filled with clear light, Issa was astonished to see men living under these conditions. He wondered how they could stay all day in the mines and then return to the huts. He was equally astonished by the predatory attitude of the men toward the mountain themselves – mountains that for him seemed as inviolate as eternity itself. Among the awesome masses of rock had grown a multitude of ores, each of which Issa saw and touched and respected for its own characteristic color and life.*
>
> *When the machines discovered the presence of those minerals, workers from the Valley started digging into the mountain to reach them, and once they started they never knew when to stop. The inside of the mountain became a free-for-all. As long as the scaffolding held the tunnels open the workers kept mining, like machines themselves, machines whose only purpose was to create new passageways and causeways. Then they laid rails for wagons to carry the ores outside the caves, where camels were loaded to carry them across the desert. Issa got to know all about these men who came from the Valley of the Nile to the caves and tunnels of the Darhib. No sooner did he encounter a foreigner or see a caravan loaded with ore on its way to the sea, than [sic] a great anger would well up in his heart. It made him wonder about the treasures the men toiled so hard to extract from his own mountains, from his world and universe. Whose right was it? Who was the real and true owner?*
>
> Sabri Moussa, *Seeds of Corruption*, 2002 (first edition in Arabic from 1980), 18-19

2.1. Hidden from View

In Sabri Moussa's novel *Seeds of Corruption* from 1980, the protagonist Nicola, a "man without a country" (11), comes to the Red Sea Hills in the Eastern Desert in Egypt in search for a place of belonging (or maybe rather a place that can belong to him). He accompanies mining engineer Mario from Italy to the Nile Valley and from there goes to the gold mine of Sukari to learn "the secrets of mining" (25). Bedouin, Issa, gives as one of the guides his knowledge of the mountains to the foreigners. Nicola and Issa become part of a mining venture in the Darhib. The mountain is said to contain talc. There are old mines there that have entered into the mountain's interior but Nicola wants to go deeper. The Darhib is not

far from Sukari and about five walking days from Qina (in the Nile Valley) and nine to ten walking days from Mount Elba (on the border to Sudan, 15). Nicola and Issa become lured into a quest of greedy mountain thrust, a project funded by the Cairo-based noble man, El Khawaja Antun Bey (*El Khawaja* means the foreigner and *Bey* is an Ottoman noble title). Antun Bey is a cosmetic factory owner who hopes to establish two more factories in Cairo with the talc extracted from the Darhib. The novel paints a captivating but gut-wrenching image of a lusty urban bourgeoisie (lusty for all kinds of physical pleasures), foreign technocrats, industrialization and mining in Egypt in the 1920s (the novel states 1347 A.H.[50], 1928 or 1929). It is a picture of exploited Valley workers as well as Bedouins caught up within the intoxicating and unsatisfiable hunger for the desert's bounty. In the end, everybody in the story loses. Issa loses his life when ordered to re-open a sand-filled mountain-well (potentially bitten by a snake) and Nicola loses his only child and grandchild in a delirious fever dream and in a mountain slide as "the mountain had exacted its own revenge against the men who tried to possess it" (14).

Moussa's fictional novel is set in the early twentieth century, a period for mining in Egypt's deserts run by European scientific, technocratic ventures where Sinai and the Eastern Desert meant opportunities for phosphate, manganese, kaolin, sand, gypsum and coal. At the same time, the Gulf of Suez, the open water body that lies between the Eastern Desert and Sinai, open towards the Red Sea and extending into the Suez Canal, and later, about half a century later, the ground below the Mediterranean Sea and the northern parts of the Western Deserts become of strategic interest for a new petrochemically-focused world. The geological hotspots of Egypt show a whole different country. From a perspective that looks at territory as a deep volumetric space of intertemporal layers of rock formations and mineral deposits, Egypt's geobody shows different characteristics than the ones that were looks at in the previous chapter. When opening up the underground layers of that geobody, unpacking chemical properties together with physical and meteorological data and *longue durée* geological timescales, a new image of what the country is and what it is made off starts to appear. This is the work of geology and that of mining and drilling as its capital-run(ning) proxies and they will be the focus of this chapter.

[50] Referring to the Islamic Hijri calendar.

For the case of Egypt, studies on geology and the local extractive industries with a focus on the more recent periods are extremely marginal, at least if one expects a critical analysis on the role of those sectors for the country's political-economy and social science view on the issue. Still too little attention has been put on modern mechanisms and politics of surveying, on the institutional development of geological research, market developments in extractive industries, actors, financiers and labour conditions as well as on infrastructural developments (for instance in accordance with the transporting and processing of raw materials) or technological changes (whether it is with regards to prospecting, surveying, mapping, scientific analysis or even refining, manufacturing and processing). What role did the scientific surveying and exploiting of arid regions play for the country's modern period? This does not merely concern the dealing with tribal nomad populations during the modern state-formation process. Those studies have been conducted successfully and they showed what role Bedouins have played during the state-formation of the long nineteenth century (see for example Aharoni 2007, Fletcher 2015 and Ellis 2018). But what about the scientific and administrative engagement with desert landscapes as socioecological regions for instance as source regions for the extraction of mineral wealth? We can find some rare studies of individual mining operations from the early twentieth century like those that took place in the phosphate mining town Qusseir (Cabassi 2012, Damir et al 2023, Pellegrini 2011). Besides, the historical focus dedicated by the field of archaeology – as demonstrated in the literature review - on archaeo-geological ventures of mining and quarrying is a rich archive of works. This includes also Pharaonic, Greco-Roman, Byzantine periods and to a smaller extend Ottoman times. But one of the Middle East's first fossil fuel discoveries was made in the mid-nineteenth century in Egypt. In 1868, a French sulphur exploration team found oil seeps in Sinai, on the shores of the Gulf of Suez. Yet, the rich research on Egypt covering that time period does not address the issue in a substantial way. Again, the desert appears as a massive blind spot in the research. Studies on the local oil and gas sector (natural gas appeared in the local drilling industry in the late 1960s for the first time, according the Egyptian General Petroleum Corporation, EGPC[51]) are predominantly directed towards industry-internal/-related audiences of experts. They are covering geological aspects, drawing countless tables of chemical properties and mineral particle concentration, exposing rock layers in reference

[51] http://www.egpc.com.eg/About_EGPC.aspx, accessed on 23 November 2023.

to geo-chemical formation but they do not look at how the local extractive industries have shaped and evolved. Some considerations can be found in discussions of Egypt's industrialization periods. Yet, even that topic as such is little studied, at least for the pre-1952 decades (some examples include industries in modern Egypt by Vatikiotis 1991, the interplay of industrialization and architecture under Mehmet 'Ali by Scharabi 1992, colonial textile industries Tignor 1987, or individual industrial complexes Karim 1941). For the post-1952, with an import-substitution economy, a shift towards more industrial efforts happened in the Egyptian economy and those have been more debated scholarly (such as Kenawy 2009, Mabro 1974, Osman 2013, Sims 2018). But then again, the role played by raw materials coming out of Egypt's deserts that were needed for those industries (for instance for public works sector or in construction) are not the focus of these works and thus they remain too little understood. In general, we can say that publications that happen in this field of studying the desert's underground and how it entered into circuits of the economy or into physical public infrastructures is not much reviewed in the scholarship on modern Egypt. One small exception is one very large infrastructure that is the Aswan High Dam. The dam project is maybe the only example where it has been actively considered, what this infrastructure is materially made off, where rocks and sand and gravel came from and how those were sourced, manufactured and built up (Reynolds 2013, Mossallam 2018). Besides the dam, what comes out of the desert's subsurface body, is mostly looked at within expert-specific discussions of concrete industries within the field of the fossil fuel sector, mineral geology, geophysical or geothermal analysis and also in palaeontology. But studies upon how specific materials are (techno-politically) extracted, what are the legal-bureaucratic dimensions of the extractive industries and how have markets evolved as well as technologies, is not studied enough within these texts. Only, historical archaeology is a very active field of research in Egypt that highlights the interplay of the exploitation of environmental resources together with cultural and socio-political and economic actions/dimensions more explicitly. There is a wide array of publications in this field and there is a lot of funding for it that comes predominantly from European archaeological missions such as the German or the French. The

issue however is its restrictions to specific periods of human history in Egypt. Egyptology for example limits its scope to 5500 BC – 641 AD[52].

The literature overview on the subject had already shown us some important elements that will be unpacked throughout this chapter. The extraction of raw materials from Egypt's desert sites is linked to a scientific and industry-focused discourse that happens in some ways disconnected from their wider discursive frameworks such as discussions of the economy or political circumstances. Further, there is a distance, like some sort of codification that happens here in relation to extraction, either through an expert-specific discursive or the time-specific framing of study related to a distanced past. Those discussion happen somehow below the radar of other political-economic debates. What happens in the desert's underground remains therefore largely hidden from view.

My focus for this chapter will be on the more recent mining and drilling missions that go back to about a century and a half. I want to understand how do these missions and scientific modellings of desert terrain in Egypt inform the legal and bureaucratic set up of the desert in the modern age? How does the scientific discourse that is being institutionalized particularly at the turn of the century, situate desert landscapes; I mean *situating* here in the sense of a territorial discursive placing that is the foundation of capitalization? And how do those discourses shape or maybe even license/grant authority to the contemporary ways in which raw materials are being extracted today throughout desertscapes? As laid out above, research and extractive missions of the late nineteenth and early twentieth century are largely set apart from the wider politico-economic context of the country that they are actually embedded in and the same goes for the exploration of other mineral wealth such as precious metals, rare stones and rocks. Neither have these exploration and exploitative measures been historically contextualized nor has their influence on the wider political-economic as well as socio-ecological context been well understood. For instance, according to my knowledge, there has not been a single study on the historical overlap of the cadastral surveying and mapping of cultivated areas in Egypt and of geological research missions

[52] According to the Egyptology curriculum at the University of Heidelberg in Germany https://www.uni-heidelberg.de/de/studium/alle-studienfaecher/aegyptologie accessed on 12 October 2023.

(especially but not limited to the Eastern Desert and in Sinai) which not only show historical conjuncture but also an overlap in actors. In other words, people that were instrumental in the mounting of irrigation works on the Nile, doing land reforms and consolidating the productive sites along the Nile in Egypt (which was at the heart of the last chapter's analysis), have also play an instrumental role for the conception of a local mining sector in the desert. This has so far not been recognized by the already rich research on nineteenth-century Egypt. It will be the focus of the first sub-section of this chapter.

Further, for the contemporary context, we can find that despite the mining sector being an important and growing sector for the local economy, it also stays absent in much of the current political-economic academic analysis. In 2019, the mining and utilities sector contributed about the same amount to the local GDP as the agricultural sector that year (11 and 13 percent respectively, according to OECD et al 2021, 39). Egypt has an active petrochemical sector, being the 14th ranked producer of natural gas in the world and also a contributor to the world's crude oil production (contributing 0.8% to total crude oil in 2017[53]). Sure, its numbers of fossil fuel trade are low for a country that lies between the OPEC giants Saudi Arabia and Libya. But today, oil is Egypt's highest paid export commodity, quickly followed by the new export rising star gold. In 2020, the country exported USD 6.6 billion worth of fossil fuels (about half refined and half of that in terms of monetary value as crude oil), most of it going to India, Italy and China (according to Chatham House data[54]). And now gas is coming. Up until now, natural gas resources have been predominantly used for local consumption effecting of the local energy supply and on import needs. With expansions in the local gas sector and gas imports from neighbouring Israel, the country hopes to establish itself as a reliable supplier of liquified natural gas (LNG) shipped to Europe (according to Bloomberg 22 November 2023[55]). Next to oil and gas, probably the most famous of all ores is seeing a new renaissance era in the ancient pharaonic sites: a new gold rush is today spanning thousands of squarekilometres in the Eastern Desert. The mountainous area around the Darhib, from Sabri Moussa's novel, is in rumbling vibration yet again. The Egyptian independent news outlet, Mada Masr (16 August 2023), reported in a recent investigative

[53] According to Mowafa Taib (2021).
[54] https://resourcetrade.earth/?year=2020&exporter=818&category=32&units=value&autozoom=1 accessed on 23 November 2023
[55] El Wardany et al 22 November 2023 https://www.bloomberg.com/news/articles/2023-11-22/egypt-set-to-restart-lng-exports-after-israel-gas-supply-rises?embedded-checkout=true accessed on 1 December 2023.

piece of a *Gold War* deep inside the Red Sea mountains, east of Aswan, where gold mining concessions have been allocated following the success of one of Africa's largest gold mines, the Sukari mine (the current production started there in 2009, after 15 years of exploration time and the mine is also mentioned in Moussa's novel). A reform of the mining legislation in 2019 reflects the renewed state interest in the capital-penetration of the sector which gave seven international and four Egyptian companies prospecting concessions in the Eastern Desert[56]. Just in the year 2000, gold was fully absent from Egypt's export repertoire and now, in the span of merely two decades, unrefined gold sold to the UAE and Canada is the country's second most important export-good (three billion USD worth in 2020, according to Chatham House data[57]).

Prospecting, mining, drilling as well as the manufacturing of raw materials are thus critical practices of capitalizing (on) the desert in Egypt. This form of capitalization, opening up the desert underground, surfaces political desires and economic ones, as well as environmental imaginaries. It also reveals the exploitation of material-ecological properties as well as of humans in the forms of labour relationships in addition to legal-bureaucratic forms of land ownership. As the desert morphs to become resource, how is the ground (re-)configured? And it becomes resource for whom and how? And what or who is left behind/below?

My argument suggests that contemporary extractive ventures deeply rely on a discursive context that treats deserts as site reserved to the realm of science and security as well as commercial purposes relying on a discourse of an *inhuman* environment, arguably able to licence geo-manipulation and for those industries to operate *hidden from view*. To show what this looks like, I will again look for the material-discursive underpinnings of local modern mining industries. Here, we will find out, how the discourse of an *algorithmic governance* not only informed the sites within and beyond the *zimam*. Desert sites, at the turn of century, played a role in the development, adjustment and experimentation of scientific tools as

[56] The bid round covered an area of 56.000 square kilometres in the Eastern Desert. This was followed by a second bidding round for an additional eight blocks in the area in 2022, according to Sarah Samir (17 July 2023) https://egyptoil-gas.com/features/egypts-mining-sector-towards-strategic-transformation/ accessed 10 October 2023.

[57] https://resourcetrade.earth/?year=2020&exporter=818&category=38&units=value&autozoom=1 accessed on 23 November 2023.

laboratories of science and they also contributed to technocratic and military-scientific endeavours to re-imagine and re-engineer landscapes in deep ways. This also affected the ways in which non-arid sites were approached – in a material-discursive feedback loop of geo-engineering as a way to capitalize on local sites and forms of *cheap* labour. Then, I will again draw on fieldwork from which I took a lot of information about the contemporary extractive industries that take place in Egypt's deserts. The conversations that I had evolved majorly around local gold mining in the Eastern Desert. This time, the fieldwork took place through a number of conversations and visits in Hurghada. I spoke with Ma'aza Bedouins of the Eastern Desert and with a number of industry professionals of the gold mining sector in Egypt, among them a drilling engineer of foreign service provider and a geologist of a local mining company. The expert interviews took place on the promise of full anonymity. This has to do both with contractual agreements that those interlocutors made with companies they work for but it also has to do with the general obscuring nature of mining industries in the country and with the insecurities that radiate from them. The conversations that I had surface that the current gold rush in the desert takes place within the contemporary financialization of desert areas as investment sites and that this happens next to and also thanks to informal mining practices that are omnipresent throughout the Eastern Desert. This new financial era works at the intersection of speculation, scientific discourse and financial tools that benefit large-scale investors and also governmental actor. Thus, the fieldwork shows that the institutional foundation of geology and mining that happened over a century ago, has had long-lasting effects on the ways in which this industry is currently working and how it still shapes local arid landscapes. Desert areas are still highly securitized and what happens in arid sites remains hidden from civilian life and oversight. Besides, also illegal extractive ventures flourish alongside large capital-investments. This puts local workers, Bedouins and migrants that are part of the artisanal mining sector under severe risks with regards to health-related exposures and their physical safety more generally and the seizing of land (for instance of Bedouin land holdings) as those industries remain hidden from public access and scrutiny.

2.2. A Scientific Problem

> *Surveying is the application of physical measurement to the earth's surface and it furnished the basis for the discussion of it.*
>
> Lyons, *The Cadastral Survey of Egypt 1892-1907,* 1908, 9

Egypt-historian Matthew Ellis asserted about the administration of the desert in Egypt for the nineteenth century period that "it remains difficult to discern how these areas were governed before then [1896]" (Ellis 2018, 13). In that year, the Egyptian's Coast Guard Administration (*Maslahat Khafr es-Sawahil*) started its important policing function throughout the country's desert regions. In my view it is quite a telling that it is a coast guard that is from now on overseeing the security of the area. It shows how the spatial organization of the desert and that of the sea can relate to one another in their ephemeral and elusive nature that is so difficult or at least very specific to capture for forms of administration that usually operate within more stable, fixed realms (for instance linked to limits and borders). What Ellis says is an important statement also on another level. Because it shows, the stark contrast of the rule over and management of Egypt's deserts to the tight and even meticulous forms of administration that are prevalent in the Nile regions, at least in the middle of the nineteenth century. This section will be about showing, how the realm of science that more strategically enters deserts regions from the mid-nineteenth century, allows for forms of organization of desert sites that can work alongside the more security-centred functions, classifying and organizing desertscapes in specific ways while also facilitating the streamlined entry of industries and capital-focused actors into those regions. Science, surveying and testing of scientific models took place in desert regions in the second half of the nineteenth century and this has also actively contributed to the tools of engineering the Nile riversystem. Desertscapes served as laboratories for means of standardization that laid the ground for the computational organization of the Nile riversystem. At the same time, with geo-manipulation happening in deserts at this time at large scale, those experimental approaches also shaped political environmental imaginaries in general. Entire geographies are being creatively re-imagined on how to change the interface between land and water, ground and underground and this also affects the political ecological dealings of the areas within the *zimam*. The deserts are an important laboratory for imperial aspirations by being discursively structured as *inhuman* sites (following the vocabulary of Yusoff described above) and as *wastelands* (following Hecht). At the beginning of the twentieth century, the desert emerges as the

material-discursive space at the intersection of military, scientific and commercial use and this still holds relevance today.

Before going into the realm of science in Egypt, first some more context on the legal-administrative organization of desert regions in Egypt at the time of the mid-nineteenth century. Before the turn of the century, desert sites are marked by a view onto these areas seen from the productive lands along the Nile if considered at all. The Western Desert's oases for example are overseen out of individual administrative posts that sit in the Nile Valley and Delta. The Siwa Oasis for example belongs the legal-bureaucratic realm of the Baheira governorate (in the western Delta). Legal functions are handled in courts in Alexandria (Ellis 2018). Individual security-related outposts perforate desert regions and they are located in the oases or in port sites. Egypt's desert sites are not treated uniformly until 1916 when the Frontier Desert Administration is being installed by the British rulership under Lord Cromer that henceforth subsumes all administrative and policing functions and structures local desert regions into the three geographical regions Western Desert, Eastern Desert and Sinai (Fletcher 2015, 85-96). A firman (a decree) that was issued by the sultan Abdülmecid I in 1841 to the governor of the Ottoman province of Egypt, Mehmet 'Ali Pasha, contained a map of 'Ali Pasha's territory and it defined the scope of the Egyptian province. The firman had been done in response to a claim by the Khedive who wanted install hereditary rule in Egypt. (His request was successful and his lineage made the ruling family of Egypt until 1952.) The map of 'Ali Pasha's overall territory, including desert regions, was however largely irrelevant to the ruler and also subsequent leaders of his lineage. Otherwise, it cannot be explained why this map – the only map that will delineate some kind of nation-state borders in the desert regions – was lost until 1925, when it was referred to in a settlement between Egypt and Italy over the Egyptian-Libyan state-borders.[58]

During the state-formation process, desert areas, such as the settlements in the Western Desert's oases, enjoy during the nineteenth century a certain autonomy from the Nile-centred administration according to the historian Ellis. Based on a discourse of *remoteness* and also cultural *otherness*, areas like the Siwa Oasis can handle up until the early twentieth century many local legal-bureaucratic issues within their own context, without referring back

[58] The story of the *lost* map is described by Ellis in the introduction of his book *Desert Borderland* (2018), 1-4.

to their administrative Nile-counterparts. This is not only true for the case of Siwa. This is also reflected in the administrative dealings with other local Bedouin communities, such as described by anthropologists Donald Cole and Soraya Altorki for the case of the Awlad 'Ali. The Awlad 'Ali are a large Bedouin tribe that lives on the Western Desert's Mediterranean shore, between the port-town of Marsa Matruh (literally, remote anchorage) and the Nile Delta. Cole and Altorki explain how the state-formation process that happened along the Nile regions affected Bedouins and how it did not. Bedouins were for instance left out of the government's military draft. This critical factor of Mehmet 'Ali Pasha's rule, a new military force based on conscription following the French model, did not apply for Bedouins in the country. Cole and Altorki wrote on this:

> On the surface, the exemption would appear to have been a good thing, especially as it extended to the onerous corvée labor required for maintenance work on canals, roads, and other infrastructure… Exemption from military service fostered marginalization of the Bedouin from Egypt's modernizing political economy. Since its inception in the nineteenth century, the modern Egyptian army and other military forces have provided a major means of upward social mobility.
>
> 2002

Here we can see how Bedouin dealings and approaches towards desert regions stand outside of/apart of the Nile region-processes that unfold throughout the nineteenth century. In some ways Bedouin communities benefitted from these forms of exceptions and in others, they did not.[59] 'Ali Pasha did not send a *wali*, a local administrator, to those regions, such as Marsa Matruh. He did however install the administrative function of the local '*umda*, a position associated with a mayor-role in the Valley but those came from the Bedouin groups themselves, even it did not come out of their own tribal organization. Bedouin land claims were granted usufruct rights, where the state allowed land to be distributed among tribe members but only for state-recognized tribes, such as the Awlad 'Ali (143).

Ellis argues that Egypt's sovereign territorial contours have played no significant role in the assertion of Egypt's modernity as linked to its geobody and its cartographic imaginary. I had added to those thoughts in the previous chapter that it was rather the *zimam*, the line of taxation, delimiting the cultivated area of Egypt discursively, installed at the turn of the century, that had contributed to the consolidation of the Egyptian geobody (and that was

[59] For more context on the role of tribal societies during Mehmet 'Ali Pasha's rule, including the military and security-related functions, see Reuven Aharoni *The Pasha's Bedouin* (2010).

later to be used for the state-led expansion of those territories, rather than a farmer- or small holder-led expansion). I would now like to further add that it was also in desert regions that a discourse of scientific held entry which also informed the treating of Nile regions. Further, this time marks the foundation for organizing desertscapes as a scientific sphere, or better as a *scientific problem* that needs to operate alongside security concerns.

In 1875 the German scientist Friedrich Gerhard Rohlfs gave a presentation to the American Geographical Society about an expedition that he led through the Egyptian Western Desert, also referred to as the Libyan Desert. In it, he sketches out the scope and intend of the exploration mission, the team and their main achievements. A synopsis of that presentation is published in the American Geographical Society's journal. Here is what it says about aim and funding of the expedition:

> When, in the winter of 1873, Dr. Rohlfs set out from Germany for the purposes of exploring the Libyan Desert, his principal object was to determine the question as to the correctness of the discovery made by him in 1869, of the depression which extends from the Great Syrte as far as Egypt, and also to determine whether the *Behar bela Nea* (river bed without water) has an actual existence, and if so, whether the Nile, in prehistoric times, could have pursued a westward course through it to the sea. In order to decide both these important questions, Rohlfs resolved to push forward from the Nile, strike through the Libyan Desert, and, if possible, to reach the oasis of Kufra. The khedive of Egypt furnished the means for the expedition in the most generous manner, and his generosity deserves special commendation, the more so for the reason that the questions to be decided were *purely scientific* [italic by me].
>
> Rohlfs 1875, 171

The expedition travelled over two years to various sites within the Western Desert. Starting off on steamer boat (provided by the Khedive) from Cairo up the Nile to Assiut and entering into the "unknown interior of the mysterious Libyan Desert" (ibid) with 140 camels. Local guides are being unmentioned and unnamed. The other *named* travel companions are other Europeans, asserted experts in their fields: "Professor Ascherson, of the University of Berlin, accompanied the expedition as a botanist; Professor Littel [in other reports this person is referred to as Zittel, not Littel; it might be just misspelled], of the University of Munich, as geologist and palaeontologist ; Professor Jordan, of the Polytechnic Institute of Carslruhe, as professor of geodesy and astronomy ; and G. Remelé, of Rhenish, Prussia, as photographer" (ibid). The self-proclaimed achievements of the researchers were the following: "the Libyan Desert was exhaustively explored, botanically, geologically and paleontologically, and the

collections made are so numerous that all the museums may be supplied. All the principle points of the Desert were astronomically determined, and more than a hundred measurements of elevations taken." (ibid)

Knowing about the immense size of the Western Desert of Egypt, it is hard to imagine that everything was exhaustively explored even by surely very confident German scientists but be that as it may. There are a number of things that struck me in this report as telling about the ways in which the scientific exploration and engagement with the desert at the time worked; how it operated and about its institutional context. The most important of which is Rohlfs' comment about his appreciation of the financial support (and in-kind support) for the mission by the Egyptian Khedive, it (meaning, the expedition) arguably being of a *purely scientific* nature. My question related to that would be: Can scientific research ever be just *purely science*? This somewhat assumes a separation of the realm of science expelled from its wider contexts, be it political, economic, institutional, legal (and the realm of the environment itself). So asking the other way around: How does geology in Egypt as a scientific discipline and practiced through missions such as Rohlfs' reveal politics over desert territories that they seek to arguably *merely* explore, discover, describe etcetera?

The context in which Rohlfs' expedition takes place, is politically complex. In the same year that the researchers are commissioned by Khedive Ismail, the Egyptian-Ottoman ruler (Egypt is still an Ottoman province, Ismail rules from 1863-1879) installs a series of new national institutions, among them Egyptian Geographical Society, the parliament, the opera, a school of law, the teacher's college Dar el-Ulum and the national library (Reid 1993, 542). The Suez Canal has just been finished, after construction taking place from 1859-1869. Railway connections are being laid out throughout the country but especially connecting Alexandria with other parts of the Delta, going south to Cairo (Alexandria-Cairo connection is finished in 1855) and then east towards to the Suez Canal (the Suez connection finished in 1872). Further railway extensions are leading southwards from Cairo to Helwan (1875) and also along the Western banks of the Nile from Imbaba (a Cairo neighbourhood) down to Assiut (1874). The Egyptian government is under severe financial pressures because of the magnitude of spendings on public works until declaring bankruptcy in the very same year of the expedition, in 1875. The Anglo-French Debt Commission takes over all the country's revenue in 1876,

installing the Mixed Courts to handle foreign ownership in the country. In 1882, following a military invasion by the British, London is effectively ruling over the Egyptian territory.

Scientific research in Egypt's desert as elsewhere in the nineteenth century is dominated by Europeans[60]. This is of course no surprise taking the important roles that Europeans play in many other parts of life such as in politics and the economy. Besides, up until 1908, Egypt does not have a single university and the country's first science faculty only opens in the early 1930s.[61] Historian Donald Reid suggests that the British who ruled in Egypt in the late nineteenth century strategically delayed the opening of local academic institutions (Reid 1993). Egypt's deserts had been a travel destination and an *object* of study for scholars of all different parts of modern scientific and military academies. Europeans travelled to Egypt with their travel logs and diaries creating careers for themselves in elite scientific and military institutions both in the imperial world and back home throughout newly established scientific societies, museums, libraries and archives. Especially since the Napoleonic Expedition from 1798-1801 that resulted in the multi-volume publication *La Déscription de l'Egypte* – which contained a map of the Eastern Desert and several geological observations (Said 1990) - men travelled to and through Egyptian deserts with interests in palaeontology, archaeology, botany, ethnography and/or studying rocks, minerals, fossils, corals etcetera.

In the first half of the nineteenth century, these are usually more individual, scattered missions of a small group of people (for an extensive overview of such missions during the nineteenth century and reaching into late twentieth century organized in a sort of timeline see Tawadros 2011). Their interests were funded and directed out of Europe with French, German and British scientists and institutions in the lead. Financial support came out of museums or foundations such as the Humboldt Foundation of Berlin, the Prussian Academy

[60] An important Egyptian contributor to the geographical scientific body of Egypt at the time however was the engineer 'Ali Pasha Mubarak (often referred to as the modernizer of Cairo and also often complimented as a prolific engineer) who published the twenty-volume book *Al-Khitat al-Tawfiqiyya al-Jadida*, a topographical encyclopaedia of Egypt containing a record of all Egyptian towns, street by street. Mubarak also headed the Department of Railways, and became Minister of Education and Public Works in the second half of the nineteenth century. Although French educated, more recent historical research suggests that he also was a Muslim intellectual influenced in his work by Ottoman-Egyptian rather than merely European ideals (according to Rana Baker with reference to Khaled Fahmy at the CEDEJ and AUC conference *Urban Ecologies in the Lower Nile Valley* from 11-13 June 2023). But even with figures like Mubarak in political leadership roles, the imperial character of Western-influence on geographical work in the country is undeniable.

[61] Egypt's first university is Fouad 1 University in Cairo that is later renamed Cairo University.

of Sciences or the Berlin's *Zoologisches Museum* (see for example about the funding of Schweinfurth's missions *Illustrierte Zeitung* from 24 February 1872 written by Rohlfs) and various Africa missions, for instance towards making advances on the source of the Nile and geographical and ethnographic understandings of upstream Nile regions, were funded following Khedival interests of Mehmet 'Ali and later of Ismail (see Tawadros 2011 and Reid 1993). Surely, one of the most prestigious scientific institutions at the time are the *Institut d'Egypte*[62] (established under Napoleon but closed in 1801 and re-opened in 1836 and again revitalised in 1859 under Khedive Said) and the above-mentioned 1875 established Egyptian Geographical Society (first founded under the name *Société Khédiviale de Géographie*). Particularly for the latter, the current historical research on Egypt points towards its instrumental role within a complex, multi-layered imperial context. Because this research on the Egyptian Geographical Society is already quite extensive (in contrast to the Geological Survey for instance), I just want to give a brief summary here. It is also somewhat evident, how a geographical institution is entangled into political arenas, for example in the negotiation of borders, in the representation/ascription of national or ethnic identities etcetera. Founding-president of the Geographical Society is the German Georg August Schweinfurth. At the heights of his career in Egypt he founded the Egyptian Geographical Society and he also headed the influential Institut d'Egypte. In 1887, he also occupied influential roles in the German colonial mission (in 1887 he became member of the German Colonial Society, *Deutsche Kolonialgesellschaft*, see Fiedler 2005, 100). Schweinfurth himself had travelled to and through Egypt (on journeys further south) during numerous explorations. One of his most extensive journeys was from 1868-1871 from Suez in Egypt into several regions in Africa that later was the base of his memoir *Im Herzen von Afrika 1868-1871* (*The Heart of Africa 1868-1871*). He was initially a botanist but soon began expanding his research repertoire and became a referential author for Egypt's natural history. Historian Donald Reid showed convincingly how instrumental the work and symbolic role was that the Egyptian Geographical Society played in a complex imperial context in the last quarter of the nineteenth century and the first quarter of the following one. Seen within the important international meet-and-greats of the time such as the international world exhibitions and

[62] The Institut d'Egypte is more a cultural institution that was founded next to the Antiquities Service by Europeans and under sponsorship of then ruler Khedive Said (Reid 1993).

congresses (for instance the Internal Congress of Orientalists or International Geographical Congress), the Egyptian Geographical Society played its part in a racial and imperial discourse of *science conquering Africa*. Reid quotes Schweinfurth:

> Mehmet Ali's vigorous hand had hardly reunited under his sceptre and subjected to a regularized like the barbarous tribes, plunderers, and fanatics who inhabit the length of the Nile Valley to the south, when already the traveller could pass in security unarmed and carrying gold across lands where he would not have dared venture hitherto. Egypt effectively became the gate by which science was going to make its entry into Africa.
>
> Schweinfurth 1926, quoted and translated from French by Reid 1993, 545

Reid concludes about the role of the Egyptian Geographical Society during the second half of the nineteenth century that "the EGS fostered and sought to legitimize Egyptian and Western expansion in Africa, even as Egypt itself was succumbing to British imperialism." (Reid 1993, 540)

It is also within this context that we can place a scientific mission such as the one Rohlfs' conducted; a reformed environment of national institutions partaking in the political negotiations upon the country's forming geography. Particularly, a new emphasis is being put on the role of scientific knowledge production and its institutions together with local policing and military missions. In addition, this time is further marked by an intense production of public works and thus a growing need for materials that can be used in order to build the colonial space of a productive (predictable) Nile Basin, built upon railway tracks, canals, roads, new towns, industrial complexes and an increasingly synthetically enhanced agricultural production; the material infrastructures on which Egypt's increasingly operationalized productive landscapes are being built (see pervious chapter).

For the research and extractive missions that happened in Egypt's own territorial realm, the second half of the nineteenth century shows that there were individual scouting missions, travels and surveying accounts, such as Rohlfs', but that it was with the entry of one critical colonial military technocrat that desert sites became a strategic topos of enquiry and intervention and that is Colonel Henry Lyons. Lyons founded the Egyptian Geological Survey in 1896. This marks the turning point for the desert's becoming of an area reserved for military operations entangled with science and economic profits. Lyons came to Egypt in the early 1890s after an education in military engineering at the Royal Engineers to Chatham (Burton

1998, 90). He was sent to service in Egypt for two initial missions. One, was to produce a report upon the effect of long-term immersion of the temples on the island of Philae that were expected as a result of the completion of the Aswan Dam in 1902 (ibid). Two, was a military posting to Upper Egypt that led him to draft a report to Lord Cromer in 1894 suggesting the need for a geological investigation of the country (P.L. in Hume book review, 1926). In 1896, Cromer facilitated the foundation of the Egyptian Geological Survey under Lyons and just two years later, Lyons would become the director general of the entire *Survey of Egypt*, the country's central research and administrative institution and home institution of the Cadastral Survey. The birth of the Egyptian Geological Survey, launched by Lyons, is described in 1971 as follows:

> The geological Survey of Egypt, which completed its 75th Anniversary on the 8th of March 1971, came into being as a result of the need felt at the time for a fuller understanding of Egyptian Geology. At that time Egypt's deserts, and especially Nubia and the oases of the Western Desert, attracted the attention of Cairo's authorities and were continuously patrolled in fear of a Mahdist invasion from the south. At the same time, the reorganization of Egypt needed metal for road building, stone and gravel for construction, and fertilizer for agriculture. The interest aroused by the great discoveries of Ancient Egypt's monuments brought to the fore the possibilities of the revival of gold extraction from the deserts of Egypt…
> When the Geological Survey started its work, the reproach might well have been made that more was known of the geography of the Moon, half of which had been properly photographed, than that of Egypt, nine-tenth of whose maps bore the legend 'Unsurveyed'. By 1928 practically the whole desert area of Egypt had been traversed and great discoveries had been made, such as the vertebrates of Fayum, the phosphates of the Nile Valley and Red Sea coast, the manganese of Sinai and the oil of Hurgada. Great advances had been made in Egyptian palaeontology through the works of the earlier palaeontologists of the survey.
>
> Said 1971, 3,11

The need for survey's establishment is portrayed by the geologist and technocrat Said, who will head this very organization about six decades later, as threefold: gaining knowledge, securing resources (for the expanding public works and a growing colonial economy), and securing state territory and all to be attained through the means of scientific exploration linked to economic activities. Under the leadership of the military technocrat and geologist Lyons, the Egyptian Geological Survey conducted and commissioned numerous reconnaissance missions to map out and capture the Egyptian territory, beyond the productive Nile Valley and Basin. A first general map of Egypt was published in 16 sheets on a 1:1.000.000 scale in 1910 and it was the first map that also included desert territory in a

more comprehensive way (in the absence of the map of the 1841 firman). It relied in many parts on Zittel's first geological standard map that was drawn as a result of Zittel's Western Desert mission together with Rohlfs (according to Said 1990). At the turn of the century, members of the Geological Survey publish detailed memoirs as means of a scientific engagement (geological observations and meteorological remarks together with autobiographical notes) with various desert sites and oases. Rushdi Said lists "Ball on Kharga Oasis (1900) ; Beadnell on Dakhla Oasis (1901), Farafra Oasis (1901), and Abu Roash (1902) ; Ball and Beadnell on Bahariya Oasis (1903) ; Beadnell on Fayum (1905) ; Ball on Garra and Kurkur Oases …" (Said 1971, 6). As of 1905, the Survey started to have a more mathematical approach towards measuring and representing desert territories and this is even directly mentioned (and celebrated) by the survey's leadership (see Hume 1921, Lyons 1922 and Said 1990). It is an intentional discursive switch that happens at the turn of the century when the discourse shifts from more narrative means of scientific knowledge production, i.e. in the form of memoirs, to more calculated forms of surveying and organizing desert territories. In 1905, the survey expanded the triangulation of mapping the Nile Valley and Delta, happening at the same time, into some areas of the Eastern Desert. This was according to Said in an attempt to revive the country's ancient gold mining efforts (Said 1971, 4). Those had been recorded following various archaeological missions. Then, "The financial crisis of 1907 put an end to the search for gold" (ibid). In the desire to open up new commercial ventures for the colonial administration, replacing the quest for gold, the mathematical coverage and organization of spaces beyond the Nile Valley was expanded. Now, we can find that it was in those sites beyond the privately-owned Nile estates that approaches of an *algorithmic governance* were developed and tested out. Look for example at the development of the standard measuring units that were used for the triangular mapping of the Cadastral Survey's land surface.

> Although a decree had been published in April 28, 1891 laying down the metric equivalents for each of the measurements of length in use in the country, no standard *diraa* or metre was made, of which the error was accurately known by comparison with the international standards. There was certainly the 4-metre base-measuring bar of Brünner-Ibañez, but this had not been used for some years ; the triple-metres used by the Cadastre of 1878-1888 were lying in the stores of the Ministry of Public Works, and another metre bar was in the Engineering Department of the Ministry of War.
> The inconvenience of having no reliable standard of length was soon felt during the work of the Geological Survey in 1896, since the errors of the reputed standard above

> mentioned which existed in Egypt had either never been determined or the original certificates had been lost.
>
> Lyons 1908, 150

Different desert sites played a critical role in the development of the standard metre as well as in its application in various areas. The goal was to develop a standard base for the computational handling of the ground that also fit into local the environment and geography. Standard metres had been developed in other places outside of Egypt and the colonial administration was in exchange with those scientific entities (or military institutes) in Sweden, Germany or in Spain. But meteorological and topologic features of Egypt did not allow for a simple application of those tools for the local context (if those measures were available at all). Specifically, the Helwan Observatory, containing the Comparator House and a series of departments and labs with various different specialities, was instrumental in the comparative application of and re-adjustments made to surveying instruments. The Helwan Observatory had moved to this desert location in about 20 kilometres south of Cairo from another desert site that was closer to Cairo central in ‘Abassaya. ‘Abassaya had become an unsuitable location for the Survey’s laboratory works with the introduction of a new tramway-connection into the area which was disturbing all magnetic research (Lyons 1922, 284). The Helwan Observatory belonged to the state’s Physical Department and it included a time service, a meteorological service, a service of weights and measures, a 30-inch telescope, magnetographs and of course the Comparator House (for the prototype standard metre and secondary standards of length) (ibid). Next to the manifold research that was conducted in Helwan, also other desert sites were important in establishing standardized measuring units. Those were essential for the coverage and determining of the cultivated area in the Nile regions. Baseline triangulation was laid out in nearby arid sites before being applied onto cadastral areas. So it is not just in Helwan but in many other desert sites that measuring and testing, re-adjusting and comparing was being practiced.

But these are not the only instances that show desert areas as sites of science in action. One might simply argue that these areas are merely chosen upon their sheer availability, laying nearby cultivated and administrative sites. Desert sites are also an important scientific space of experimentation on another level.

> In 1926, during the progress of the 1 : 100,000 survey of the desert, a large area, 19.500 km^2 (named by Dr. Ball the "Quattara Depression") was found to be below sea level and, at one point, to approach within 61 km of the coast [Mediterranean coast]. Both Dr. Ball and the then Surveyor General, Hussein Sirry, were attracted by the idea of obtaining electric power allowing the water of the Mediterranean to flow down into the depression through turbines located at the end of a tunnel. For the next four years, the engineers of the section were assigned to make contour maps of the new depression at five-meter intervals and to run lines of levels between the sea and the proposed outfall of the tunnel. Deep borings to ascertain the nature of the ground through which the tunnel would be pierced were also made. A great deal of data was thus collected to permit a thorough examination of the subject. But, in the end, it became apparent that though an immense amount of power might be thus obtained, yet, at the then current prices of fuel, the same amount could be produced more cheaply in Alexandria. In 1931 the investigation discontinued.
>
> Said 1971, 7

This case illustrates symptomatically how techno-utopian visions are imagined, tested out and modelled in desert regions, such as here in the Qattara Depression inside the Western Desert. While the Suez Canal was already dug and also a first dam was erected in Aswan spanning the entire Nile, I would argue that it was experiments like these that deeply informed later construction projects such as the Aswan High Dam and also geo-engineering experiments such as that of a parallel new Nile Valley and a new Nile Delta. Experiments like Ball and Sirry's of a *desert-sea* show a scale of ambition and also a form of environmental imagination that relies on large-scale engineering. These are also attempts that will later articulate themselves as *terraforming*, meaning as ways in which otherwise assumed uninhabitable environments are structurally re-configured for specific kinds of human habitation. Similar *desert-sea* projects were also being experimented with in other parts of the Sahara, for instance in Tunisia and Algeria by French scientific missions. Surely, the predominantly British members of the Egyptian Geological Society at the time were following publications such as those made in the French Geographical Society's Bulletin in 1874 written by Captain François-Elie Roudaire. The geographer of the French army was proposing *une mer intérieure en Algérie* (an inland sea in Algeria). Roudaire similarly suggests a canal from the Mediterranean in order to fill an 8.000 squarekilometer desert depression with sea water, forming an artificial lake in order to *improve* the local climate and create new trade routes – of strategic advantage for the French colonizer - and serve as a *natural* barrier from threads

coming from desert tribes. After eight years of research and thousands of francs spent on scientific missions led by Roudaire, the proposal was also abandoned.[63]

What shines through in these examples is a colonial conception of the desert, as a base of scientific experimentation and as a site scientific-intervention that also informs scientific approaches elsewhere and together they shapes engineering works and forms of administration that apply elsewhere, such as those applied in Nile regions. They also show that desert interventions are designed and taking place upon a discursive treatment of those areas as *disposable,* as *wastelands*, speaking with Hecht and using the wording of Yusoff as *inhuman* where the effects of these schemes upon local communities or upon their socionature lifeworlds are not considered more than the mere collateral of scientific progress or development. Thus, *terraforming* ideas shape in these contexts, as they build on an understanding of these sites viewed as inhuman, as uninhabitable. While the Qattara Depression is in most parts not an inhabited area, the nearby Mediterranean coast is and its mostly Bedouin population is not mentioned in the scientific report above in any way. This relates to Gabrielle Hecht's idea of waste where governance treats some people and places as disposable (which is also articulated in specific built infrastructures). Those discursive assignments of desert sites are further promulgating and they form the basis of later engineering schemes such as the Aswan High Dam that dramatically did affect human livelihoods. A number of Nubian villages were submerged under the newly formed water reservoir of Lake Nasser leading to a mass-eviction of over fifty thousand Nubian people away from their ancestral lands on the Nile. They were moved to purpose-built areas in Kom Ombo on reclaimed land that would become available through the closing of the High Dam (Reynolds 2013, 194). Those communities were moved away from their land and put into the grammar of productive lands designed on ways on engineering and calculation.

But the desert in Egypt (and as in other imperial realms as we saw above), is not just a space for scientific experimentation. It is also very much a space for military interventions applying military scientific tools that are part of that wider scientific discursive production. So does the mapping of desert sites as done by the colonial administration under Cromer and Lyons show

[63] See for a historical science-fictional engagement with this case *L'Invasion de la Mer* by Jules Verne from 1905 and its English-version introduction contains an overview of the historical context, 2001.

a particular marriage of scientific enquiry and war administration and war practice. Not only did the leading surveying personnel come out of military ranks and its educational systems, the British war offices also supplied instruments and published geological reports and maps. For the time of the First World War, geologist Rushdi Said wrote,

> Upon the outbreak of hostilities, a few officials from the Survey were lent to the British Army for Survey work. Their number was gradually increased and in August 1915, a party recruited from the Survey, complete with printing machinery and photographic apparatus, was sent to Iraq. These groups were pioneers in the preparation of maps from air photographs. All the trench plans of Gallipoli as well as the map of Iraq (on the scale six inches to the mile) used by General Maude in his advance to Baghdad, were compiled from air photographs by these groups.
>
> Said 1971, 7-8

Scientific inquiry and war administration as well as the policing of desert areas went hand in hand, for instance through the aerial surveying of desert regions. It is what the British had termed *aerially enforced colonization* (Towle 1989) and it depended on the conjuncture of the production of maps and the controlling/patrolling of sparely populated arid thresholds. Next to planes, also cars were employed in those contexts.

> In the period 1914-1918, WWI interrupted the geological exploration activities in most North Africa. However, new information was added during that time thanks to the efforts of the soldiers/scientists who participated in the war. In 1916, the British Light Car Patrol was formed, of which Claude H. Williams and John Ball were members. The use of motor cars for reconnaissance in the Libyan Desert contributed to a better understanding of the Egyptian deserts and the distribution of sand dunes.
>
> Tawadros 2011, 7

The first *properly* (according to Said 1971) mapped out desert region in Egypt was the northern part of the Sinai Peninsular which was first drafted by the Survey of Egypt and the British Army, finished in 1914. It was subsequently extended by systematic triangulation, covering the entire Peninsular by 1924 (ibid). This encompassing and systemic surveying of the territory can also be understood as a way to enact sovereignty over territory such as in Sinai in order to consolidate the in 1906 settled administrative border between Anglo-Egypt and the Ottoman/Turkish territory along the Rafah-Aqaba line. This was the preferred territorial limit of the British leadership that wanted to secure the entire Peninsula and thus ensure London's exclusive control over the Suez Canal.[64]

[64] See for the 1906 border options and negotiation process Warburg 1979.

Next to this collaboration of the military and scientific realm, the turn of the century and the beginning of the twentieth century also is a period where the Geological Survey also served commercial interests and allowed for the entry of foreign commercial actors to enter arid areas strategically as sites for profit. At the same time that Ball and Sirry are experimenting for the Geological Survey in/with the Western Desert, the Survey also ventures out into the commercial exploration of a number of raw materials that become particularly relevant at the beginning of the new century. These are crude oil on the one hand and phosphate rock on the other. Also manganese and coal are being explored and extracted but the commercial focus at the time lies on exploiting the first two. Colonial technocrats and Survey members like Hume and Ball facilitate explorative missions and also establish the institutional frameworks under which commercial ventures can take place. The Petroleum Research Board is established in 1918 and both geologists sit on the board. European oil drilling companies enter the Egyptian market and desert landscapes at this time. After first oil finds in the Eastern Desert's side of the Gulf of Suez (in Gamasah in 1885), the Anglo-Egyptian Oil Fields Ltd. is set up in Hurghada in 1911 with Shell and BP in the lead. In the same year, also in Hurghada, a first refinery is opened. After that the government is putting desert areas along the Gulf of Suez on the market for exploration biddings and a first commercial oil field is established in 1938, again an Anglo-Egyptian venture. At the example of oil exploration, we can see how the scientific discourse shifts further, now increasingly belonging to the private realm of companies. Hume, director of the Egyptian Geological Survey and founder of the Petroleum Research Board, said in a lecture to the Royal Geographical Society in 1921 "The arduous work undertaken by many of the [petroleum] companies would afford material for an equally interesting account, but their records are not as a rule made public." (Hume 1921, 274)

For the commercial exploration of phosphate, it is the Italian *Banco di Roma* that establishes a mining company town on the Red Sea shores in Qusseir in 1912 (after having invested in prospecting in the area since 1910, Damir 2023, 69). Phosphate is also being extracted from nearby Safaga (run by the British, ibid) and closer to the Nile in the desert next to Esna. Phosphate is the chemical component of phosphorous which next to nitrogen is the most important fertilizer for agriculture (Hellal et al 2019). It is no coincidence that phosphate is such a significant mineral of that era in the early twentieth century in Egypt. It is the time of heavy engineering of the Nile riversystem as a productive cultivated area, as we saw before,

where agricultural production is a calculated venture where land reclamation enhances and optimizes harvests and land profitability. Phosphate plays a role in this. The extraction of phosphate began in 1908 with "only 700 tones" and grew to almost 70,000 tonnes in 1912 (unknown author, *Phosphate Production in Egypt*, 16 June 1922, 547). By this time, phosphate had become also a significant export commodity with trade going to Italy, Japan and Australia (Pellegrini 2011, 42). For the commercialization of those mining ventures, transportation routes are being expanded in those years, primarily the railway. Railway connections are built by 1922 between Safaga and Qusseir along the Red Sea, from Qena in the Nile Valley into Western Desert Oasis of Kharga and from Shusha in the Valley to the Baharaiya Oasis in the Western Desert (as shown on a sketch map that accompanies the publication of Hume's lecture 1921, 260).

To sum up this section, scientific research and the establishment of the Egyptian Geological Survey have put Egypt's deserts on the map – while before little attention was put by the forming nation-state onto those regions. Scientific practices have influenced the discursive frameworks of desert sites as a *problem of science* that acts as a proxy to the militarization and policing of those landscapes and facilitated the commercial penetration of foreign businesses/investors into those sites. Geological surveying has influenced environmental ideas and conceptions of arid areas, as *inhuman* sites (whether actually inhabited or not!) and as *wastelands* that can be re-imagined and re-configured through the heavy involvement of engineering works and scientific experiments. This, in turn, does not only inform the ways in which desert territories are being treated. No, it also shapes the ways of geo-engineering environments elsewhere, including in the Nile regions. Here the lens of scientific engagement obscures how certain actors gain specific access to those sites, while structuring those areas as belonging to the realm of scientific enquiry, military oversight and commercialization, thus beyond civilian outreach and beyond any (real) consideration of communities that are affected, living in those areas or working in those ventures.

2.3. Messy Desert Assets

At the beginning of 2023, the Egyptian government published the online portal *Invest in Egypt* (investinegypt.gov.eg). It is a service provided by the General Authority for Investment and

Free Zones (GAFI) and it summarizes local legalisation and also includes a search engine together with a map of the country displaying the latest investment opportunities. The majority of those opportunities lie in Egypt's desert regions. The map includes land reclamation schemes in various Western Desert's oases and also the New Delta and it further encompasses fishing zones in the Red Sea, new manufacturing zones in the newly established Suez Canal Economic Zones (SCEZ) as well as real estate in new desert cities. The entire middle segment the Eastern Desert is coloured in grey, indicating the country's largest investment zone, at least in terms of land surface. This is the Golden Triangle. It is next to the SCEZ the other Special Economic Zone that was established in the aftermath to the Sharm El Sheikh Economic Development Conference from 2015. It covers according to the map's description an area of 9000 squarekilomtres and it also includes a few additional smaller areas that lie outside of its immediate contours in the Eastern Desert. On another investment map of Egypt, this time provided by the fossil-fuel servicing company SLB (former Schlumberger), Egypt's Western Desert together with segments of the adjacent Mediterranean Sea are patterned in green and grey and pink blogs, indicting, according to the map's scale, oil and gas fields as well as so-called *development blocks* and *exploration blocks*. SLB facilitated through their website a bidding round for international investors that took place earlier this year (2023) for the commercial exploration and extraction of hydrocarbon resources on Egyptian territory, most of which are located in the northern half of the Western Desert and reaching up all the way to the Nile Delta (for the exploration and extraction of oil) as well as on Egypt's share of the eastern Mediterranean Sea (for the drilling for natural gas).

The abstraction and discursive translation of the Egyptian territory that we find on those maps are based on the algorithmic governance of earlier decades. This time they are interactive 2D renditions of the voluminous territory, surfacing sliced up underground geological properties – sometimes from a few hundred, sometimes from ten-thousand metres depth.

This sub-chapter focusses on the more contemporary mining and drilling missions in Egypt's deserts. Those ventures belong to a new wave of the financialization of desert territories, where arid sites are sold off on an investment map as investable assets. In the previous section, we have learned about the entry of a scientific discourse into these sites that is entangled with security and commerce. In what follows next, I will now look at how is the desert's underground materially and discursively re-configured through geological works and

mining ventures and how the new era of financialization concretely materializes on the ground.

To get there, I will again give some historical context of how the extractive industries in the country evolved since World War II (which where the previous section more or less ended). And then we will go into the field. Mining as an investment opportunity happens on the one hand in the digital spaces like those shown by SLB or by GAFI, the Egyptian investment authority. On the other hand, it also takes place within desert sites where we find contested grounds of artisanal gold diggers next to highly-mechanized drilling sites inside obscured and securitized desert regions. I was able to learn more about gold mining in the Eastern Desert from talking to a gold prospecting geologist and a site technician of a foreign service provider working on different mining concession sites both inside the Eastern Desert at the time of the interviews that took place in 2023. Further, I was able to have a brief but telling conversation with a sheikh of the Ma'aza Bedouin of the Eastern Desert about the local Bedouins' relationship to local mining ventures. I knew Sheikh Mar'y from before the interview. He was my guide on some desert excursions that I took with him to learn more about the Eastern Desert's Bedouin life, botany, animals and also about the local geology. When speaking to him about mining when I visited him this year (in 2023) in Hurghada, he was clearly uncomfortable and brought the conversation to a more abrupt end while before, during previous visits in the desert, he was easy to talk to, with a confident, charismatic and even humorous disposition. Together those exchanges gave me a perspective on mining in Egypt that is particularly revealing in its obscurities. What Anna Tsing described with the term *friction* (2005) is very tangible in those sites where global finance and high-tech innovations collide with and at the same time work thanks to the messiness and uncertainties that put those arid grounds into constant "productive confusion" (33) as Tsing writes. The anthropologist, Tsing, describes this for the Kalimantan forest's logging industries in Indonesia where the roads "shrink and simplify territory [for some], making it easier to get from here to there. For most everyone else, the logging roads expand landscape emptiness, separating off and on-road sites and creating obstacles between once connected forest places …" (38). It is similar on the roads passing along the Red Sea coast. First driving past the existing drilling rigs of petroleum-extraction on the Guelf of Suez when going down from Cairo to the touristic resorts on the Red Sea. But then, around of Marsa 'Allam and further going south, the road starts to *contract and expand* to stay in Tsing's image; not just because the asphalt is a lot less

maintained here and the servicing of the road (with gas stations or rest houses) disappears for long stretches. Going further south, you never know if you are really allowed to be here, until you reach Shalateen about two hours before the border to Sudan. Now you know for sure that you are not welcome. Passage is prohibited for civilians. In Shalateen the militarily closed off area of the so-called Shalateen-Halayeb Triangle begins. While this triangle[65] is in itself a relic of what I discussed in the previous section, where deserts are the exclusive sites of science, security and commercial industries, what lies outside of the triangle, namely inside the vast desert regions between the valley and the seas is much more difficult to grasp. In this following section, I am however making an attempt to do so. The desert roads that lie between the touristic areas on the Red Sea coast that pass through the Red Sea Hills leading up to the Nile Valley (an about three to four-hour trip by car) have a similar feel to Tsing's account of the Kalimantan Forest. Here the passenger drives through the landscape like cutting through it with the least friction possible where the rusty-coloured mountains and those who live in them and all that happens there merge into the background. Perforated with checkpoints, the roads are meant as a passageway between diving resorts and Valley tourism of Ancient Egyptian sites. Here, the mobile securitization of the desert is expansive because of its elusive nature. The mining for gold that is happening inside those mountains has seen very recently, only for the past few years, a new renaissance era. Now, it is driven by stock-market registered companies together with governmental actors as well as a similarly vastly expanding artisanal mining sector. I will discuss below, how this new era of financialization of mineral wealth materializes in this desert region in Egypt, taking the example of gold mining in the Eastern Desert, to understand the material-discursive ways of desert capitalization in Egypt today while not leaving out of sight, how those contemporary practices rely on the historical structures laid out above.

[65] The border dispute between Egypt and Sudan for the Triangle goes back the early twentieth century, when British Sudan claimed rights over the area that lies north of the otherwise agreed to sovereign borderline on the 22 northern longitude line. In January 2000, Sudan withdrew its presence from the area and control over it went fully to Sudan. Later that year, the Sudanese president renewed claims onto the territory which led the Egyptian General Organization for Physical Planning initiative a number of settlement programmes for the area to expand the Egyptian outreach over it. The plan of GOPP for 2014 was to resettle a significant three million people to this border region (Serag 2023). The current population of the area mostly belongs to the two nomadic tribes, Ababda and Beshariya. The interest in the area is largely driven by an interest in its mineral wealth that next to gold also includes oil (offshore). This led to armed clashes and even an assassination attempts against then-ruling president Hosni Mubarak (Mohyeldeen 2020).

But first again some historical context. The extraction of phosphate had peaked in the 1930s in Egypt even if World War I had brought some interruptions to the process. In 1927, the Italian State Treasury took on all the shares of the Egyptian Phosphate Mining and Trading Company, preventing its bankruptcy. By 1946, Egypt ranked second in the worldwide extraction of the fertile agricultural material phosphate, after USA, and phosphate was after cotton and sugar the third most important export commodity of Egypt at the time (Damir et al 2023, 69). During World War II, the Egyptian local manufacturing market experienced a surge in the production of local goods. A local industrial sector started to take shape while the existing cotton-related sectors, spinning and weaving, were also growing strongly.

> It is almost always conveniently overlooked in contemporary Egypt that despite foreign economic preponderance, despite the absence of energetic state intervention, and despite the alleged shortsited greed of private interests, the manufacturing sector grew at an annual rate of 10.5 percent between 1946 and 1951 with high rates of capital accumulation… The advent of the military regime in 1952 did not so much mark a new era as it signalled the end of the phase of 'easy' import-substitution (primarily textiles and processed food) and the beginning of state-led import-substitution that would come to include intermediate and capital goods.
>
> Waterbury 1989, 60

While in 1912 just about a quarter million Egyptians made up the country's industrial labour force, this number grew to one million by 1939 and two million by 1952 (Bodenstein 2010, 65-66). This industrial growth was however little based on mining and on desert materials during this time. Rushdi Said reported that from:

> 1928 until 1956 the Geological Survey had a less aggressive role to play. Its activities were turned to questions concerned with the underground water supplies of the oases of Kharga and Dakhla… In November 1937, at the request of the Ministry of National Defence, the Geological Survey commenced an investigation into the future development of the water supply of the Mediterranean littoral west of Alexandria. Bores and pits were sunk, salinities and water levels were determined at intervals. During this episode the Geological Survey of Egypt became section in the Mines and Quarries Department which had become diversified in its activities. Gold Mines in Sukkari were opened, basalt quarries were enlarged and a small [oil] refinery in Suez began its operations all under the management of the Mines and Quarries Department. While these operations did not stand up the test of time having been opened prior to proving ample reserves or carrying out the necessary techno-economic studies, they nevertheless, provided a field for training mining engineers and administrators.
>
> Said 1971, 12

At this time, water became an issue of national security. Securing and expanding freshwater resources, was thus of prime importance and it will be the base upon which the transformative years of the 1950s and 1960s will be conceived. For the design, conception and construction of the Aswan High Dam, research produced at the Geological Survey as well as by other foreign surveying bodies was decremental. The US Geological Survey embarked on two geological missions for groundwater resources in 1953-1956 and 1959-1967. Those were a large part of their technical assistance programme to the Egyptian government and they included a hydrological reconnaissance mission of the Mediterranean littoral region, as well as well-boring in the Western Desert's oases in the research phase of the New Valley Project (Taylor 1976, 38-40). The local Geological Survey is being massively expanded in those years after 1952, in the light of import-substitution as well as a new focus of the newly formed government into industrial sectors such as the manufacturing of iron, steel, aluminium and fertilizer. After the 1952-revolution, the Survey's personnel grew six-fold compared to pre-revolution years (Said 1971, 16). Already in the year 1952, the government had decided to build the large Iron and Steel Complex in Helwan (south of Cairo) and the Kima fertilizer factory in Aswan. The fertilizer factory was supposed to use the vast amount of electricity that would be generated from the hydro-electric production of the High Dam. Iron deposits were discovered by the Survey in the Bahariya oasis area and Maghara coal in Sinai (ibid). In 1956, the General Petroleum Authority is established and the local petroleum sector is starting to grow significantly. While nationalization awaits other industries all across the country in the socialist years, in the oil and the newly forming gas sector, Joint Ventures between the Egyptian Government and foreign companies prevail. They remain the dominant form of ownership in the sector until today. In the 1950s the General Petroleum Company gave out over sixty licences for oil exploration in the Gulf of Suez and the Eastern Desert (ibid). First seismic marine surveying begun in 1954 and this led to the first offshore oilfield run by the Italian company Eni in 1961 (Wescott et al 2016). The 1967 war with Israel affected local industries and the mining sector in specific. With the temporary loss of Sinai, Egypt lost access to some of its most important mines from which manganese, kaolin, sand, gypsum and coal were extracted (Said 1971, 73). Rushdi Said takes over the Geological Survey in 1968. He writes about that period:

> Close to 30,000 workers of these mines had been forced to flee their positions and return to Cairo. Those who did not have a dwelling place in Cairo were allowed to live

> in tents that were set up in the year of the geological research institution in the district of 'Abbasiya. This situation continued until my arrival nearly one year after the war.
>
> Ibid

In the years after the war, the survey and its related companies have a slow recovery. While Said invests in the institutional development of the organization and aims to put exploration and the economic evaluation on *a more sound scientific base* (according to his own words in Said 2004, 100, 101), the 1970s were not an active mining period. An exception is the Abo Tartour phosphate mine which one of Said's largest projects and is launched in 1974. The project is described by David Sims some forty years later as "Egypt's longest failure" (2018, 238). According to Sims, the market price of phosphate was starkly overestimated and colossal infrastructure costs were spent on the project's development (i.e. an expensive railway into the Western Desert location for 450 kilometres together with ports and bridges, ibid). The only desert matter that does start to experience an extractive boom is grainy material in the form of sand, gravel and aggregates needed for Egypt's growing construction sector that is starting in the late 1970s and comes to full flourishment in the decades after. Particularly, the local cement industry will become a decisive source of an economy built on real estate (as well will see in the next chapter). Besides construction, the other rising star of the 1970s and 1980s is the fossil fuel sector. The period between 1973-1985 is considered a *golden period* for the exploration and commercial extraction of oil, especially in the Gulf of Suez with hundreds of active wells (in 2015, there are 1545 exploration wells in this offshore area that led to the extraction from 170 fields, Wescott et al 2016). The market liberalization reforms of the late 1970s enabled the increased commercialization of oil and gas prospecting and drilling. This is for instance celebrated on a stamp of Egypt Post (the national postal service) from 1978 that celebrates the Sumed oil pipeline between Suez and the Mediterranean (Alexandria where a refinery was built in 1977) which had started to transmit 2.5 million barrel of oil per day since 1977.[66] The so-called *gas clause* from 1980 aimed at enhancing the exploration of natural gas and the development of gas fields in the country through Production Sharing Agreements. Gas fields were at the time mostly located in the Nile Delta; first gas discoveries made there go back to 1967 (Eni SpA 2018). The institutional

[66] According to Goldschmidt et al (n.d.) at *Encyclopaedia Britannica* which also states that the pipeline was financed by a consortium of Arab countries, namely Saudi Arabia, Kuwait and Egypt, https://www.britannica.com/place/Egypt/Resources-and-power#ref306719 accessed on 29 November 2023.

development of the sector is further accompanied by infrastructural works such as the layout of a national gas grid in the 1980s (Wescott et al 2016). In the early 2000s, large investments went into the LNG sector with plants built in Damietta (40% owned by Eni) opened in 2004 and in Idku in 2005 (Eni SpA 2018). In 2015, the local gas sector that is primarily serving a local demand, has a break-through with the discovery of the Zohr Gasfield in the Eastern Mediterranean, 180km north off the shores of Port Said, the largest gas-find in Egypt and in the whole of the Mediterranean. The importance of the hydrocarbon sector for the local economy is also demonstrated in its accumulation of Foreign Direct Investments (FDI) which accounted for 67% of all FDI in the fiscal year 2016/2017. In that year 10% of FDI went into the local manufacturing sector and 4.5% into construction (Taib 2021, 49.1, following numbers from the Central Bank of Egypt from 2019). Today, the mining sector's share in the economy is at 9.8% of the GDP. The share of manufacturing is at 16.7% and its highest performers are aluminium, cement, fertilizer, iron and steel as well as refined petroleum (Taib 2021, 49.1). The role of the construction sector for the contemporary Egyptian economy will be discussed in detail in the next chapter. What is important for this section to know is that in the local extractive industries, we find a turn towards more governmental focus on enabling both local and international investments through legal reforms and new financial instruments. This accounts for the petrochemical industries as well as for gold which is the new star on the horizon.

This is where we enter the field. Now the question is, how does this new era of finalization of the local mining sector concretely materialize on the ground and what is its discursive context?

Gold mining is, as already mentioned earlier, an Ancient Egyptian mining practice that has left a number of famous relics and artefacts, now exhibited in museums across Europe and in Egypt itself. Those are in form of jewellery, gold-plated busts or even maps (like the Turin Papyrus Map which is said to be the world's oldest map, displaying gold mining ventures in the Eastern Desert[67]). Other relics that those ancient gold diggers of the pharaonic dynasties

[67] A number of geological surveys of the Arabian-Nubian Shield (which spans the Eastern Desert) refer to the Turin Papyrus Map that takes its name simply from being located in the Egyptian Museum in the Italian City of Turin (see for example Habashi 2014, Hamimi et al 2021). It was found in a tomb in Luxor as part of an

left behind are the actual mines themselves. Gold mining as a spatial practice has a time-travel element to it because miners start where previous mining activities stopped. This is also the case for the Sukari Goldmine of Egypt's Eastern Desert. Mines were opened and closed, and re-opened and expanded at Sukari throughout several epochs. Archaeologist account especially for the period of the New Kingdom, an active time for gold mining (1550-744 BC) and for Egypt's Ptolemaic period (Faucher 2018). The roads that connect the Valley with this area inside the Eastern Desert and reaching towards the Red Sea's ports were built under Roman conquerors (Sidebotham 2008). Eastern Desert's Mons Claudianus and Mons Porphrytes were quarried for rocks and rare stones as building materials such as for columns and also gold and emerald mines exist from the Roman period (ibid). At the beginning of the last century, it was the gold of the Eastern Desert that had attracted British geologist to expand their scientific outreach onto the Eastern Desert. In 1905, gold and petroleum gained the main attention of the new Department of Mines, said president of the Geological Survey William Hume. "Some very rich gold ore had been found in the mine of Um Garaiat, near the great Wadi Alagi in the south-east of Aswan, this leading to the exploitation of many of the gold-mines worked by the Egyptians" (Hume 1921, 273). A bit over a century later, it is again the search for gold that creates large dreams and has administrators make reforms to their mining sector with the hope of a golden success story. In 2019, the Mineral Resources Law is being reformed in response to an almost unexpected success of a newly re-opened ancient gold mine at Sukari but this happened after many decades of no gold extraction in the Eastern Desert. So why this new focus on gold?

From the autobiographical writings of the head of the Geological Survey, Rushdi Said, about the 1960s and 1970s, we know that gold prospecting was seen as an uneconomical venture during that time and that gold reserves were estimated to have been exhausted. The focus of the industrial era was to find raw materials for the growing industrial ventures, for example those that could use the electricity that was now available from the hydroelectric power of the Aswan Dam. In 1964 and again in 1971, the Egyptian government had signed an agreement with the Soviet Union to gain technical assistance for the search for the minerals that could be industrially applied. Part of this agreement was that the Soviet Union had sent

archaeological mission that took place between 1814-1821 and it is said to date back to the Egyptian New Kingdom period of 1559-1075 BC.

a number of vehicles that the Geological Survey was able to use for their field parties in their missions (according to Said "in the hundreds" 2004, 87). Said writes:

> As for the garaging of the survey's fleet of vehicles, we decided to build a large garage in Marsa 'Alam to house a large number of them. The garage was built on the abandoned site of the Sukkari gold mine, some 20 kilometers to the east of Marsa 'Alam. The workers of Marsa 'Alam volunteered to build the garage under the supervision of one of our engineers. It was a steel structure that used discarded drilling pipes and sheets of corrugated iron at almost no cost to the survey.
>
> Said 2004, 87-88

What served in the late 1960s and 1970s as a garage for prospecting vehicles will become some forty years later one of the world's largest producing gold mines. While the current reports of the Arabian-Nubian Shield (the geological land mass of the Eastern Desert) and Egypt's very recent gold mining ventures seem to suggest an obviously gold-promising landscape, the geological part is just one part. The other is the discursive framing of that geology tied to financial instruments and linked to legal-bureaucratic contexts.

The Sukari Goldmine was re-explored by geologists in the 1990s and according to my interview with a local geologist, it was on the geologists' own initiative that this happened. The Egyptian government including the Mining Authority did not have a gold focus. After the more industrial era and with the market-liberalization of the late 1970s, the Eastern Desert was the mere backdrop of Hosni Mubarak's new tourism industry that started to take shape along the Red Sea coastline. The geologists were however able to enter the field thanks to good governmental connections and also a financial cushion to fall back on since commercial mining ventures rely on years of investments into the scientific work before even having any *bankable* prospects for potential ore reserves. For the Sukari Goldmine, it took 15 years of prospecting and investments before opening up the mine in 2009. During this time, hundreds of experts were employed in the project. The company Centamin was founded to operate the gold mine in Sukari and it is today listed both on the London and the Toronto Stock Exchange. Investing in gold mining stocks, meaning in shares of a gold mining company, is advised by investment-platforms such as *Investopedia* as an easy investment with high profit margins, much higher than investing in gold bullion itself.[68] Investment reports of a mining company like Centamin sound something like the following: "an improved open pit schedule, including

[68] According to Bromberg et al (12 January 2023) on https://www.investopedia.com/articles/economics/09/why-gold-matters.asp accessed on 30 November 2023.

a 40% improvement to LOM strip ratio (6.5x) compared to full year 2022 ("FY22") (10.8x); an increased underground schedule, including a 75% increase in average LOM ore mining rates (1.4Mtpa) compared to FY22 (0.8Mt) … " (Centamin plc 12 October 2023, 1). These are calculations that are done between the geological data, efficiencies of extraction, international gold price and in relation to the scientifically evaluated quality of the ore. To get to this stage, the geologist told me, years of investments went into geological capturing of underground properties. The said geologist works currently on a gold prospecting mission in another area in the Eastern Desert, close to the oil drilling town of Ras Gharib. It is a rather small concession of 140 squarekilometers (much smaller than Sukari) and it is at a much earlier stage, still in the prospecting phase. Now, two years into the research, him and his team of fourteen other experts (amongst which are geologists and GIS specialists) are still working towards a qualitative assessment of the mineralization in the area. As a commercial mining mission, they are not looking for a gold vein per se. Of course, when they find the vein it is a great sign. The same goes for signs for previous mining missions in the area. But these are just one indication of the occurrence of gold in the area. What commercial mining companies want to exploit however is the much larger gold *reserve* which is a large area that contains massive amounts of gold particles, in the form of residue inside the rock and those are outside of the vein. According to a foreign drilling-machine provider, this is where the actual business of gold lies. It is, according to him, however only for "the well-equipped operations have the capacity to capitalize on that"[69]. Once the quality of the geological mineralization is identified, its amount can be estimated through geo-chemical and geo-physical mapping. Between these two stages, hundreds or thousands of samples are being taken (depending of the concession size) with the sample's targeting area becoming more and more concrete as the research progresses. First drilling samples are taken from about 100 metres depth, then 300 metres and later up to two thousand metres. The rent of the drilling machinery is among the most expensive components of the entire exploration process, especially diamond drills which are the preferred option for geologists as these are able to take an underground sample in its intact structure. Reserve Circulation (RC) Drilling is another option but it crushes the rock and thus it gives less information about the rock's structure. Drilling machinery belongs to the specialized tools employed in those commercial

[69] According to an anonymous interview from 15 June 2023.

mining settings and for the Egyptian context those are imported and usually rented from foreign service providers. Drilling samples are sent to independent research labs as part of the external auditing that needs to take place in order to evaluate the quality and the quantity of the gold reserve. The Toronto Stock Exchange for example provides standardized reporting guidelines that the external auditor can follow in order to assess the reserve of the concession; NI 43-101 is such a reporting guideline.[70] Once the report suggests a *scientifically proven reserve*, the mining company can rise financial investments for the further roll-out of the project. Financing can come in the form of either equity shares in the mining company, such as by listing the company on the stock market (like Toronto, for which the above said guidelines have to be followed), or in the form of bank loans/credit. Once the company, opens a line of credit, *the desert becomes asset* because it is the scientifically proven reserve that counts as the collateral for the loan. Should the company not be able to pay the loan back (with interests), the lender takes parts in the physical gold reserve that then can be extracted by another company.

What we see here is that mining as a spatial operation of capitalization within a context of finance acts across the realm of geological discourse of science linked to engineering infrastructures and lab research as well as international financial tools intersecting at the modelling of a *scientifically proven reserve*.

The Sukari case was a success story (to repeat, mining started there in 2009). Because it was such a success, it inspired policy makers to reform the mining sector on a policy level. The new mining law that came into effect in 2019, aims to attract and streamline capital-entry into the mining sector. When the Golden Triangle was announced as a Special Economic Zone (it was legally enforced in 2017), it made large segments of the Eastern Desert into a high-priority investment area. First gold mining concession bidding rounds did not attract investors and industry-players failed to participate in the first rounds in 2017. So, in March 2018, the Ministry of Petroleum and Mineral Resources hired the UK-based consulting firm Wood Mackenzie for advising on how to reform the sector (according Lynx Egypt[71]). In August 2019,

[70] As referred to me by the mining geologist on 5 December 2023. This is what this reporting guideline looks like *National Instrument 43-101* published at https://mrmr.cim.org/media/1017/national-instrument-43-101.pdf, accessed on 5 December 2023.

[71] https://www.lynxegypt.com/assets/pdfs/LYNX-Business-Bulletin-law.pdf accessed on 3 December 2023.

the new mining law was adopted. The law changed the approach from partnership agreements between the mining company and the government (which was first installed in the Nasser years in 1956 and had prevailed since), to fully privately-run ventures. Now, companies rent desert land for the time of their concession and they do not have to form a separate company together with the governmental entity for the time of the concession. The reformed mining law also allows to expand the duration of the concession more easily and beyond the before-set threshold of two years. The law also states that no new exploration licence has to be issued in case of an unlicensed ore being mixed-in with a licenced one. Some other amendments were made with the law that make the sector more private-sector driven, to minimize bureaucratic hiccups. Companies are at the same time benefitting from other investor-benefits from Special Economic Zone which provide logistical infrastructures for example. Since 2020, the Ministry of Petroleum, Mining and Mineral Resources runs new bidding rounds for gold prospecting concessions practically on an annual basis and now with more success. Since 2020, a few hundred concessions have been allocated. In 2022, the minister, Tarek El Molla, even announced to have approved Egypt's first official gold refinery to be built in Marsa 'Allam.

How does now this investment-environment concretely materialize on the ground? How does it affect the mining process? As the drilling specialist told me, mining in Egypt is *messy*. At the time of the conversation, in summer 2023, this interlocutor was working in two different areas in the Eastern Desert; one right inside the desert, west of the diving resort town Marsa 'Allam, and another inside the military-zone of the Halayeb-Shalateen Triangle. He told me with promise to full anonymity the following:

> The Shalateen site is about 25 kilometres into the desert from the town of Shalateen. It is very close to the Sudanese border. The mining company has set up a more permanent camp with generators that work the freezers for food supplies. Then, more short-term, smaller camps are setup if a site is 50 or 80 kilometres away from the main camp (or further). The workers on the mine now work on a two month on and one month off rotation. It used to be three months of work and 1 month off before but the workers were going crazy. It is too much. In the field, they sleep in tents.
>
> *Vanessa: Do you ever get bored there?*
>
> No, I'm too busy for that. It is a very remote, isolated area but there is too much to do to get bored. Getting [drilling] machinery into the triangle, from Shalateen, is extremely difficult and annoying. Sometimes we have to wait at the checkpoint for no

> raison – because the guy, some general, who makes the phone call to check about the licences, is taking a nap. The bureaucracy is the biggest challenge here and it is the most complicated bureaucracy that I have ever had to deal with. In no other country has it been so difficult to do the job – it is contradictory and non-sense. In terms of the "politics", Egypt is the worst country I have ever worked in. And I have worked in countries like Sierra Leone, Mali, Guinea, Brazil…
>
> In the Triangle, there are military watch towers everywhere. You don't see a border to Sudan, just the area where there are no more towers, that is Sudan. You cannot drive at night through the area. They will shoot you. Especially with the war in Sudan, it has gotten very tense in the area. They don't let you passed the checkpoint after 3pm because you wouldn't make it to the camp in the daylight.
> The area is full with things like gold, copper, zinc, silica. It's all there. But they each require a different process. The most financially economical is gold and that is why gold mining is really booming now.
>
> There are illegal/artisanal mines everywhere. I have never seen anything like it. Nowhere else is the illegal mining industry so massive. In the desert it is everywhere and right behind the touristic areas on the coast. Huge artisanal mining operations, large fields dug out: 50m deep, 100m long, 80m wide. A lot of the people are Sudanese working in the mines. If you approach, the workers shoot in the air, for the others to leave – as an alarm system. Usually right outside the mine are dozens of large dump trucks, about 15 trucks per field. It is all so visible and obvious, impossible for the authorities not to know about it.

He shows me a video on his phone of an open-pit artisanal mine and it does look massive with dumper trucks right outside the pit. On Youtube and Tiktok, young Egyptian artisanal miners are posting similar videos from their mining operations inside the Eastern Desert[72]. They show how they work with metal detectors and small detonation devices, for instance in an area nearby Aswan called Wadi Allaqi (a gold mining region that also William Hume had mentioned in his lecture in the 1920s). In one of those videos, you see the young men using an electric drill connected to a generator, making a hole in the ground and inserting black powder manually, tossing it inside. The fuse for the detonation is maybe three meters long. The small explosion makes a whole of about one and half metres depth and dust and rubble is spread over the area. A small fan, also connected to the generator, blows some of the dust from the eruption away from the miners. In other videos, you see that also the artisanal mining is using some more heavy machinery like diggers.

[72] *Tariqat tafjir euruq aldhahab walabyar* (How to blast gold veins and wells) https://www.youtube.com/watch?v=xuvgU8dN2Ck&t=12s accessed 30 November 2023.

Everyone that I spoke with on the artisanal mining in the Eastern Desert confirmed that at the same time that companies like Centamin entered the area for the commercial exploration of gold, also unofficial mining started to grow quickly and it seems as if they are in a somewhat symbiotic relationship. Mining companies benefit from the local miner's explorations and discoveries. The involvement of the local authorities in those mining schemes can only be speculated about. But as the drilling expert said because of the very visible nature of the open-pit mines, the mountains of tailings on their sides and their sheer scale of the operation as well as the use of large trucks and machinery – that have to come into the area necessarily from the official roads – it is impossible for them not to be in-the-know about it, surely benefitting well from these ventures. While the investment-narrative around gold in Egypt suggests that this industry is located in a specific area of the Eastern Desert and run by corporates, the reality looks quite different. Concessions for prospecting are allocated for sites all over the Eastern Desert, including the militarily closed off Triangle. Formal and informal mining work side by side. From my conversation with the local sheikh, I know that Bedouin communities are involved in the local industry but his discomfort with telling me more about it, hints towards them acting a grey zone where beneficial relationships with some mining companies can also quickly turn against them. Here the commercial and the informal, the illegal and legal are part of the same process. It benefits those that can enjoy the financial and political securities supported by legal and financial instruments that rely on a discourse of science while also benefitting from the insecurities of others. It is further this proliferation of economic and financial interests into those desert areas that re-enforce a heightened securitization of these sites. This further happens at the expense of the physical integrity and protection of local, informal labour particularly who are involved in the informal mining sector as well as the protection of land of the local Bedouin communities. Behind the elusive securitization of those desert areas, big business is happening that is – at least one can assume – very lucrative for some while extremely unsafe for others.

From environmental and health assessment reports that were done on gold mining in the Eastern Desert, specifically focussing on the Sukari Goldmine, we know about the potential health and environmental implications of open-pit and underground mining in this geographical area. A study conducted in 2020 attests that the so-called *modern* Goldmine at Sukari uses cyanidation in the gold processing which happens on-site. Cyanide is according to the researchers "one of the most hazardous contaminants associated with precious metal

mines and has been on the priority list of hazardous contamination since 1995" (Abdelaal et al 2020, 2). The study found that the tailings storage facility pond which is a large dump leach pond was built right outside of the mine. The pond lies directly on top of a fractured groundwater aquifer and because of the geological structure of the ground, the research assessed, that leakages occur and that these affecting the groundwater body. Their final evaluation says that "This study provides evidence for downward leakage of cyanide-rich wastewater through tears in the bottom liner of the TSF [tailings storage facility] pond into the fractured groundwater aquifer north of the pond, allowing release and northward transportation of cyanide contamination within this aquifer" (Abdelaal et al 2020, 14). The World Health Organization attests that exposure to cyanide through drinking water or food can lead to metabolic disfunction which results in weight loss and can also on a chronic level affect the nervous system (World Health Organization 2003). This area of the Eastern Desert is not uninhabited. There are Bedouin groups of the Ma'aza and also Ababda and Basheira Bedouins that reside in seasonal variation throughout the area. Further, the growing tourism industry along the Red Sea coast also relies primarily on desalination from brackish mountain water which it sources from the mountain wells. Potential links should be further assessed. For the growing artisanal mining sector health implication and risks with regards to miners' physical safety are further happening on multiple levels. Those are for instance linked to the direct exposure to the tailings' dust during the extraction process. The processing of the ore often happens in Nile Valley regions such as in the Valley-town of Edfu. Another recent study (containing some of the same researchers of the above-listed research) on mercury and methylmercury contamination linked to the artisanal processing and refining of gold residue done in Edfu uses remote sensing imagery and hydrogeological analysis of Nile surface- and groundwater. This study found 130 active gold tailings ponds in the research period (that is not clearly dated but from the information given in the text it was around the 2021/2022). The study says further:

> The hydrogeological investigations suggest that amalgamation-tailing ponds represent a major source of contamination in the study area. The ponds are either unlined, above-ground pools structures with permeable soil foundation in the lowlands, or sinkholes excavated in highly fractured carbonates over the plateau. They discharge into and contaminate nearby, croplands and irrigation and drainage canals, where the THg concentration could reach up to 210 ng/L, exceeding by as much as 17 times the standard (12 ng/L) recommended by the US EPA [Environmental Protection Agency]…

Abdelaal et al 2023, 52529

The researchers further state that long-term exposure to even low-level mercury can cause neuropsychiatric symptoms like memory loss and methylmercury can lead to neurological diseases (5215) and those did not even account for the effects of direct exposure from the mercury vapours through inhalation which are can severely affect neurological and immune systems.

The price of the gold is a high price to pay, again for the many, not the few. We can see in what is laid out above that the effects of the capitalization of local desert sites are again of an interscalar nature. Mining in Egypt thrives on the uncertainties and disposability – to follow Hecht's vocabulary – of some people and some places as *inhuman* sites, to speak with Yusoff. For the particular case of Egypt and as detailed above on the case of Egypt's gold mining sector in the Eastern Desert, we can add to Hecht's and Yusoff's work that these industries benefit from and contribute to the intensified securitization of current and potential future extraction sites. This has colonial/imperial roots and further proliferates in the contemporary era. It benefits governmental actors such as those belonging to the security apparatus who can operate largely hidden from view, outside the reach of civilian access and oversight. Extractive-industries' desert sites are theirs for grabs, in a marriage of convenience between them and capital-actors backed by scientific tools and financial instruments.

3. (A) New Desert Capital

3.1. Error of Scale

Many urban construction projects in Egypt start with the building of a mosque and/or a church. The construction of a religious building takes on many roles for the surrounding urban context. One of those roles is to function as a good blessing for a newly built area and another one is to claim (access to) space. Because even if built without a licence – which is often the case – it is almost impossible to tear a place of worship down. In a 2022 exhibition, artist and architect Manar Moursi, displayed in films and performances under the title *The Loudspeaker and the Tower* some of the many dynamics at play around the construction of religious sites along Cairo's Ring Road, one of the city's main infrastructural arteries. Part of the exhibition is the film *Stairway to Heaven*. It starts with the following lines:

> A 72km ring road wraps around the city of Cairo like a slithering snake, a dam. Intended as a wall, a ring road was built to defend the city from itself, from the crawling, sprawling growth. Outside of its parameter affordable accommodation and basic services are not always available. To resolve this, some residents have devised innovative solutions…
>
> Moursi 2019 (film)[73]

The artist shows from a series of viewpoints – seen from the architect, the builder, the *muezzin*, the farmer but also from bricks, land, electric lights and the ring road itself –, how the construction of mosques in these highly contested urban sites is entangled into political and social structures; not at least through the symbolic but also infrastructural value that both mosques and churches carry. Moursi shows how religious buildings function as architectural apparati that install/enact political authority into the urban site (here she brings for instance the case of the Egyptian state aiming to unifying the prayer text across the country) but at the same time, the very built-up structure allows for illegal, self-built urban areas to hack themselves into the infrastructural network of the city, gaining access to roads, electricity and water networks through the mosque. Mosques in Moursi's work have thus a hybrid function. They both act as medium of official, dominant narrative and power structures as well as the

[73] Quote from film *Stairway to Heaven* displayed as part of the exhibition *The Loudspeaker and the Tower* by Manar Moursi at Trinity Square Video, Toronto, Canada (3 May 2019 - 8 June 2019) and College Art Galleries, University of Saskatchewan Saskatoon, Canada (18 September 2020 - 19 December 2020). The film was lent to me by the artist for consultation on 12 August 2023.

subversion thereof, namely as a short-cut for securing amenities and access to limited public goods.

In other urban context, for instance in those of new government-built desert cities, the role of these spaces of worship differs from those shown by Moursi. However, their construction and their *architectural performance* is equally embedded into a mix of symbolic power, infrastructures and the built environment.

In 2017, the Egyptian government started with the construction of its largest urban project to date, a brand new capital city, aimed at hosting over six million Egyptians and becoming the new centre of state power. The very first buildings erected on the new capital site were of course a mosque and a church. Their construction began in June 2017 and construction was finished, according to public statements, *in record time* after just eighteen months. The timing and speed of construction play a significant role within the *performance* of creating this new desert city. Not only, were these two first important buildings meant to be finished fast (and before the day of Coptic Christmas, chosen as meaningful date to inaugurate them) but they were also designed to be monumental in size. Al Fattah Al Aleem Mosque (its name making a direct reference to the current Egyptian president, Abdel Fattah el Sisi, also the main initiator of the new capital city), was supposed to be the largest on the planet, after Mecca. And the new magnified place of worship for Egypt's Coptic orthodox Christians, the Cathedral of the Nativity of Christ, is dubbed to be the largest church in the Middle East. Superlatives are part of the performance whether it is in size/scale or in time. Both church and mosque are part of phase one (out of three phases) of the flagship project of Egypt's currently ruling regime. Their fast-tracked design and execution were thus crucial for starting off the mega-urban project right. With Egypt, being a predominantly Muslim country, the mosque had to demonstrate this as an architectural medium through the means of scale. It was not necessarily meant to be larger than the church but definitely not smaller. Both buildings were therefore designed of the same size on about 450,000 squaremeter land mass. But while the mosque is indeed one of the largest of its kind, what planners and client only realized upon inauguration, as they physically came to visit the new capital site, is that the grand structure of the mosque is practically *sunken*, *swallowed* by the surrounding landscape. The choice of location did make sense for planners from the point of view of the two-dimensional map. Seen from a bird's eye

perspective, the mosque lies conveniently at one of the infrastructural entry points into the new city. When arriving from Cairo it was one of the first things visitors were meant to notice. The mosque is located at the edge of Greater Cairo's Middle Ring Road as well as a on highway connection between the new capital and New Cairo (one of the large suburban extensions of Cairo built under the previous regime and an area of Cairo that, similar to the new capital, is targeted towards upper-middle and upper-class segments of society). But its location is also, and that is more inconvenient, within a land depression. What planners did not take into consideration was the site's topography and the strong symbolic effect that this topography would create upon the mosque's *architectural performance* played out on the means of scale, especially in reference to the new grand church. While Al-Fattah Al-Aleem Mosque lies in within a lower part of the new city, the new church, was built on a hill. The desert east of Cairo, is characterized by *wadis*, limestone plateaus and mountains, and in this case, it was this topography that hacked itself into the performance of the two symbolically important sites. Because looking from the ground, taken from the embodied experience of a visitor to the new capital, the church is omnipresent in the city's landscape whereas the mosque remains hidden. The symbolism entrenched into the visibility-invisibility of these two critical buildings within the embodied experience of space and the performance of scale showed major planning faults; *an error of scale* if you like. As a consequence of this *scalar-error* of the *sunken* mosque and the *omnipresent* church, one year later, another, even bigger mosque was built in the new capital. This time, elevated, built on top of an Islamic Cultural Centre, with a staircase leading up to it. This even larger mosque was finished in 2022 and named *Masjid Masr Al Kabeer* (Egypt's Grand Mosque).[74]

In this chapter, I want to put the focus on the construction of new towns in Egypt's deserts. The case of the church and mosque(s) in Egypt's new administrative capital showcases a number of elements of desert urbanization that will be sketched in detail throughout the following paragraphs. Those include the design of those sites and their specific characteristics as sites that take shape in the country's state-claimed arid territories. It also includes, how this design may be affected by a discursive setting being part of a legal-administrative

[74] This anecdote follows an observation made by an anonymous research interlocutor who worked as a lead planner for phase two and three of the New Capital (interview conducted on 7 July 2023).

organization of desertscapes in an age of finance. Building new cities into the desert has taken on new heights during the Sisi-rule that started in 2014. In the fiscal year 2017/2018 an overwhelming 80 percent of all public investments in the housing sector went into new desert towns while during the same time only two percent of the population (of about one hundred million people) lived in those towns (CAPMAS 2019). But building new cities in the desert is not a new invention of the Sisi-administration. According to urban analysist David Sims, no less than forty-five new cities – or at least new urban development projects - had been built onto desert territories in Egypt since the late 1970s (Sims 2022a, 28) which is when the government's new town programme started, particularly targeting construction on arid areas. Timothy Mitchell, commenting on Sims' work, noted that "Egypt led the world in the number of new cities it attempted to build in the second half of the twentieth century" (Mitchell foreword to Sims 2018, xx). Next to massive public spendings, also millions and millions of tonnes of cement, concrete and steel have been deployed in these projects for the provision of housing, infrastructures and utilities. In 2018, Egypt was the fifth ranked producer of cement worldwide and since that date production capacity has grown even further (from 81 Mt in 2018 to 84.5Mt in 2021[75]). At the 2015 Economic Development Conference in Sharm El Sheikh, president Sisi announced the construction of a number of new mega-cities across Egypt's arid lands. Those include a new Mediterranean seaside town called New Alamein, a new urban centre overlooking the Red Sea with the name of New Galala City as well as the New Administrative Capital; all planned to accommodate a population in the millions – each. The military government under president Sisi followed thus into the footsteps of previous Egyptian post-monarchy rulers. Now, new compounds and entire new cities are orbiting the Greater Cairo Region, multiplying the size of the Cairo metropolitan area[76], especially thanks to the government-built desert cities to the east and to the west of the capital. Also twin-cities along the threshold of the Nile Basin and seaside resort towns on the country's coastlines are giving the desert's edge a new urbanized layout. With most of Egypt's agricultural areas being privately owned, often in small land holdings of a few feddan, it seems like an obvious choice to do larger-scale planned construction on the desert's edge, close to existing urban and provincial regions. But also the construction of new urban sites onto state-

[75] 2018 numbers are derived from Taib 2021 and the 2021 numbers are from Zaazaa 2022.
[76] See tables 1 and 2 provided in Sims 2022a.

claimed arid sites shows specific characteristics and we can ask, how this form of planning and development enabled specific actors to gain access to those landscapes and how those in turn have shaped these desert sites according to their own liking or their own missions and desires.

Within the Egyptian academic context, the currently quite active scholarly debate on desert towns has highlighted how a series of governmental plans supported by international and multi-lateral development actors has materialized in an urban form for mass-scale construction projects in the desert following means of standardization (Sims 2018, Denis 2018). Desert cities are frequently described as *ghost towns* and sites where on the *blank canvas* of an *empty* and *abundant* desert new visions of urban planning and society are designed and built from scratch. Little of the research has addressed the questions of the material means – including access to water – upon which new town schemes rely? What we find within the existing academic landscape is a strong focus on reviewing these projects seen from the Nile. New towns are often being opposed or reviewed in reference to other urban forms that are appearing across the Nile regions. For example, architect and urban analyst Mohamed Elshahed's says that:

> The poor urban management of Cairo since the 1970s, paired with enormous population growth – due in large part to internal migration of residents from other cities in Egypt seeking a better life – has resulted in two dichotomous urban forms. The first is the informality that encircles and often punctuates the historic/planned city… The second result has been heavy investment in desert-city development, enabled by redirecting major portions of infrastructural spending. These trends are two sides of the same coin, and they reflect the deep inequalities in post-Nasser Egyptian society and its economy.
>
> Elshahed 2018, 391

What Elshahed observes is of course correct and it helps to grasp within the Egyptian (or Cairene) context, how housing has evolved in a dichotomous path between resident-driven planning and construction on the one hand and state-driven planning and construction on the other. These two construction drivers build in very different geographies and they result in different built forms. One is happening largely on privately-owned agricultural areas and those are usually informal and thus illegal construction projects that exist within a setting of uncertainty (and that can be demolished at any time). The other is state-driven and -enabled construction of often large-scale projects that take place on state-claimed desert terrain. The current research has made important advancements for showing that in response to the

inadequacies of those newly built desert sites, informal construction is on the rise in supplying affordable and more suitable solutions towards existing housing needs (see also Shawkat 2020). In this way, this research has been able to confront the planned housing sector with itself, demonstrating the wasting of public spendings for projects that the majority of urban dwellers do not need or do not benefit from while at the same time suffering from persistent uncertainty and insecurity in fear of demolition of self-built housing solutions. These are important findings and I would like to further add to these an additional perspective, namely that I want to look at desert towns as one of the means in which the desert is being capitalized. To stay within this framework and in order to myself capitalize on what has been laid out before, I will put the conception, design and construction of desert cities in Egypt into their concrete material-discursive context. This means to first understand some of the rationales and tools of town planning in an arid setting and how desert cities were conceived in the first place. So, the question is: Why and where did desert towns start to appear? I can then further ask: How does this relate to other means (discussed in previous chapters) to capitalize on the country's arid terrains? Finally, I discuss, what informs the concept, design and implementation of desert cities in Egypt today and how do they leave their mark onto the socionature lifeworlds of the web of life that they are embedded in?

To remain within the by-now established flow of the overall dissertation, I first apply a historical-focused lens, followed up by contemporary observations made on the base of fieldwork. As a reminder, I will look at desert cities as one of the means of the capitalizing of the desert in Egypt, my overall subject. Here the idea of *capitalizing the desert* has a nice *double-entendre* because it is also in desert regions that new capital cities are being planned and realized. The New Administrative Capital is such a project and it will be looked at in detail in the fieldwork-informed subsection. But as we will see in the paragraphs below, even this project is built in reference to other previous models of new capitals and new desert towns that have appeared in Egypt's deserts before. We will also see below, where the material and discursive roots of desert town construction lie in the country. I will again look at the nineteenth century first, where I found that desert cities were already built that have a daunting resemblance to those contemporary schemes of the financial era (and they also differ in some ways). Then I will delve into the fieldwork that I did for this segment on the case of planning and designing Egypt's New Administrative Capital. Here I spoke with three

different architectural offices all involved in different capacities in the planning of the New Capital project. I also shadowed a construction-supervisor of an earth moving company on the new capital site and learned from him about the local topography, ground laying works and utility infrastructures.

My proposition for the argument of this chapter is the following: I suggest that looking at how new cities were designed and built into the country's desert thresholds since the mid-nineteenth century (and not just since the 1970s!), we see some specific elements that characterize those town developments as those sites morph to become strategic areas for the economy. We will encounter financial structures of building and managing those newly erected sites within a context of colonial administration. Those have further given a specific urban form to those areas. I want to suggest that those early built-from-the-map desert towns of the mid nineteenth till early twentieth century are somewhat of a precursor of later desert developments of the liberal market age of the past forty years. (In the meantime) In the post-1952 decades, we see the desert thresholds of the Nile taking up a new role with regards to housing and construction. Now, desert developments are an important part of the *productive horizontal expansion* of the Nile Delta as a *technosphere crescent of development*. (Here a lot of the vocabulary that was laid out in the land reclamation-chapter in reference to the work of Aihwa Ong will be re-activated.) At the same time, desert settlements function as spaces to test out and mould different social and economic models, where they constitute an important vector for a newly building national-discourse/identity. Finally, I demonstrate that since the 1980s, it was together with the institutionalization of the desert as a governmental asset, the rise of the local construction sector and a new stratum of society (the builder-developer) as well as the coming up of new spatial solutions for the era of finance (not just in Egypt) in the form of the zoning of spaces that Egypt's desert town construction starts to explode (in a figurative sense). Now, ever more spectacular spaces are being designed and sold on an investment map. Here I want to make an important claim, saying that in terms of their administration and legal constitution, these new desert town developments operate more as detached, separate units that are seemingly uprooted from the immediate context that they are built in. But looking at the metabolic configuration of these sites, we find that they are still very much part of Nile technosphere developments and as such they also affect the immediate and wider ecosystem in consequential ways. This is what I describe with the

term of the *desert as real estate space*. Here, the function of housing is almost like a by-product of the overall sales pitch. In the *desert as real estate space*, we also find private schools and military hospitals, free zones and touristic resorts. The *desert as real estate space* is both *part of and apart from* the scociometablic context that it is built into and in this way, it re-incarnates early desert town developments of the previous century. What this means concretely is that while those newly conceived sites are built into a specific socionature context – benefitting from *cheap* resources, *cheap* labour etcetera – they also rely on being detached from their immediate surrounding, relying on separate realm of jurisdiction and governance for example. These forms of administration make believe that these new desert towns are independent units which veils the fact that the ever-growing resorts, compounds and cities are still part of a desert ecosystem and that they are affecting those ecosystems. In my concluding remarks, I will argue that the model of the *desert as real estate space*, that was fundamentally conceived in the housing and tourism sector, has because of its success further mutated and proliferated into other realms – including agriculture and mining – thus becoming the spatial matrix of Egypt's desert capitalization. It operates through a productive encampment that grounds and uproots at the same, acting as a part of and apart from the material-discursive realm of the country's desert and it is an emblem of the new financial era of selling Egypt off the map.

Throughout the chapter, we will see how previously laid oud elements (throughout the dissertation) of desert capitalization also happen within the realm of housing and construction and in some cases, it is even the growth of the latter sectors that influenced desert development strategies at large. The desert as a laboratory (of science and socio-economic models) plays an important role here and also the desert as an *inhuman wasteland*, which I evoked in previous chapters. In some ways, with this chapter, I am able to also fill in some less discussed segments such as the transition from the Nasser socialist years to the liberal reform era and how this transition materialized concretely. So far in the text, I have not given the deserved attention to the important 1970s, 1980s and 1990s and this chapter is a great opportunity to do so because it is in those decades that housing and construction take off in the modern era and the path towards the financialization of the desert is being paved.

3.2. Desert Cities before Desert Cities

There were desert cities in Egypt before there were desert cities. What I mean with that is that building in the desert predates the last quarter of the twentieth century which is when the government went very strategically into the construction of cities onto state-claimed arid sites. In the nineteenth century there were port-towns and guard outposts in places such as Marsa Matruh on the Mediterranean or Safaga and Qusseir on the Red Sea that have the character of a desert settlement and that had a certain independence from the Nile for most of their actually long history. Marsa Matruh for instance (literally, remote anchorage) looks back at an over two-thousand-year long history (Cole & Altorki 1998). The town that lies about 350 kilometres west from Alexandria contained at the turn from the nineteenth to the twentieth century, according to the anthropologists Cole and Altorki, a few hundred people, mostly Bedouins of the Awlad ‘Ali and the Jumia‘at tribes, a Sanusiya lodge (the Sanusiya are a religious movement established in Libya in the nineteenth century), and a considerable amount of seasonal Greek sponge fishermen were residing in the town over the summer (Ellis 2018, 87). At the time of a forming nation-state, sea-side towns and oases dwellings fulfilled the functions of administrative and security-related outposts that were governed out of separate Nile Valley and Delta regions (until 1912) and also from within their own realms and as we know from the work of Matthew Ellis for the modern history of the Western Desert. Those sites enjoyed relative independence from the Nile-administration and Nile-life as sites of *legal* (and administrative) *exceptionalism* (Ellis 2018).

Towns and newly forming provincial centres started to take shape in the Nile regions from the 1870s onwards. Cairo and Alexandria however kept a dominant position (Sims 2022b). At the same time, we find the occurrence of what we can call Egypt’s first desert towns which are the Canal towns and the new desert satellite extensions of Cairo and also in Alexandria. Since the mid-nineteenth century, the Nile Delta’s edge is being altered through infrastructural and discursive means (hydro-infrastructures, transportation, cadastral mapping and taxation) and those will also influence the occurrence and design of desert settlements along the riparian edge of the Delta. What we see here, is that new towns are being built into arid sites within a context of a techno-political expansion of the productive Nile Basin, especially along the thresholds of the Nile Delta. Besides, those newly built sites show specific discursive (legal-bureaucratic) characteristics. Using the wordings of Aihwa Ong

(2020), we can refer here to this as a form of an *expansive territorialization* as a technosphere of development. As the interface between water and land is being re-negotiated along calculated measures of productivity and predictability (as discussed at length in the first chapter), new settlements are being designed and constructed on the drawing boards and there are being shaped by specific actors in specific ways.

These new towns include for instance the Canal Towns built along the new Suez Canal. Let us first look at these. They include Port Said, Ismailia and Suez. The Suez Canal was built between 1859 and 1869 under Egyptian-Ottoman ruler Khedive Ismail. Its construction took place within a context of colonial administration, primary employment of foreign engineers and construction companies, European debt-financing mechanisms and Egyptian peasants employed as forced labour. The canal is one of the world's main built waterways and it also initiated the construction of new built from scratch cities on desert land: Port Said, on the northern, Mediterranean-end of the canal; Ismailia, in the middle of the canal and Port Tewfik on the southern, Red Sea end of the canal. These are newly built as company towns for the *Compagnie Universelle du Canal Maritime de Suez* (known in English as the Suez Company). The already existing town of Suez (on the Red Sea side of the canal) grew dramatically in size as a result of the construction of the canal. The Suez Company is a joint-stock company that was established in 1858 by Ferdinand de Lesseps to build, maintain and operate the canal that connects the Mediterranean to the Red Sea. For the construction of the Suez Canal, Laleh Khalili working on maritime trade routes, pinpoints the following: "The canal was a site of technological experimentation and innovation and an exemplar of capitalist infrastructural power and colonial expansion" (Khalili 2020, 40). Khalili underlines the important role played by the administrative form of the joint stock company that according to her was just as important for the configuration of the colonial site as was the construction of physical infrastructures (ibid). The Suez Company enjoyed numerous benefits and existed practically apart from the Egyptian legal-bureaucratic context. The company was given exclusive rights to the canal for 99 years granted by *firman* from 1854 from Khedive Said Pasha. It was exempt from paying customs on the import of materials required for the construction work and also the land for construction spanning 133,000 hectors was gifted to the Suez Company (Bonin 2010). About half this area was meant from the start to be reclaimed through the newly laid

out freshwater canals and those new agricultural sites were exempt from tax. Further, the reclaimed arears were not to be returned after the 99 years (ibid).

> The originality of the company came from its statutes: it had been conceived as a joint-stock company at a time when such statutes did not still exist in Egypt, which explained that it referred to French law; its legal basis was in Alexandria, but its managerial and financial headquarters in Paris – where was located the chief executive officer. Committees in London and Paris ruled over the relationships with maritime companies. The 1888 Agreement about the neutrality of the canal had added to the non-Egyptian embeddedness of the Company, thereafter involved in some kind of a "universal" over-look.
> Anyway, for day to day life, the Suez Canal Company enjoyed great autonomy in Egypt. Thanks to its financial dimension, to its key economic role, to its technical and engineering might and expertise, it was able to exert, in the same measure as other European rival "powers", some actual influence at the khedive's court, then to be an influent stake-holder of discussions with the authorities about economic life of the country.
>
> Ibid

During the construction of the canal, the Suez Company realized quickly the need to build accommodation for administration, management and the overseeing of the construction as well as to house workers and to store materials (Piatons 2012). Port Said and Ismailia were built for those purposes in 1859 and 1862 respectively and they served as French company towns until incorporated into Egyptian common law in 1869. The two towns as well as the previously existing town of Suez are all located on the western side of the canal and this choice of site is critical. Because, while the canal did give water access to these newly established towns and while it was crucial for them to be conceived in the first place, it was the linkage to the fresh water canals coming the Nile Delta that supplied the cities with water and allowed for their sustenance. A major new fresh water canal was being dug by *corvée* labour between the Nile Delta town of Zagazig towards Lake Timsah where the town of Ismailia was being established. The Ismailia Canal's construction lasted from 1861-1863. Along those new fresh water canals, like the Ismailia Canal, land reclamation projects started to appear over the years successively expanding the Delta eastwards towards the canal towns. Port Said with its location at the doorstep to the Mediterranean became a town of commerce and trade. Ismailia laying at the centre of the canal, was meant to oversee construction and house the canal administration; it was the home to the headquarters of the Suez Company and later the Suez Canal Authority. Suez, once a transit point for the religious pilgrimage to Mecca – on the other side of the Red Sea – became an industrial centre for the

local oil production (Bayoumi and Bennafla 2023). The urban layout of these cities corresponds to the hygiene, conformity and colonial ideology-informed planning approaches at the time as they are being planned and sketched out on the map: zoning and geometrical layout, hygiene through ventilation and public spaces, segregation between the European expat community and Egyptian workers. “The plans adopted grid layout pattern from military engineering, but without walling off the compounds. Like other company towns, however, communities were segregated by ‘race.’ Housing and community services for European managers and workers were separated from the “Arab village” for Egyptian labourers by the garages for heavy machinery” (Piaton 2012). Most of the construction and supply of building materials for the new towns was done through sub-contractual appointments to European firms, many of them based in Egypt and working with a local workforce. Focus of the town construction process was, according to Piaton, rather to be pragmatic and cost-efficient and not to be architecturally avant-garde but to satisfy the Suez Company’s shareholders (ibid).

The three towns along the canal – Port Said, Ismailia and Suez – are emblems of the infrastructural expansion of productive Nile regions at the time. Yet, they are also remnants of the colonial design of space of private company towns under ownership and conception of European firms (banks and construction firms). So while these new towns are embedded into the expansion of the Nile Delta’s political-ecology, they are also distinct from it by means of belonging to separate realm of administration and jurisdiction. Here, an investor-friendly context was created that benefits foreign shareholders on the base of *cheap* (or free) resources and labour, belonging to an extra-jurisdictional and extra-administrative realm – uprooted from the local discursive context –, creating a planned environment on the drawing boards that is both *part of and apart from* the Egyptian context that it is built in.

Similar developments, we start to see appearing towards the turn of the century in a time of British military occupation and under foreign bureaucratic leadership in Egypt. Now, in addition to the canal towns, a number of planned desert settlements start to appear in the direct periphery of Cairo and also in Alexandria. They are also part of the colonial town planning that is at the same time is *part of and apart* from the expansion of the Delta as a productive site of the economy. See for example the urban area of Heliopolis. It is today a neighbourhood of Cairo but it was first built in 1905 as a desert enclave outside of the existing city contours close to Cairo’s ‘Abbasaya district and connected to it by a new electric railway line. The area was even built be the very owner of the streetcar company and construction

finished in 1930. Funding came from foreign private individuals and European banks (Angélil et al 2018, 63). Cairo Electric Railway and the Heliopolis Oases Company developed a "resort-like district appealing both to the foreign and local bourgeoisie with leisure facilities such as a Palace Hotel (today presidential palace), a racetrack, and an amusement park, around which the entire urban structure was organized" (ibid). Similar to the canal towns, also Heliopolis applied a segregated town-planning approach for European expats on the hand and locales on the other. During the same years, also the Cairo suburb of Maadi (developed by the Egyptian Delta Land and Investment Company, DeVries 2021) and the khedival spa town of Helwan are being developed by expat-owned companies and through new transport extensions (foremost the railroad). Helwan was used as a thermal bath that equally followed the hygiene and segregation standards of colonial town planning of that time period.

Also at the beginning of the twentieth century, mining and drilling sites start to take up speed and European companies build towns to house foreign and local workers. Those are located on the Gulf of Suez and along the Red Sea, such as in Ras Gharib, Hurghada, Qusseir and Safaga. To give one example, the phosphate mining town of Qusseir (which I also looked at in the mining chapter) is fully owned first by the Italian *Banco di Roma* until:

> World War I brought major interruptions but with fresh capital and a partial change of ownership, mining and production in el-Quseir continued. In 1927, all company shares were transferred to the Italian State Treasury, effectively resulting in the first (Italian) nationalization of the company. The Egyptian government cooperated with the company to construct a railway linkage to Qena on the Nile. A branch office of the Italian Fascist Party and several recreational facilities were installed as well.
>
> Damir et al 2023, 69

The company town had employee dwellings at the waterfront arranged in rows for the Egyptian workers and separate accommodation for the Italians. Even in the actual mining sites inside the Red Sea hills, accommodation between locals and foreigners was separate. The town also had a Franciscan church and a company cemetery. In the early twentieth century, the company employed about 2000 workers, out of which were about 100 Italians and according to the research by Mirhan Damir, Martin Meyer and Hellen Aziz, to increase the communication-ability between the few Italians and the many Egyptians, the Egyptian workers learned Italian in the local school after working hours (75).

In the second half of the nineteenth century and up until the early twentieth century, desert settlements are majorly conceived and designed by expat businessmen and foreign investors. This is also a time of town-planning based on the bird's eye view from the map where algorithmic forms of town planning are integrated into racist discourses and into a context of operationalized work and physical hygiene. While usually integrated or at least reliant on Nile ecologies (such as fresh water) and cheap local labour, they also benefit from a privileged role within the local legal-bureaucratic systems. So these spaces are at the same time part of and apart from the material-discursive settings that they are built in. The construction and productiveness of these sites is facilitated by governmental planning that is led by the British military occupation (and before the military occupation), suppling both physical and discursive infrastructures in their support. The desert towns of those decades have some strong resemblance with desert cities that are going to take shape with the wake of the liberal capital-driven age of the past forty years. Maybe they can be understood as precursors of those later town developments of the *desert as real estate space* or as places that laid the effective foundation for those later schemes.

For the war and inter-war periods we find less investments in large scale infrastructures and planning but a growth in industrial sites in the form of large factory buildings and utility complexes as well as sites meant for the housing of a growing professional class (Bodenstein 2010). These are foremost located within existing provincial and urban areas such as in Cairo and in Alexandria (as well as in provincial centres) (ibid). Desert construction, for instance with regards to housing, is going to play a critical role for the post-monarchy regime under Abdel Nasser.

During the Nasser years in the post-revolutionary moments of a newly fully independent Egyptian nation-state, new desert settlements are an integral component of agrarian reform plans and infrastructural expansions. I already explored earlier, how new land reclamation schemes that started to appear first on the western side of the Nile Delta, such as the Tahrir Scheme of 1953 with its model villages were meant as an opportunity to experiment with and model a newly shaping national discourse as well as new socio-economic lifestyles. Those schemes also came with a very specific spatial organization of the built environment as well as a discursive form of how these sites were run. By the year 1970, there were three new

cities, 37 new central villages and 117 off-shoot villages that appeared together with the land reclamation programmes east and west of the Delta (Wahdan 2014, 24 table 3). Quite a few researchers working on land reclamation schemes in Egypt refer to this already (see for example Acloque 2022, Malterrre-Barthes 2018, Voll 1980). What is less looked at in this context, is that it was also in that same period that tourism as a widely practiced activity starts to emerge. This also gave a new role to the threshold of the desert on the Delta's edge, especially along the Mediterranean coast west of Alexandria.

Infrastructural developments in the area already had started to appear at the beginning of the twentieth century under Khedive 'Abbas Helmi II. The Khedive initiated the construction of a railway from Alexandria going towards Marsa Matruh and further west towards Libya. In 1908 the construction had reached Marsa Matruh making the northern segments of the Western Desert a lot more connected to the Delta regions. First settlers from the Nile regions started to relocate towards the Mediterranean shore but it was a very slow process. In the interwar periods, the population grew according to Cole and Altorki very slowly (Cole and Altorki 1998). During the socialist era however, so starting in the 1950s, the beach along the northern coast gained a new role where camping sites and new touristic villages were built and run as cooperatives for the productive rest of the working population during the summer months. Already Mehmet 'Ali Pasha had built a summer residence in Ras el-Tin, near Alexandria and 'Abbas Helmi II built the famous El Mantazah palace to spend his summers on the coast near Alexandria (Moursi 2022, 285). In the 1950s, those areas started to appear as sites for camping and vacationing (in the form of *tesayef*, meaning *summering*) for the working population.

> Though the intention was to make them affordable, in the end, they served a new elite class associated with the regime. However, the Egyptian State was still interested in making the beach accessible to a broad segment of the population and promoting beach-going as a national right gained after the revolution. New post-revolution labor laws formalized annual holidays, echoing Soviet socialist ambitions to create productive labor and productive rest conditions.
>
> Moursi 2022, 286

Those new sites were accessible by train from Cairo or through the newly extended desert road between Cairo and Alexandria (289). Touristic villages are being built and those will make the base of a booming tourism industry in the desert as real estate space of the 1990s and 2000s.

As the Delta is expanding into its desert thresholds, it is in those new sites that a new discourse of nationalism linked to agricultural production (through mechanisation and cooperative organizations), industrialization and top-down governmental planning (through five-year plans) becomes spatially articulated first. With the construction of the High Aswan Dam this is being further epitomized. Now, the riparian threshold of production as the state-claimed arid sites are being morphed through technocratic interventions and major infrastructural schemes. Those also include new heavy industrial centres that appear on the desert's edge. The post-1952 years were set out to reach more economic independence through a self-sufficient industrial sector. The first five-year plan of the Nasser government for the period 1956/57-1960/61 poured fifty percent of all public investments in the industrial sector into the development of new industrial urban centres like in Helwan (Wahdan 2014, 26). Those sites experienced a large growth in population in the aftermath of the 1967 Six Day War with Israel that left the canal towns vastly destroyed. But also the capital Cairo experiences a planned intervention of a new large desert quarter built as a new centre of political power. In 1956 the first Greater Cairo Masterplan was published. Cairo was to remain an important site for the local political-economy despite agricultural reform and industrialization efforts that focused on areas outside the capital. In 1959, a presidential decree led to the establishment of Nasr City, intended to be Egypt's new capital at the time. The town was developed as an eastward desert extension of Downtown Cairo and not necessarily as an independent city. It was meant as a planned, large expansion, close to the existing administrative areas in 'Abbasaya and Downtown and it was composed of two parts: public facilities and new intuitions in the northern part and housing blocks, services and public gardens in the southern part, connected through the Nasr Road. Housing blocks were in form of the Socialist-design ideal of the time: superblocks.

> According to Sayed Karim's handwritten account of the founding of Madinet Nasr, in the early 1950s, when he proposed his project to the municipality and various ministries, they refused to consider it because they saw his proposed expansion of Cairo as conflicting with the ideals of socialism. However, after a chance meeting with then officer Anwar Sadat, who was impressed by the architectural model of the city, Gamal Abdel Nasser gave a presidential order for its construction. Sayed Karim achieved his grandest commission by appealing directly to the highest echelons of political power. By the late 1950s Karim presented the plan not as a residential expansion of Cairo, as he originally envisioned it, but as a new capital with government offices, a stadium, and a convention center.
>
> Elshahed 2015

Although some governmental offices moved to the Nasr City, important symbols of state power such as the parliament stayed in Downtown Cairo. With the lack of affordable housing and adequate transportation services, people did not move to the area in expected rates, thus Nasr City "failed to create the revolutionary urban setting it promised" (ibid). Nasr City is a good example however of a new rising narrative that would become a major driver of desert construction, at least discursively, which is that of a redistribution of the growing population tied to a discourse of a local housing crisis. In the year 1960, the Central Agency for Public Mobilization and Statistics stared its work and since then, the statistical measuring and representing of the population, its movement (from one governorate to another) and its demographic change (reproduction rates) become somewhat of an obsession of the bureaucratic regime. This aligns with other means of calculation as a major driver of administration and policy that were characteristic for the time and that still count as relevant today. Nasr City is also a good example of the top-down grand scheme town planning rationale that is starting to emerge, where the function of housing of a professional class and symbolic functions of national discourse and identity intersect.

For the subsequent period under the leadership of military officer Anwar Sadat (who was a senior member of the Nasser entourage and Nasser's vice-president twice), researchers of Egypt might expect a stricter cut in the spatial configuration of planning. Yet, there were several steps that led to the shift from a planning-regime of socialist discourse to the liberal-market era that Sadat stands for. In some cases, the Sadat-regime follows strongly the planning ideals of the previous era. Geopolitical circumstances changed and so did the economy and governmental revenues and this is reflecting in Sadat's town planning approach. Yet, the change from rural development to urban construction, from agricultural expansion accompanied by industrialization and a new national project to investor-driven land speculation schemes of housing in the desert, took on various steps. Sadat laid the foundation for the *desert as real estate space*. But he also continued with the technosphere expansion of the Delta that characterized Nasser's leadership.

Sadat's reforms take place within a global context of increasing liberalization in many parts of the world but in the case of Egypt, it is also very much tied into regional, geopolitical dynamics

and a shift in political alliances followed by altering political-economic systems (having a deep effect on the country's territorialization). Sadat launched the New Town Programme in 1974 and his government also initiated a number of key institutions that are today instrumental in the desert urbanization frenzy. At the basis of this was the October Working Paper from 1974 in which Sadat announces *a New Map for Egypt*. The paper states:

> After October 6 and with all the vistas that have been opened before us and after deciding to set up and execute a comprehensive civilisational strategy, I believe, it is time to comprise all this within the framework of a comprehensive project for drawing up a new map for Egypt.
> This cannot be achieved by setting up scattered projects here and there. It can be done by creating areas for population concentration and new economic activities, enjoying all the potentials of urban attraction thus appealing to large population groups which can set up an active, settled, productive life enjoying all services and so that they may be able to equal the pulling power of the capital, by being not less attractive and conductive to life, labour and enjoyment.
>
> Sadat 1974, 80

October 6 of 1973 marks the end of the armed conflict between Egypt together with other Arab states and against Israel. The conflict resulted in Egypt regaining the Sinai Peninsula (Israel had occupied Sinai since 1967, officially Sinai became again internationally recognized Egyptian territory with the Camp David Accords in 1978). The afterwar period (after 1973) was one of major changes in the country, not least because of a changing economic situation and also because of a political move towards new geopolitical alliances. The military confrontation was a costly endeavour and military expenses ended up in the billions of Egyptian Pounds (according to the October Working Paper). *The Tasks of the Stage,* as the title of the October Working Paper indicates, were the two following elements: *Economic Development* and *A New Map for Egypt*. Nasser's agricultural desert schemes proved to be barely productive and lacking in economic returns (Malterre-Barthes 2018a, 371). In the afterwar years, government funding and focus went thus into new sites of development, both into the reconstruction of the war-effected canal cities as industrial centres connected to world trade as well as into the construction of entirely new towns in the desert as new industrial centres (Sims 2018, 119). Both main tasks of the nation setup under Sadat were to be achieved in accordance with each other: new towns together with new economic efforts. The economic reform programme that the paper would set in motion will enter the textbooks as the so-called *infitah* (the opening), an open-door policy in reference to an outward-looking, open economy, open to both foreign and local investments and capital markets. The October

Paper identified the Suez Canal region and the Sinai Peninsula as well as the Mediterranean Coast and the Red Sea coast as sites particularly well suited and in most need of development efforts. Developments were thus aimed at fulfilling a series of functions, one of which was a security-related function, where regions where to be settled as a way to claim sovereign rule over such spaces. Investments were for example made into developing the northern Sinai region as well as the into the recovery of the canal towns. But beyond this, the October Working Paper states that "The aim is also to realise a real and integrated Egyptian existence in all parts of the country." (82) This was going to be achieved under the slogan of *Ghazw as-Sahara* (Desert Invasion) in accordance with the military jargon of the ruling regime. Some researchers have come to associate the economic *infitah* period with a territorial *infitah*, like we see for example in the writings of Marc Angélil and Cary Siress:

> The economic *infitah* was thus coupled with a territorial *infitah* involving not only the reorganization of space, but also the redistribution of the population within it… The grand vision of cities in the desert, one that foresaw more than a dozen new urban nodes around Cairo alone, called for a massive spatial decentralization by which flows of people and goods would be redistributed rather outward than inward toward the core: an exodus, of sorts, of cheap labor force that would be housed in subsidized tenements and employed in new factories in satellite cities.
>
> Angélil & Siress 2018, 376

To begin with, Sadat started off with the construction of two new towns on two infrastructural corridors radiating out of Cairo. One was the north-south axis along the Delta's west from Alexandria to Cairo and the other was on a west-east axis from Cairo to the Suez Canal (Ismailia). In the centre of these two corridors the first large new desert towns are being sketched out: Sadat City and 10th of Ramadan. Both are located in connection but not direct proximity to Cairo. They are purposefully designed not to be within commutable distance. The new town of 10th of Ramadan lies mid-way between Cairo and Ismailia. It was inaugurated on national television in 1977 with a still-frame broadcast of images showing military officers standing in front of a factory and greenery (Angélil et al 2018, 143). The other new desert town, Sadat City lies halfway between Cairo and Alexandria and it was planned at the time to also become a new administrative centre of the national government and the country's new capital city (two decades after Nasr City). Construction of these two new desert towns practically happened at the same time. Both sites were designed to become an urban growth

poles with a large industrial base. Workers were to be housed in government-subsidized housing blocks.

Sadat City and 10th of Ramadan were developed within a planning context that was aimed to design a "national capital crescent-shaped urbanized region extending from Alexandria to Cairo to Suez" (el-Shakhs 1994, 244). Sadat City was planned as a new administrative heart of the country containing a national government complex with buildings for ministries and government centre and plaza and amenities for governmental services. But when even the Cairo-based ministry responsible for the development of Sadat City (the Ministry of Development, New Communities and Land Reclamation) in 1989 decided not to move itself to the new capital, it became quite evident that Cairo's power base was staying put. The plan of Sadat City indicates that the city was designed around a central spine like an infrastructural core from which utilities and infrastructural networks were extended into sub-developments containing housing on the northern side or industrial areas on the southern side (following local wind patterns, according to urban planning sketches included in el-Shakhs 1994). Water was mainly planned to come from groundwater sources but with its proximity to the Nile Delta tributaries those are part of the Delta's connected sub-and surface water networks. Urban planner Salah el-Shakhs wrote about Sadat City that "The City's attractiveness, and therefore success, would hinge on a massive front-end capital development to make it, as quick as possible, a realistic alternative for migrants headed to Cairo and Alexandria" (245). The planner points towards the capital-heavy involvement of the government to get the project off the ground. Further subsidies and incentives accompany such a town-development in order to attract private investments and that of local family offices (Sims 2018, 125). This was going to be achieved through the introduction of the industrial zone model which was from the beginning a spatial-bureaucratic feature of the new planned desert towns such as Sadat City. The benefits of the industrial zone span things like low-interest credits, licences for imports and exports, exemptions from customs and taxes (Ibrahim & Ibrahim 2003, 111).

Following Sadat City and 10th of Ramadan a series of new towns emerge during the Sadat years in the replicable formula of spatial governance of connection to the Delta (with access to water and cheap labour) built under capital-heavy involvement of the government that facilitates the entry of industry-centred capital actors who are able to benefit from an investor-friendly bureaucratic context. New desert towns include Al Amiriya el-Gadida

(outside of Alexandria, later named New Burg el-Arab), New Damietta, 'Ubour and Badr (on the roads right east of Cairo towards the Suez Canal and Salihiya (between the Delta and the Suez Canal, Ismailia). This spread-out but infrastructurally connected assemblage of desert towns is signified by the fact that they were designed as stand-alone towns, with their own industrial base and that were aimed to become growth poles on developmental corridors, radiating from Cairo and also reflecting back towards the capital. The names of the new towns are part of the political-discursive performance of these sites. They were integrated in a discourse of nationalism, presidential pride and power manifestation as well as geo-political celebration over the victory towards the regional adversary Israel. 10th of Ramadan and 6th of October (which was planned a few years later) describe essentially the same day of the victory in the October War from 1973, just one referring to the Islamic and one the Christian calendar.

What is important to take from the above laid out section, is that desert settlements start to appear long before the more strategic move of the liberal market-driven age that picks up in the late 1970s (which will be looked at in concrete in what follows). Looking back, we find already investment-driven approaches towards town planning that emerged in a colonial context of foreign-capital driven actors that created urban spaces that were both part of the socionature of a productive Nile Delta and also discursively detached from this very sitting. Towards the mid-twentieth century, the government-directed reconfiguration of the Delta's edge took on the shape of land reclamation and industrial developments. Those resulted in desert settlements that are incorporated into a technosphere expansion of the Delta based in the heavy involved of infrastructural means (*an infrastructural prowess* to speak with Ong 2020). Here – to also repeat what was already demonstrated in the land reclamation chapter – new models for socio-economic rural life are being tested out and pioneered. During the Sadat era, with changing economic circumstances and a shift in geo-political alliances, new spatial formulas such as that of the investment zone are created. And now, also a new discursive framework is being laid out that will nurture a speculative approach towards the development of arid sites. This will be the focus of the next section.

3.3. The Desert as Real Estate Space or "We Needed to Find a Reason for This City to Exist"

Egypt's New Administrative Capital project is probably one if not the most discussed and maybe even the most controversial scheme of the Sisi-government's strategy to build into the desert. It is the largest desert town development in the country, so far planned to host 6.5 million people on an allocated area of 700 squarekilometres. It is located southeast of Cairo and with its proximity to capital, once finished, it will create a Greater Cairo Metropolitan Area that covers the same landmass of New York City and Los Angeles combined (!) (Sims 2022a, 31). The New Capital was announced at the 2015 Economic Development Conference next to a number of other mega-projects and also other mega-cities. However, it seems like for this one project in particular, the conference itself as well as the press coverage that followed were an important part of the design and implementation of the new city; for the *performance* of the city as an investment site. Anna Tsing had described such a moment as an integral part of the investment process – in her case it was in the context of gold extraction – which Tsing depicts with the following characteristics:

> Spectacular accumulation occurs when investors speculate on a product that may or may not exist. Investors are looking for the appearance of success. They cannot afford to find out if the product is solid; by then their chances for profit will be gone. To invest in software development requires this kind of leap: Software developers sell their potential, not their faith to trust the processes of innovation and patenting to yield as-yet-unknown property rights and royalties. Real estate development requires an assessment of desirability and growth, not demonstrated occupancy; it sells investors attractiveness. In each of these cases, economic performance is *conjured* [italic by me].
>
> Tsing 2005, 75

Similar to Tsing's observation, we see potential investors and financiers looking at architectural models of the New Capital Cairo (which was its first working title back in 2015). High-rise skyscrapers, thousands of apartment blocks, the world's largest park and other high-design features that make the desert appear the least desert possible and the mere backdrop of limitless investment dreams. The models and renditions are presented by the well-known American architectural firm Skidmore, Owings and Merrill (SOM) and one of the Middle East's most shining star real estate developers, Mohamed Alabbar of the UAE. As the conference participants from the multilateral financial institutions and private sector entities are

circulating around the miniature yet-to-become desert phantasy-land one might wonder whether they are conjuring (like Tsing suggests) and preparing to build something big, desires cast into concrete and steel, or whether they are preparing to scavenge on whatever will be left of the investment frenzy and maybe even of the old capital that remains beyond the model.

This section is about painting the picture of a context of finance and speculative engagement with the urban form on Egypt's arid sites in conversation with Goldman's ideas on *speculative urbanism* (2023, 2011). I will first look again at the discursive and also material dynamics that triggered the finance capital penetration into the realm of desert development and planning in Egypt. We will see that it was in the housing and tourism sector first that an assetification of increasingly larger tracts of desert land held entry. I call this the *desert as real estate space* – with a nod to Keller Easterling's conceptions of *infrastructure space*. Then, taking the specific example of planning, designing and building Egypt's New Administrative Capital, I will show how this desert as real estate space concretely takes shape, what informs it and informs its contexts (that is both of a material and discursive nature). Finally, the aim is to add to Goldman's, Easterling's and also to Tsing's suggestions arguing that looking at desert towns at the intersection of planning, finance, governance and socio-ecology, we see that the financial asset-rendering of the desert in the desert as real estate space does not only have a discursive dimension – next to a metaphysical one (as Tsing has proposed) – but it is also embedded into metabolic systems (in the physical realm) and shapes those in return. While Egypt looks back at an urban history of planning new towns on the (development/investment) map into arid sites throughout the past previous four decades, the interplay of the speculative nature of these developments, the use of arguably abundantly available resources (such as desert land, construction materials, cheap labour) create ever more detached and absurd investment sites. This comes however with massive costs of which especially the environmental costs seem little factored in if counted at all. The desert hinterland of the productive Nile regions are, yet again, disposable, inhuman landscapes. Yet, to render them productive and investable for the few results in diametrically opposed effects for the many as desert landscapes are re-programmed, water is being diverted, valleys are filled and hills flattened. The deserts' edges are mould into becoming the real estate simulacrum of themselves, from geo-physical landscape to predictable investment site.

To get there, in the section, we will look back and across and forward to see the new town construction in Egypt's arid terrains in both its infrastructural and ecological setting as well as within a discursive context that organizes these spaces as investment sites. Here I will focus on the decades that follow-up with the section above, so from the mid-1970s onwards. Core of this is to understand, how does the liberal capital-driven agenda of the past forty years concretely shape the spatial planning of new desert sites? What characteristics do these urban sites show with regards to their spatial organization, material constitution as well as their financial and legal-discursive setting. Taking the very timely example of Egypt's New Administrative Capital, I am hoping to show that a city like this takes on several roles and only of those is the function of housing. I spoke with people that at different levels, including very senior levels (involved into regular conversations with the presidential office upon the design of the New Capital), were involved in the conception, layout and implementation of the New Capital project. Besides, I also learned about the topographical and ecological foundations upon which the new mega-city is being currently built which further adds to the argument a layer of considering such a project in its metabolic context.

As we saw in what was discussed in the previous section, the construction of towns across arid areas pre-dates the late 1970s of the market-driven urban planning approaches. Even new capital cities/sites were designed in the third quarter of the twentieth century. Those were conceived from a top-down governmental planning perspective together with new industrial centres in the Nasser and Sadat-period and there was more of a continuity in the conception of new desert developments rather than a clear rupture in the spatial planning regimes. Nevertheless, the reform programme that the Sadat-administration launched also paved the way for more speculative approaches towards land development. Sadat's programme was based on a number of administrative and legal interventions that were meant to enable a more investment-friendly environment and this ultimately led to a new urban form shaping arid terrains.

For the legal-bureaucratic context of new town developments some key moments were important for the opening of the areas along the desert's edge – starting in the immediate periphery of the Delta, Cairo and the Valley and shortly after also along the coastlines. One

such moment is the establishment of the New Urban Community Authority, short NUCA, in 1979. The General Authority for Physical Planning (GOPP) had been established in 1973 and it was meant to be working under the Ministry of Housing responsible for all activities related to the construction of housing in the country. In the first instance, it focused on the rehabilitation and reconstruction of the war-affected canal towns. During the 1970s, the idea was for GOPP to make the plans and for NUCA and the local governates to implement those plans. But this planned equilibrium would soon get out of balance. NUCA was (and is still today) mandated with a wide array of responsibilities that enable the selection, sales and development processes of new town developments on state-claimed desert lands. Examples include selecting and allocating new desert land parcels, conducting tendering and bidding as well as allocating land concessions, in some cases defining land prices, administering sales and project funding, drafting new policy to further the establishment of new urban settlements, providing concessions for the execution of infrastructural work, receiving funding from other governmental bodies to ensure the sufficient funding of projects and to establish private subsidiary companies for the implementation of new desert city projects (including being able to provide in-kind or cash-share capital investments into these private arms).[77] NUCA essentially acts as an economic authority with powers in physical planning and its role in the urban development of desert sites cannot be overstated. Urban analyst Dalia Wahdan states that over the years, the planning authority GOPP even went into the background and NUCA became the central agency when it comes to the planning and implementing of new towns (Wahdan 2014, 58-59). Eventually, so Wahdan's claims, GOPP took on a mere consulting role for the planning process as such because physical planning took on more and more the shape of financial planning with physical planning consequences (ibid).

Next to the establishment of NUCA, another key event is a new legal foundation of desert developments that was enacted through the so-called *Desert Law* coming into effect in 1981 (still within the Sadat presidency; Sadat is assassinated shortly after in October 1981). Legally speaking, the foundation of the desert as an investment site under special supervision of the military was laid with this law. It enables individuals, cooperatives, partnerships or

[77] See for a detailed overview of NUCA's mandate the website of the MENA-region urban research initiative TADAMUN http://www.tadamun.co/?post_type=gov-entity&p=10150&lang=en&lang=en accessed on 12 November 2023.

corporations to acquire and own desert land outside of the *zimam* (the *zimam* as an important administrative marker of Egypt's productive land mass is elaborated in detail in chapter one of this dissertation). Law 15 from 1963 prevented any natural or juristic foreign persons to own agricultural land in Egypt. Based on the new Desert Law, desert land provided an entry ticket into land holding in the country even for Egyptians where the owning of land parcels in the desert was attractive considering the bargain prices and the much larger limits of land holding sizes. NUCA is the agency that sells these tickets and regulates who is allowed to play in the game. But even NUCA is not fully able to define the rules of the desert game. The Ministry of Defence is in the first instance in the position of declaring areas of strategic or military significance. After the Ministry of Defence, the Ministry of Agriculture and Land Reclamation can theoretically put a hold on land sales and declare a strategic interest on land parcels. The Cabinet has also the right to temporarily expropriate desert lands if necessary for state safety (Abdelfattah 2015, 39). What the Desert Law does is that it puts an investment focus onto the state-claimed desert areas. This is a moment that institutionalizes the vast sites beyond the *zimam* as state-owned property. Arid sites can now strategically be sold and traded. In addition to that, the law laments a specifically beneficial role to the Armed Forces not just with the access to these sites as sites of security interest but with a *first-dips* kind of approach towards the commercial access of promising areas. Yezid Sayigh, commenting on the rise of Egypt's military economy, wrote in this issue:

> Most important, however, was the legal foundation that Sadat laid for the military's formal control of the use of state land, which has proved to be one of its foremost assets. Law 38 of 1977 had already required tourism agencies to obtain MOD [Ministry of Defense] permission in order to operate in border areas, which included the country's coasts, a principal tourist destination. Presidential Decree 143 of 1981 expanded this requirement to include all "desert land," that is, any area not previously registered in cadastral surveys as *zimam*—owned by legal persons or entities, public or private, and subject to real estate tax. This encompassed an estimated 90–95 percent of Egypt's total surface area, thereby expanding the military's potential economic benefits significantly. Sadat followed this up with Law 531 of 1981 establishing the EAF Land Projects Agency, which was allowed to generate income from military real estate, much of which lay in desert and border areas.
>
> Sayigh 2019

Sayigh shows that active and retired military personnel as well as the companies of the Armed Forces benefitted in particular from the economic opening of new investment sites on desert sites.

In the first years after the establishment of NUCA and at the time of the effective realization of the Desert Law – we are still in the last years of the Sadat rule – six new towns including 6th of October, New Amiriya (later called Burg el-'Arab), New Damietta, 'Ubur, Badr are being announced. They still follow to large extend the planning objectives that were also set for 10th of Ramadan and Sadat City in the sense that they were further away from the traditional centres (Cairo and Alexandria) along infrastructural corridors and in direct extension of existing Delta and Valley infrastructural connections (including water, roads, power grid) and planned with an economic base as stand-alone new cities in theory. Only 6th of October was planned from the beginning in closer proximity to Cairo. These are new towns that appear on desert land planned by NUCA with high front-end capital investments from the side of the government made into the development of infrastructures and into the construction of the new towns. With the switch to the Mubarak regime, we see a new spatial solution coming up that allows for the rise of the *desert as real estate space* which is that of the planned satellite city. These are newly built extensions to Cairo that appear as a planned solution under Housing Minister Hassaballah el-Kafrawi to the attested overpopulation of the capital. The new sites are purely residential and they are tailored towards accommodating different segments of society (including public housing projects). Urban researcher Eric Denis wrote about this interpretation of desert towns by then Housing Minister el-Kafrawi: "This champion of standardized, mass-produced public housing built on the desert fringes had been in command of the housing ministry since 1978. In el-Kafrawi's view, what mattered was to establish a planned alternative to counter the expansion of illegal working-class housing into the fertile land of the Nile Valley, while also creating a new urban society." (Denis 2018, 37) A new urban development age was on the rise and with it the desert as real estate space. Now new satellite extensions are built next to Cairo without any specific economic considerations about the kinds of jobs that those new inhabitants could occupy, next to the effective contribution of newly built areas to the local economy. Nine such satellite towns are first announced by the mid-1980s and five of them are being realized over the subsequent years (Sims 2018, 127). These five new dormitory towns are later assembled into two larger urban areas that are today known as New Cairo (in the desert east of Cairo) and Sheikh Zayed (in the desert west of Cairo). Next to these, also a number of twin cities are being developed along the Nile Valley. These new sites become increasingly used for a growing home buyers-market and a new asset-depositing class – however big or small the wallet. This new class of

home-owners arose in correspondence with the rise in remittances from millions of Egyptians working in the Arab Gulf. The importance of having industrial sites or economic provisions as part of the plan was now starting to be abandoned. Now, NUCA designs settlements for the settlement sake; housing is becoming real estate. This is the beginning of a new property market with housing as its main vehicle. Up until this time, buying property in the form of real estate was "virtually unheard of representing less than 2 percent [in 1976] of urban tenure, a testament to how the housing market was a recent invention in Egypt" (Shawkat 2020, 20). Mubarak's government facilitates the development of these residential sites with a legal-administrative framework and with a growing number of infrastructural projects. Egyptians start to joke that "between the inaugurating a new bridge and a new tunnel… President Mubarak will inaugurate a new bridge" (Osman 2013, 182).

Then, towards the early 1990s, another planning shift happens that David Sims describes as follows:

> Up until this time, new towns were mainly developed to receive working and professional classes through the construction of state-subsidized housing blocks and to welcome citizen investors through the allocation of individual residential plots… With the retirement of El Kafrawy in 1993 and his replacement by Mohamed Ibrahim Suleiman as minister of housing, a much more 'state capitalist' mode of development was applied. Large private real-estate developers became the main agents of progress, enhanced by an extremely friendly relationship with NUCA. This shift coincided with Egypt's first taste of the dictates of neoliberal economics and structural adjustments, First, the boundaries of exist sting new towns and settlements were rearranged and dramatically extended, particularly 6th of October. Huge tracts of land began to be sold at giveaway or below market prices at an emerging new breed in Egypt, the corporate real-estate developer.
>
> Sims 2018, 128

The *infitah* had brought about a new local elite which would become the main driver and main beneficiary of the planned urban focus on the desert's edge. According to political analyst Tarek Osman this new elite was still very much rooted in an old elite of the pre-1952 monarchy but also included – and that was completely new – current and former military staff and intelligence personal and those two segments of society intermixed during that era. This created new elite dynamics and structures (Osman 2013, 135). We met members of this group already in the land reclamation section, the Maghrabi family. Now, these corporate real-estate developers, including the Maghrabi's cousins, the Mansours (Palm Hills Development Company), go big into the planned urbanization of desert thresholds, primarily appearing

around Cairo. This marks an important shift towards the expansion of property markets on desert land from state-planned urban sites to private developments of a newly blossoming private sector working in cooperation with its governmental proxis. In terms of the urban form that this gives rise to, we see again another new spatial formula starting to proliferate around Cairo's desert regions. This new urban layout is the private real estate's gated community or *compound* as it commonly referred to in the Egyptian vernacular. Now builder-developers build gated enclaves in the arid orbit of Cairo. These private companies start to flourish thanks to often close relationships with NUCA (for example family ties between developers and the board of directors at NUCA) and the support of the government as the provider of infrastructural connections as well as functioning as a guarantor to the projects. This offsets a construction boom that creates even a housing surplus by 1996 (Shawkat 2020, 20). But rather than catering towards a growing demand in housing (because of a growing population), it fosters an uneven distribution of housing access (ibid), dealing with real estate. Starting in the 1990s, there was no longer a priority towards the government's provision of housing and a new focus was applied onto privatization and on an investor-friendly planning climate, especially in the real estate market. This was also a result of the economic reform programme of 1991 that Egypt had assigned to in the aftermath to the Gulf War. The reform followed an agreement made with the IMF and the World Bank. The deal that Egypt had cut was a partial reduction of its foreign debt in return for the deployment of Egyptian troops in the war (Denis 2018, 37) but it was also accompanied by a larger economic reform which was one of the conditions of the multilateral finance institutions.

> After this agreement, the state could no longer give priority to public housing programs. In any event, the initiation program of new towns intended for the working class had entirely failed to achieve its aims… The sale of land resources was also part of a privatization program meant to refill the government's coffers. The transfer of real estate development in the desert to the private sector signified a disengagement of the state from housing production altogether. The real estate boom was now underway, and has maintained ever since, a dynamic of producing new, exclusive, and restricted residential neighbourhoods – private cities, even. Better still, the ministry has allocated lots in the desert to major building contractors in exchange for public infrastructure projects such as bridges, irrigation canal, and so on.
>
> Denis 2018, 37-38

Increasingly growing tracts of desert land are being developed mostly around in Cairo, for instance in Sheikh Zayed or New Cairo, as gated communities by private builder-developers. These are real estate complexes for the middle and upper classes where exclusivity and the

right-kind-of-crowd intersect with the provision of cosmopolitan amenities such as private/international schools, private hospitals, private security and a rich retail infrastructure. Egypt has now fully arrived in the *desert as real estate space*. Private land development companies are being formed who buy up desert land, again often almost for free. Those are Egyptian family offices or private individuals, often Egyptians, which to repeat have "extremely friendly relationships to NUCA" (Sims 2018, 128) or with direct family relations to the government's leadership. For instance, SODIC, the private real estate development of 6th of October which was established in 1996, is majorly owned by Magdy Rasekh, father-in-law of the ruling president's oldest son.[78] State agencies such as NUCA both act as a supporter and as a guarantor of these schemes, selling desert land cheaply to their private allies, developing infrastructure to connect developments with the city's networks and facilitating lending. Further, the state also acts as a speculative property developer itself. "The largest builder of Cairo's new neighbourhoods, far bigger than the builders of Dreamland or Beverly Hills, was the Ministry of Defence. Military contractors were throwing up thousands of acres of apartments on the city's eastern perimeter to create a new suburbia for the officer class." (Mitchell 2002, 274) Starting in the 1990s, Egypt witnesses a building boom, says Timothy Mitchell, where real estate is replacing agriculture as the country's third-largest nonoil investment, after manufacturing and tourism (275) and one of the largest contributors to the construction frenzy is the military. Around the turn of the millennium, Egypt sees a doubling in the size of Cairo in terms of built-up land – most of it planned (and not informally built) (ibid). Following the success of SODIC and others, in the early 2000s, a whole array of builder-developers is being established including Palm Hills (majorly owned by the Egyptian family Maghrabi-Mansour[79]) and Emaar (majorly owned by the Emirati Emaar Property[80]), companies that are now listed on the Egyptian stock exchange (EGX) (often co-listed on other stock exchanges) and they are among the most potent actors on the EGX.

[78] According to Reuters "Egypt ex-housing minister gets 8 yrs jail for graft" from 29 March 2012 https://www.reuters.com/article/us-egypt-verdict-idUSBRE82S0KW20120329/, accessed on 17 December 2023.
[79] Following information provided by The Built Environment Observatory at https://marsadomran.info/en/2022/09/2764/ accessed on 17 December 2023.
[80] Following information provided by The Built Environment Observatory at https://marsadomran.info/en/2022/09/2744/ accessed on 17 December 2023.

Alongside the construction boom reshaping the contours of capital Cairo, is a newly blossoming tourism economy that is starting to form in the desert along the country's coastlines where a new era of investment is re-configuring the beach as an investment area.

Up until the late 1980s, Egypt's tourism industry was still concentrated to the cultural touristic destinations of Ancient Egypt's relics in the Nile Valley together with international visitors coming to Cairo (and Giza which is part of the Greater Cairo area). Only the Mediterranean coast had become a first touristic destination reserved to a local tourism culture during the Nasser years (as pointed to earlier) and this was further expanded by Housing Minister el-Kafrawi in the 1980s by new touristic model villages. Those were again designed for Egyptians, mostly coming for weekend trips and summer months from the capital. Military restrictions had been imposed on the coasts along the Red Sea during the 1970s as a consequence of the Arab-Israeli War (October/Yom Kippur War) from 1973. In 1980 those restrictions were lifted and a handful of hotels opened along the littoral edge. A few hotels had also been built in Sinai during the Israeli-rule over the Peninsula (Sims 2018, 187). A new coastal highway was then built along the Red Sea and an airport opened in Hurghada in 1989. In 1988, the Ministry of Tourism was granted by prime ministerial decree the right to coordinate the strategic development of designated touristic areas (Richter & Steiner 2008, 947). Those were a 5km-wide stretch along the Red Sea coast as well as along the southern side of the Sinai Peninsula, individual large desert areas around the Western Desert's oases and almost the entire 500km length of the Mediterranean coast, west of Alexandria (World Bank Group 15 June 2006). Parallel to the infrastructural provisions, a new institutional setting was put in place to encourage and facilitate investments in the new sector. The Tourism Development Authority (TDA) was set up in 1991 to take on the planning of touristic zones and its first focus was on the coasts along the Red Sea. Here, land concessions were sold to private developers like the newly established Orascom Hotels and Development Company of the Sawiris family (established in 1995; later the name changed to Orascom Development Egypt). While the state supplied infrastructures, mostly domestic investors close to the government (including those that are also active in the Greater Cairo region) buy the land cheaply and come to develop an archipelago of touristic villages and resorts as well as tourist cities along the Red Sea coasts both along the Eastern Desert and on the southern shores of Sinai. Along the Mediterranean coast (not including northern Sinai) also massive investments in tourism are

being deployed (often by those some real estate developers and also state-actors) but not in the form of hotels or other infrastructures meant to receive visitors from abroad – the business model on the Red Sea – but in the shape of a narrow coastal ribbon of private touristic villages and dormitory weekend/holiday homes for Egyptian visitors. Here it is privileged segments of the Egyptian society who spend their summer months on the northern shorelines. Outside of the hot season, these private compounds spanning the length of an about 300 kilometre-long maritime stretch between Alexandria and Marsa Matruh are largely empty, touristic villages often closed and not in use. Geographer Leïla Vignal constitutes an *inversion of territory* that took place in the field of tourism since the 1990s. New desert territories have become the major focus of investment and development efforts coming from the state leading to an abandonment of the Nile Valley regions in the touristic industries. Vignal states that most of the players in the coastal industries are *off-shore*, dependent on a workforce that comes from the traditional Nile regions next to goods and infrastructures (such as electricity) which are mostly imported from Nile regions. Vignal writes that:

> One can therefore question the efficiency of the current development of tourism as a genuine instrument for encompassing economic development. Indeed, the trickling down of the wealth generated by tourism through the expansion of a new labour force, and its effect on related industries (industry of construction or of furniture etc.), is still limited. This is in part due to the de facto control of the State, which decides who is allowed to invest in the new Eldorado-s of tourism, thanks to its planning role. It can also be related to the fact that the new tourism economy is dominated by a handful of powerful private actors.
>
> Vignal 2010

What we can now find is that together these new landscapes of tourism and the above described privatization wave of desert urbanization taking place around Cairo create what can be captured as the corporate encampment of the desert threshold which I would argue is a characteristic spatial feature of the desert as real estate space. This held entry in Egypt under the Mubarak administration. Through the partitioning of state-claimed arid space on the map, special zones of legal-administration are carved out and those are managed out of national bodies like TDA or NUCA. Private builder-developers have crafted an investment landscape that is acting as a proxi of the state, reliant on the state's facilitating of the private investment frenzy. At the same time, state-actors themselves – including the military-industrial complex and its off-shoots – also add to this and benefit from it. These investment

sites rely on their fast-tracked access to *cheap* resources such as desert land and construction materials, *cheap* labour and streamlined bureaucratic and legal infrastructures that enable and secure investments as well as the management of these enclaves. Almost acting like a spatial symbol of the planned take-over of the desert's edge is the golf course, a feature built into any renowned compound and touristic resort. Golf courses in desert developments act almost like a metaphor and spatial marker of this *inverted territory* where the desert has been turned inside-out, becoming the least desert possible. I do not use Vignal's understanding of the *inversion of territory* here where – in her understanding – things and people and finances move from places along the Nile to new places inside the desert. I rather understand this as a material-discursive inversion of territory from within where properties are re-configured and managed in new ways.

In 2011, the Egyptians took to the streets their anger and resentment to the crony intermingling of private developers and state actors in creating wealthy wonderlands for the few and under-serviced urban sites for the many. A series of corruption lawsuits had followed in the aftermath of 2011, bringing some of those players to court. It even included the sons of the president that were arrested for their involvements in real estate affairs linked to the Cairo 2050 plan (Denis 2018, 38). But the real estate business rebound rapidly in the years after the social unrest (39). In the Sisi-administration the growth of the desert as real estate space continued and not only that; it grew to before unseen new dimensions with many of the old beneficiaries making new money. The years between 2006 and 2017 (with the revolution in between), witnessed the most remarkable growth of planned private desert construction with 1.5 million new units being built (a 75 percent increase compared to the decade before, Shawkat 2020, 24). Now, the desert as real estate space is massive, expansive and it is all around. Like a stencil, it promulgates on the map across arid sites. We find a remarkable resemblance of these modern-day desert-encampments with developments that appeared about a century ago. Both rely on being part of and apart from their material-discursive contexts. Whether it is a touristic village like El Gouna on the Red Sea or a gated compound of Palm Hills in Greater Cairo, these are privatized residential islands where everyday life is governed by an investment board (and sometimes an elected representative from amongst the homeowners) but not by a local governor or elected public representative. Public functions including education, health care, waste management and security are managed through private solutions without major interference from outside, meaning from

the state itself. A number of social scientists have elaborated on this subject, looking into socio-spatial configurations of these walled-off sites, for instance discussing cosmopolitan lifestyles, private education or the social segregation seen in the context of urban life in Greater Cairo (look for example at Adham Khaled 2005, Mona Abaza 2014, Anouk de Koning 2009, Diane Singerman 2009, Noha Roushdy 2023).

This is where the fieldwork begins; in the planning and design of the to-date largest desert town development on local arid terrain, the New Administrative Capital. This project continues with the investment-driven approach of a compartmentalized desert development that like its predecessors is at the same time part of and apart from its socio-ecological and legal-administrative contexts. While it may be argued that the government of Egypt replicates a model of new administrative centres designed on the drawing boards that have appeared in many countries, from Australia to Brazil, and that building a new capital city is not an Egyptian solution to a purely Egyptian problem, I want to emphasize in the upcoming paragraphs that the local context has specific articulations (and effects). In my view, it relates to the above outlined context of building and designing new capitals (such as Nasr City and Sadat City) and new desert towns as well as touristic compounds in the country. The New Capital project epitomizes, so my argument, the *desert as real estate space* and my proposal here is to look at it from this specific viewpoint. The argument suggests that the New Capital is a prime example of the assetification of state-claimed arid sites in proximity to and in direct extension of the existing urban centre of Cairo. Rather than the private-sector driven approaches of private investment archipelagos mushrooming out of the desert in the Mubarak-years, the New Capital shows that in the Sisi-era, the government is in the driver's seat hoping to replicate previous (private) success stories and capitalizing on its largest asset, the desert. During the Mubarak years, speculative urban planning happened in hidden board rooms. Now, the new approach is to build loud, public and big, ultimately with the hope to attract foreign direct investments and also financial involvement of the local heavy-weights. Because of that planners create recognizable and replicated/replicable urban shapes: standardized apartment blocks, green spaces, smart-city features, skyscrapers, concrete and glass; the built-up urban form of the *infrastructure space* described by Keller Easterling (2016). In addition to Easterling's observations, we can add – exemplified by the New Capital – the socio-ecological foundation and effects of this national project. It relies on (and it further

cements) the incontestable access of state agencies to the country's deserts, the equally incontestable access to resources necessary for the massive construction (i.e. cement and water) and for the day-to-day life of the new city. Besides, because of the goal to create ever more attractive investment-topoi, construction becomes more and more absurd, detached from or without any consideration of local topographical-meteorological conditions as well as local needs. In the desert as real estate space, an investable image of a site is being cast into concrete and steel, the landscape is being inverted to became a simulacrum of itself. But rather than being mere simulation, the earth is being flattened, water is re-directed and recognizable investment symbols of the urban form are being built up that are made of physical resources and raised by a local workforce. Those workers will soon disappear from the New Capital site, knowing that the new city meant to host millions was never built for them to enjoy.

How did it all begin? There had been several discussions about the construction of a new administrative centre/new capital already during the Mubarak presidency. GOPP (the physical planning organization led by Mostafa Madbouli who would later become Prime Minister under Sisi) had planned for a "new city trade and business center (CBD) east of Cairo, area of 2000 Feddan"[81] in its governmental planning strategy *Egypt 2050* (first called Cairo 2050) which was first published in 2007. The plans show a new CBD located in the desert east of Cairo, not far from its current site but on a much smaller scale. While the final New Capital project spans a vast area of 7000 squarekilomtres, equal to the size of Singapore, the first plans from 2007 indicated a modest 8 squarekilometres land surface (2000 feddan). After the 2011 revolution, other plans started circulating for a new capital situated to the west of the Nile Delta and closer to the Qattara Depression developed by the Egyptian architectural firm CUBE Consultants. CUBE had during the Mubarak- and later during the Sisi-administration close ties to the governmental leadership and served as a core advisor for the Cairo 2050 plans as well as for the master planning of the New Administrative Capital.[82] When in 2015

[81] GOPP *Vision of Cairo 2050 – Within a National Vision of Egypt* 2009, https://cairofrombelow.files.wordpress.com/2011/08/cairo-2050-vision-v-2009-gopp-12-mb.pdf downloaded on 17 December 2023.

[82] CUBE Consultants were in the lead of a new grouping of local architects and planners called Egypt 712 that formed in the aftermath to the revolution in 2011 which was discussing the plans of geo-engineering a new lake into the Qattara Depression together with the proposal for a new Political Capital called Nefertari close to that new lake on an infrastructural connection off the Nile Delta towards Siwa, see CUBE Consultants *Egypt*

the announcement was made by the government to develop a new capital city few experts were therefore surprised.

The development of the scheme happened in several stages and the 2015 Economic Conference was an important and telling moment for how this project was meant to be conceived. The Sharm El Sheikh event showed that it was from the start meant to be a state-directed large-scale investment project with high political value. The US architectural firm Skidmore, Owings and Merrill (SOM) was commissioned for the initial project design. Their design brief, so two of the involved architects told me, was meant to create a large city on a massive land surface that contains a number of urban features with the *wow-factor*, meaning with recognizable landmarks. A large park was envisioned with *green space* as one of the buzzwords. Another symbolic feature was that of *height* with the provision of building Africa's tallest skyscraper. During the eight weeks of planning for the initial design proposal, frequent consultations were held between the architects and the Egyptian governmental leadership of the project. Those also included the president himself which according to the architects is a rather uncommon high-level involvement. It indicates the intense political will for the new city. The commissioned goal for SOM was to decide upon main attractions that would capture the investors' attention. The new city was meant to be spectacular. But unlike other, similar new city/town projects that SOM had worked on, according to the architects, the city was meant to be of grand symbolic features purely for the purpose of investment into real estate. The architects said that other comparable sites are built in large-scale terms to attract either tourists or high-profile expat communities, thus broadening the commercial and economic base of the client. For Egypt's New Capital however it remained entirely unclear what the economic purpose this new city could be other than selling real estate units. Here it shows, how the New Capital follows, though in a bloated-up manner, Egypt's planning ideals of the past two decades where real estate compounds had been designed and built around Cairo with the exact same intention, namely for local upper- and middle-class segments of society to buy up housing units. Also a planner of a much later design phase of the New Capital project came to this point mentioning that even for the design of Phase two and three of the mega-project, there had still been no economic considerations for the commercial activities that

712 Misr al'ouda lilmustaqbal https://www.youtube.com/watch?v=1HdKpDTBNt8 accessed on 17 December 2023.

the new city would provide. Only services in direct relation to the government and diplomatic missions were to directly benefit from the new city but those will by far not provide enough opportunities to absorb a workforce in the hundreds of thousands, said the planner. He told me in an anonymous interview that "We had to come up with a reason for this city to exist"[83]. Buildings, streets and entire neighbourhoods were thus designed and laid out on the map before specific functions would be retrospectively allocated to them. The idea was to build big and to build quickly and that later, it would become somehow clear, how those new urban centres were to be used (or not). It shows that in the desert as real estate space, need and use (of buildings or even neighbourhoods) are not what informs the design process. Rather, the attractiveness of a space, a spectacular vision with recognizable features and also the security of the investment are the decisive elements.

It is clear that a project of such a scale is only possible because of the large front-end capital-investments from the public side. Initially the goal for the entire scheme was for it to be realized in cooperation with large private investors such as real estate developer Mohamed Alabbar – involved in the first design phase. But those partnerships quickly fell through and other major foreign investors could not be gained in support of the mega-scheme. The government stepped in to stick to the grand plans and realize the new city in the making largely on their own. A private company was formed in 2016 called Administrative Capital for Urban Development (ACUD) and since then, it oversees the implantation of the many sub-projects of the new capital. Over the years, ACUD has coalesced between being a more military-run endeavour and a civilian one (represented by the Ministry of Housing)[84]. Besides, a number of sub-developments are handled by the presidency directly (such as the Central Business District). The large development complex of the so-called *Octagon* which lies directly adjacent to the New Capital on the Cairo-Ain Sokhna Road is a project developed in parallel but it is outside of the New Capital's parameters and as the new centre of power of the Ministry of Defence it is developed exclusively by the Armed Forces themselves. The New Capital is being built in three main phases. Phase one is by now (2023) built up in most parts

[83] From anonymous interview held on 7 July 2023.

[84] When ACUD was first formed in 2016, out of 13 members of the Board of Directors five came from the military and only three were from the Ministry of Housing. In August 2017, the CEO was General Ahmed Zaki 'Abdin, replacing a civilian (Loewert & Steiner 2019, 70). According to my interview with a planner of phase two and three of the New Capital, the leadership at ACUD had changed in recent years again towards a more civilian leadership, led by people from the Ministry of Housing.

with only sub-plots awaiting completion. Phase one contains a series of development zones that include a central artificial river hugged by an open-air green zone/park (sometimes referred to as Capital Park or Green River); residential areas are coming out of this green spine as individual development plots; the governmental quarter containing the parliament, ministries, supreme council, diplomatic missions and international representations; the CBD (sometimes referred to as Smart Village containing Africa's tallest skyscraper, the Iconic Tower) and finally a palace district for the presidential palace (size is 9.5 squarekilometres according to Loewert & Steiner 2019, 72). What stands out in the design of phase one is the focus on green spaces in the layout of the new city and the scale of the overall design as well as of individual design elements. Julian Bolleter and Robert Cameron measured that just in phase one of the new capital over forty percent of the project's overall landmass are planned to be green spaces, equal to 70,000 hectars of land (Bolleter & Cameron 2021, 13). The Green River/Capital Park occupies the majority of this green space. It is designed as a core feature of the overall plan, as a landmark attraction in the symbolic sense but also as an infrastructural spine for the flow of water through the city. In my conversation with Dr. Somaya El Bahy of the Egyptian design consulting firm CUBE Consultants, the Green River was described as a critical design element, mirroring the life on the Nile as an Egyptian way of life and an important part of Egypt's cities in general. Somewhat contradictory that is however its application in the New Capital's design. Here, the west-east alignment of the Green River stands perpendicular to the south-north flow of the ancient waterway. The Green River appears as an aesthetic feature structuring the design according to infrastructural needs such as the programmed flow of water through the arid landscape. While other Egyptian cities hug the Nile banks and allow for the continuous passage of fresh water, the New Capital marks a final destination of the hundreds of cubic tonnes of fresh water that are being re-directed towards it every day. This water will seep into the arid ground and it will not feed again into the Nile aquifer. The site is simply too far away from the Nile and its aquifer for a beneficial connection of the water to be maintained (Bolleter & Cameron 2021, 13). In order to turn the immense arid site east of Cairo into a spectacularly curated green landscape that equals the size of over 2300 golf courses, two large pipelines were built that connect the water network of the Cairo suburb New Cairo with the New Capital. Each of those pipeline pumps a volume of 125,000m^3 of water per day (ibid). This is fresh water coming from the Nile. Another pipeline is planned to provide desalinated water coming from the Red Sea in the future (ibid).

Seen in this metabolic context, the New Capital is fully embedded into the web of life and socionature of its wider context on the desert's thresholds. The symbolic value of large and even abundant green spaces in a desert landscape shows in its decadence how this mega-scheme tries to sell the desert as real estate space by configuring an inverted desert from within. The New Capital's design thus fully complements previous desert town vision that were developed in touristic or housing contexts in the country and it also reflects design trends elsewhere though in a supersized manner. The question remains, who has to pay for this? Where will this water, now re-directed to one of the country's most politically relevant schemes, be missing? Surely, urban areas in Cairo or sites further downstream that are of less political relevance will see the consequences first.

Besides green spaces another core aspect that the design of the New Capital reveals is linked to the beforementioned inconsideration of the local topographical identity of the site. I had mentioned this in the opening section of this chapter where I spoke about the construction of the grand mosque and church, the two first erected buildings of the whole new city. I want to elaborate on this a little further to show how yet again, the desert is not just perceived as a wasteland and as the mere backdrop of development. For the desert to become the blanc canvas of limitless investment dreams, it had to be made – both in discursive as well as in material (geo-physical) ways. This is part of the New Capital's core design. Not only does it rely on large amounts of fresh water (to supply it daily for the appearance and maintenance of an investable green anti-desert) being structured around the central green valley/river, the New Capital also relies on an almost featureless surface terrain. The city's design resembles that of New Cairo in the sense that there was no consideration or provision of existing topographical features. That is why issues occurred like those of the *sunken* mosque and the *omnipresent* church. But besides those more symbolic problems/errors, the city's layout was designed on a flat surface which actually did not exist in this site. The selected New Capital location is characterized by wadis and limestone plateaus and also hills (Gabal Nasuri, Gabal Yahmmoum el-Asmas, Gabal Anqabiya, Gabal el Qattamiya, see map by Abdelhafiez et al 2022, 4). It was further already heavily altered through the extraction of sand and gravel in the area that took place over the past three decades in correspondence with the heightened construction of new desert towns around Cairo. In direct proximity of the project site some of Egypt's largest cement factories are located: Qattameya Cement, Suez Cement, Al Arabia and El Sewedy as well as La Farge and Helwan Cement (ibid). They sourced the grainy raw

materials from this area, leaving behind a *sympoietic* landscape of sand and gravel extraction with craters that are in average about fifty metres deep. On my visit to the construction site of the New Capital shadowing an earth moving engineer for a day, this is what according to engineer Ramez Kastour made up the bulk of the landscaping work[85]. The goal for the foundational work, that his firm was sub-contracted to do, was to level out the ground, filling the former sand-quarries and levelling out the topographical relief of a 1000 feddan land surface. The job was to move ten million cubic metres of earth. With the help of seventy heavy machines on site for drilling, digging, transporting and rock crushing (including five crushing plants) and 180 workers employed on the project, the team was quite literally *flattening the earth*. This form of landscaping can next to the greening of the desert be seen representative for the desert as real estate space. Because for the desert to be the blanc canvas upon which hundreds of thousands of standardized apartment units can being conceived, it has to be re-configured from within; no matter the costs.

And what will be the potential aftermath of this massive construction? In the case of New Cairo, flush floods are recorded repeatedly precisely because the design did not consider any path for the water to escape to in the case of rare but annually occurring rainfall. Similar projections can be made with regards to phase one of the New Capital's design (Bolleter & Cameron 2021, 13).

That this New Capital project is being further realized despite major financial difficulty facing the government and the country in general is surely linked to the political importance of the project, closely tied to the current presidency of Sisi. How the city will be governed in the future remains to be seen but initial signs suggest that it will be majorly treated primarily as a new investment zone in correspondence with the reforming of the legal infrastructure relating investment zones and the promulgation of the zone-model under Sisi. Currently, the state regulator, the General Authority for Investment and Free Zones (GAFI), is working towards setting up a legal-bureaucratic framework for the New Capital as well as New Alamein and the entire Red Sea Governorate (including New Galala City) as new financial hubs on the Egyptian map. Again, with the hope to attract primarily foreign direct investments but also local financial inputs, GAFI regulates these sites as extra-territorial administrative spaces,

[85] My field trip with Abo Kastour for Construction and Integrated Works took place on 1 February 2020.

run under central regulator with its streamlined, business-friendly investment environment rather than being regulated and governed locally through the respective governorates.[86]

In summary of this last section, we can conclude that Egypt's New Capital, though a timely and specific interpretation of the Sisi-administration of the desert as real estate space, is a product of decades of desert construction and reforms in the sector. It relates to, replicates and magnifies previous attempts of turning seemingly abundant desert land into investable sites of the economy through processes of capitalization. Yet, while arid landscapes in direct proximity to existing productive are vast, the costs for turning them into assets are also immense. At the same time, desert landscapes are little or not at all considered in terms of their specificity. With the goal to attract attention and compete with other local and international investment sites, ever more specular sites are being conceived despite not corresponding to local needs and without considerations of who benefits or what type of longer-term contributions (to the economy or the local housing sector) such projects would generate. As a spatial formula, the desert as real estate space, is being further replicated, it multiplies and mutates, now appearing in mega-scale across arid sites. First, malls and compounds, resort and touristic villages, now, entire urban regions and even regional hubs are being metamorphed to become centrally managed extra-territorial spaces. Yet, as I was highlighting in the case of the New Capital, those desert encampments are not detached from their metabolic context. They heavily rely on the fast-tracked access to critical resources - *cheap* nature and *cheap* labour – and they also influence those contexts. The short-term as well as *longue durée* consequences of those investment dreams will be felt by those that were from the beginning never factored in to benefit from these new sites. So in addition to the negligence and under-servicing of existing urban areas, the burden of the ecological aftermath of the construction frenzy will be certainly for them to bear. Because there is no doubt that a project of that political weight will not be built big, will not be greened and that it will not be spectacular.

[86] This is an ongoing process and some of the most recent information on the bureaucratic structuring of the new financial hubs can be found in the press communication of GAFI or Egypt's State Information Service such as here *GAFI: Egypt to Cooperate with UAE-South African Consortium for Financial Hub in New Capital* 30 September 2023, https://www.sis.gov.eg/Story/187057/GAFI-Egypt-to-cooperate-with-UAE-South-African-consortium-for-financial-hub-in-New-Capital?lang=en-us accessed on 2 January 2024.

Conclusion

The past one and a half centuries have left their marks on arid sites in Egypt; scars of raw material extraction and re-directed flows of water, erased mountains making way for built up cities and touristic amusement parks. Waves of bureaucratic reforms and new infrastructural regimes have re-organized the syntax of these spaces as well as their sociometabolic condition. As this research has shown in detail and on numerous occasions, this was not a very recent process and it definitely did not start with the market opening reforms of the late 1970s, despite what much of the current research on Egypt's modern political economy and its current desert programmes might suggest. Instead, the research demonstrated that economic and political actions have taken place in and given shape to desert areas across the country (but dominantly on the desert's threshold regions) way before this time. This research has managed to delineate historical roots of desert practices with regards to material systems and discursive actions and it surfaced that desert development schemes in Egypt are not new and they are not a symptom of the neoliberal era. Rather, colonial past and capital present are interwoven in capitalizing Egypt's arid regions. What the empirical chapters have shown us is that tools of governance, of science and of economic productivity have been tested out and applied in desert areas and they have allowed for an omnipresent central state to enact its exclusive right over the access to and use of those regions. In addition, desert schemes have facilitated the entry of state-close and state-preferred actors to acquire arid regions and turn those into assets for their own benefit. There are immense costs involved in turning arid sites into productive areas of the economy, considering for instance the amounts of fresh water needed to realize or maintain those projects whether it is a reclaimed corporate farm or a new desert metropolis. However, as such schemes are conceived upon a legal-discursive setting of arid landscapes being an inhuman site that arguably is a wasteland that is under-exploited, those very costs associated with these schemes are not considered enough, not measured and not scrutinized. Today, desert regions in Egypt are the playing field of large corporate actors and of the state including its private or semi-private subsidiaries. They are the ones that benefit from regulations and actions that in the hope to create a business- or investor-friendly (arid) environment for the design of extractive investment schemes that the few will benefit from while the price to pay will be

for the many. This is the result of legal and bureaucratic processes that institutionalized the desert as the exclusive realm of the state. An effect of this is that it is largely state institutions that can alter, extract from, police and also sell the country's drylands while being able to act beyond any form of public accountability and potential interference.

What I showed with this dissertation are some of the cornerstones that have defined this process of the ongoing capitalization of Egypt's desert sites. But instead of a linear chronological account, I have engaged with the subject in a way that displays continuities and leaps, conflicts and overlaps. Rather than an analysis of individual development projects, reviewed in a chronological manner, the research demonstrated how forms of capitalizing arid terrains play themselves out, as modes of operation that organize spatial and spatio-temporal nature/capital relations in vastly uneven ways. The research has revealed that this does not only happen on multiple scales – from bio-engineering on the cellular level to city-planning of the built environment – it has also pointed towards the diversity of tools involved in the process. These are of material and also of legal-administrative nature. The given examples have demonstrated that desert sites provide an opportune topos of orchestrating large-scale, centrally managed interventions that because of their often capital-intensive nature have allowed a newly flourishing class of local elites as well as state-actors to acquire those spaces in support of and supported by an international investment agenda that fosters these uses of space. The discursive shape of the zoning of space has especially over the past three decades allowed to partition local arid territory on the investment map. This is true for various kinds of sectors whether it is in the tourism industry, corporate agriculture, real estate or mining. Particularly the thresholds of the Nile Delta and Valley have seen a large variety of material-discursive interventions that hoped to expand the country's productive territory. But rather than simply adding new agricultural areas to existing ones, land reclamation, as chapter one has argued, re-negotiates the very terms of productivity through re-organizing nature/capital relations. Chapter one also discussed that large-scale agri-businesses are able to dominate in high-value produce markets because of the ways in which they are able to re-engineer the agricultural process as such. Desert farms operate in a controlled environmental setting by which they can guarantee and even predict production. In contrast to their small-holding counterparts in the traditional Valley and Delta regions of the Nile, their access to fresh water for instance – the bottleneck resource in the agricultural process – is being

ensured through the involvement of high-value irrigation systems as well as a favourable legal-bureaucratic context and close ties to key regulating institutions that allow for those large corporate actors (or those belonging to institutions of the public realm) to have prioritized access to much-fought over limited resources such as water.

Further, as seen throughout chapter two, the case of gold mining in the desert east of the Nile Valley has shown that the extraction of resources, and thus value from the desert's underground, happens largely beyond any public oversight where corporate or public actors operate in an environment of hyper-securitized secrecy blurring the vision of the actual owners of the land, the Egyptian public (including Bedouin communities), to know about and to oversee extractive industries, their methods and impacts. This is the result of colonial practices that shaped at the conjuncture of scientific discourse, racist ideas and securitization captured in the image of the inhuman environment. Bedouin communities of the region as well as informal actors of the nearby Valley-areas are caught up today in the ongoing aftermath of those colonial ideas and practices that have come to shape the contemporary forms of extractive capitalization of dryland regions in Egypt. The artisanal mining sector, although symbiotically connected to the more formal mining missions, lives in the contentious frictions of quick economic profits and struggles over land use as well as the ecological effects of digging up and processing the desert's underground.

The immense urban construction that is re-shaping desert areas, again, especially those on the edge (of Valley/Delta and seas) builds new spectacular investment spaces, but again, the question remains, at what price and in whose benefit? Within a global rally for ever more spectacular real estate ventures and with the desire of the state to capture investments of the local elites these spaces are conceived without considerations for existing local conditions or even needs. What the research in chapter three has underlined is that also global investment frenzies have concrete sociometablic impacts. While, for instance, the zoning of spaces creates more insular developments that are managed centrally and are often run as extra-territorial sites, those spaces have a metabolic setting that they are embedded in and that they affect. I have shown this here, taking the case of the New Administrative Capital but as part of the conclusions and in review of the whole of the analysis, I can assess that this is also true for other sectors and developments. What I had termed the *desert as real estate space* is a thus a model of the material-discursive organization of space that permeates across arid sites in Egypt today and applies to sectors such as housing, tourism and also agricultural

production, mining and manufacturing alike. It encompasses a form of standardized operations of territory where centrally managed means of governance rule over and shape distinct areas of production that operate somewhat detached from their immediate contexts. Yet, for them to work, to be economically productive, they rely on *cheap* (and secured) access to local resources and to labour and they deeply alter the (*cheap*) metabolic contexts on which they depend (referring to Patel and Moore's use of *cheap*, 2017). It further replicates models of urban design and governance in connection to modern extractive economies of Egypt's colonial era which the historical tracing of built urban forms in the desert had revealed.

A core take-away from this research is that seeing capitalization of arid lands not as an insular project but rather as something that happens within and thanks to its sociometablic contexts, we can recognize that desert schemes have concrete geo-physical consequences and affect local communities on multiple levels. With this research, I provided a study that takes those connections, dependencies and linkages seriously. It was therefore necessary, in the research, to involve the actions of a multiplicity of actors, to look across scales and temporalities. This allowed me to show that what strikes us as very contemporary issues, such as the private compound culture (and is discussed in the contemporary literature on Egypt's desert cities as phenomenon of Egypt's neoliberal era and within a context of globalization), is not a new invention at all, at least not in the context of the dealing with investment sites in Egypt's arid landscapes. Rather, at the turn of the last century, this was already a well-established model for creating investable assets that (as I have argued) are both part of and apart from their local material-discursive contexts. These colonial forms of organizing territory and extraction of value show themselves as a precursor and enabler of later investment instances. This could only be recognized when those schemes were traced back historically. Now, the ongoing aftermath of colonial practices of extraction and knowledge making processes as well as legal-administrative tools with regards to land management, production and labour have been reviewed and put in relation to the more contemporary practices. Colonial regimes of science and administration, that regulated desert regions in Egypt and have led to the discursive regime of the inhuman, have created the foundation of our contemporary dealings with those sites. This includes the vast securitization and obstructing of desert regions. It has also affected the creation of today's development schemes that are state-led programmes of

monocrop plantations, resort tourism, real estate enclaves and industrial zones while the sociometablic conditions of the desert (including its more-than-human and human inhabitants) have morphed into being the mute, largely invisible backdrop of development.

The research has made – hopefully in an impactful way – a contribution to seeing the processes of capitalization of deserts in Egypt as embedded practices that are elementally linked to fertile regions in Egypt as well as its seascapes. Its contributions rest on showcasing this embeddedness in sociometablic systems and historical continuities, revealing roots and effects of environmental change and injustices in a complex and empirically grounded way. At its core, the research tackles how changes in sociometablic conditions, such as a deteriorating Nile Delta, are historically rooted in modern extractivist ideas and practices that put ecology and certain people into the service of politics and the economy by surfacing the uneven nature of extractivism exemplarily. Ecology (and its ruining) is thus also politics. The research, thus, grounds timely Anthropocene debates into a concrete geographical context, showcasing landscapes undergoing immediate and longue durée changes that are affecting a variety of communities. Eventually, the dissertation argues that arid terrain is an important sociometabolic site that is necessary to investigate and study, both within the web of life and in historical contexts. Intervening in those drylands or turning them inside-out, as we have seen here in the case of Egypt, cannot remain unscrutinised because often the price to pay to pay is extremely high.

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Appendix

Fieldwork Record

Field Research Activity	**On/off the record**	**Date**
Field visit bricks factory El Ikhlaas	On the record	20 January 2019
Interview Mahmoud Riad, Riad Architects	On the record	28 January 2019
Field visit New Capital	-	2 February 2019
Interview Somaya Bahy El Din, CUBE Consultants	On the record	4 February 2019
Interview Prof. Moataz El Mahdy, real estate lawyer	On the record	12 March 2019
Interview EIPR	Off the record, anonymous	2 April 2019
Interview Yahia Shawkat, 10 tooba (online)	On the record	10 May 2019
Interview/Conversation Sheikh Mar'y, Eastern Desert	On the record	28 May 2019
Interview Dan Ringelstein, SOM (phone)	On the record	7 August 2019
Field visit New Capital	-	6 October 2019
Interview Hassan Hussein, Express Contracting	On the record	1 December 2019
Interview Bernard Rettig, SOM, London (in German)	On the record	12 December 2019
Interview George Duncan-Jones, physicist, oil drilling	On the record	10 January 2020
Field visit New Capital and interview Ramez Kastor, Abo Kastour for Construction and Integrated Works	On the record	1 February 2020

Eastern Desert guided walk and interview with Sheikh Mar'y	On the record	29-30 October 2020
Field visit and interview Tareq Tohamy agricultural engineer Noubaraya	On the record	28 November 2020
Interview Hala Barakat, botanist and agricultural researcher	On the record	1 March 2021
Field visit Red Sea Waste Recycling Plant	-	10 March 2021
Interview MAFA agricultural engineer, Samir Auwad	On the record	25 October 2022
Interview Sami Barakat, MAFA legal representative	Parts on the record, parts off the record	25 October 2022
Interview MAFA CEO, Sherif Maghrabi	On the record	25 October 2022
Interview Ahmed Zahran, CEO KarmSolar	On the record	5 December 2022
Interview Noubaraya and Tanboul land owner and farmer, Prof. Mahmoud El Khafif (in German)	On the record	6 December 2022
Interview MAFA sales and marketing representative, Mahmoud El Shishiny	On the record	9 December 2022
Interview Prof. Irena Springuel, desert botanist	On the record	30-31 January 2023
Interview mining, foreign service provider	Off the record, anonymous	15 June 2023
Interview architect and planner of New Capital design phase 2+3	Off the record, anonymous	7 July 2023
Interview Tamer Elsherif, SLB	On the record	21 September 2023
Interview Sheikh Mar'y	On the record	15 October 2023
Interview mining prospecting geologist	Parts on the record, parts off the record	23 November 2023