SUSTAINABILITY GOVERNANCE, SOCIO-ECOLOGICAL LOSS AND PRACTICES OF CONTINUANCE IN MOROCCO'S AGRICULTURE–ENERGY NEXUS

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Dissertation Abstract

This dissertation examines how the global environmental governance–sustainable development nexus normalizes socio-ecological loss through three analytics. First, *techno-political desert imaginaries* trace how historically sedimented portrayals of semi-arid lands as empty, future-oriented spaces of intervention are rearticulated within Morocco's renewable energy transition. *Calculative loss* examines the technoscientific and technocratic mode of agri-energy hydraulic governance, through which water access and agricultural eligibility are selectively measured and classified in ways that justify the exclusion of small-scale farmers, particularly women, and normalizes their loss. *Temporal (sustainable) development amnesia* is the governing practice through which unresolved socio-ecological loss is selectively remembered as either a problem of the past or one that future innovation and development will resolve.

The dissertation applies these concepts to the development of the Noor Ouarzazate Solar Complex, Morocco's first large-scale renewable energy project, inaugurated in 2009, and situates it within Morocco's longer history of agricultural and water governance. Through these entanglements of Morocco's agriculture-energy nexus, I argue that sustainability governance functions as a technocratic and historically sedimented mode of rule that is underpinned by colonial logics which characterize Morocco's deserts and waters as extractable and available for state development priorities and global capitalist ambition. This, in turn, has subordinated desert-dependent ecologies and livelihoods, with especially uneven consequences for women, whose access to land, water and state support is already affected by compounding social exclusions. The dissertation also examines how these logics are extended over time through the upcoming Noor Midelt project, in which the politics of time erases historical responsibility and normalizes ongoing socio-ecological harms through renewed promises of technological innovation.

Having outlined the limits of technocratic sustainability governance, the dissertation's final chapter turns to the place-based relational knowledge practices of small-scale farmers, particularly women and their experiences in caring for their land, family and community, amid ongoing drought and state neglect. It analyzes women's intergenerational and cyclical place-based knowledge-practices, grounded in the ecological-spiritual ethos of *baraka* (blessing), *amana* (sacred responsibility) and *twizi* (communal solidarity/mutual support). These interconnected, lived principles provide an alternative understanding of how small-scale farmers practice sustainability, unbounded by the extractive and linear logics of contemporary sustainability governance.

Dedication

To the *noor* of my life, my son, Malik, you're my *7ob el kabr*.

To the women who opened their homes and their hearts and allowed me into their lives; this *amana* was cherished, held with care, and I hope these pages captured the beauty, struggles and complexities of continued tending to land and water amid intensified drought and technocratic interventions.

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List of Acronyms

ACWA	ACWA Power
AfDB	African Development Bank
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CIF	Climate Investment Funds
CNRST	Centre National pour la Recherche Scientifique et Technique
CO2	Carbon dioxide
COP	Conference of the Parties
CSP	Concentrated Solar Power
CSR	Corporate Social Responsibility
CTF	Climate Technology Fund
DNI	Direct Normal Irradiance / Irradiation
EDF	EDF Renewables / Électricité de France
EIB	European Investment Bank
ESIA(s)	Environmental and Social Impact Assessment(s)
ESA	European Space Agency
ESMAP	Energy Sector Management Assistance Program
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEG	Global Environmental Governance
GGS	Green Generation Strategy
GHI	Global Horizontal Irradiance
GIS	Geographic Information Systems
GMP	Green Morocco Plan
GCF	Green Climate Fund
ID	Identification / national identification
IEG	Independent Evaluation Group
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IRENA	International Renewable Energy Agency
IRESEN	Research Institute for Solar Energy and New Energies
IUCN	International Union for Conservation of Nature
KfW	Kreditanstalt für Wiederaufbau / KfW Development Bank
kWh	Kilowatt-hour
MASDAR	Masdar / Abu Dhabi Future Energy Company
MASEN	Moroccan Agency for Sustainable Energy
MDH	Moroccan dirham(s)
ME	Middle East
MENA	Middle East and North Africa
MW	Megawatt(s)
NA	North Africa
NEAL	New Energy Algeria
NERC	National Energy Research Center

NREA	New and Renewable Energy Authority
NREL	National Renewable Energy Laboratory
NES	National Energy Strategy / national new energy strategy
NGO(s)	Non-Governmental Organization(s)
NoorO	Noor Ouarzazate Solar Complex
NWP	National Water Plan
ONEE (formely ONEP)	Office National de l'Électricité et de l'Eau Potable / National Office of Electricity and Drinking Water
ORMVA	Office Régional de Mise en Valeur Agricole
PPP(s)	Public-private partnership(s)
PV	Photovoltaic
R&D	Research and Development
RA	Results Area
SAPs	Structural Adjustment Programs
SDGs	Sustainable Development Goals
SEGS	Solar Energy Generating Systems
SPIS	Solar-powered irrigation systems
SWANA	South West Asia and North Africa
UAE	United Arab Emirates
UN	United Nations
US	United States
USD	United States dollars
WEF	Water-food-energy

Glossary Terms

al-Razzāq – Meaning 'the provider' and one of the names of Allah
Amana – Sacred responsibility
Anzar – God of Rain
Asida – Moroccan porridge
Baraka – Blessing
Batates – Potatoes
Bir – Well
Couscous – Both small rolled grains and the dish made from them
Dār – House/home
Darija – Moroccan dialect of Arabic
Dura – Sorghum
El hob el kabeer – The big love or love of life
Fram – A term used in Morocco to describe big agricultural farmlands.
Fūl – Favabean
Fusa – Alfalfa plant
Jnān – Small farmland
Jnānat - Small farmlands (plural of jnān)
Karmoos – Fig
Khattera – An underground water tunnel system, with ventilation shafts and vertical wells
Lubiya – Cowbeans
Molokhia – Egyptian spinach
Nakhl – Date palm tree
Sadaqa - Charitable giving
Saqqiya – traditional water channel
Sedd – Dam
Suwaqi – Traditional water channels (plural of *saqqiya*)
Tamazight – dialect of the Amazigh language spoken in the central Atlas.
Tashelhat – dialect of the Amazigh language spoken in southeastern Morocco.
Tlaghenja – Amazigh rain summoning ritual
Twizi – Communal solidarity/mutual support
Wadi – Riverbed
Zanga – Street, alley or land.

Chapter 1: Introduction

After dawn, in hidden and in plain sight, the *jnānat* (small farmlands) of Ouarzazate sit still, offering only the sounds of early morning birds chirping, paired with women's low chatter and giggles. Their harmonious sounds are accompanied by the women's unsharpened knives slashing against the alfalfa plants they gather to feed their livestock. As you look past remnants of morning dew and the seemingly endless and connected greenery, you can see, and in moments of silence, hear the sound of water flowing through the *suwaqi* (water channels) that funnel water onto the fields, feeding the crops, herbs and greenery. This scenery is not exclusive to Ouarzazate but can be seen/heard/felt, though increasingly more fleeting and rare, in the sparse remaining oases in and around Zagora and in the remote farming villages that neighbour Midelt.

In these moments, drought, climate change and the slow erosion of small-scale farming seem like a far-fetched nightmare. However, as you get your footing and rise from the grass bed that offered you cushioning and gaze just far enough, you are met with seemingly contrasting views. Initially, you encounter a monochromatic, seemingly unrevivable, crisp-dry landscape that constitutes the majority of the Drâa-Tafilalet region. In contrast to its dull, harsh surroundings, a long, shiny silver tower reflects the light. This tower is eerily visible from the tops of valleys, the centre of town, to the hidden *jnānat* at the edge of Ouarzazate. The multiple disjunctures between time and space, from greenery to a rocky, soil-like desert to the shiny techno-futures of mega-solar power plants, do not elude the women who farm these lands to provision their families. Nostalgia, mixed with fear and frustration, is often the topic of discussion during their early-morning field runs, which dictate much of what they can provide their livestock and families.

On the contrary, within national and international imaginaries and the technocrats who brought them to fruition, the Noor Ouarzazate (NoorO) is positioned as a model for much of the Global South, particularly in the SWANA (South West Asia and North Africa) region (popularly known as the Middle East and North Africa [MENA]) and across Africa, by signalling a new, modernizing development pathway toward sustainable governance[1]. It is framed as a symbol of a

[1] Imaginaries refer to shared institutionalized ways of envisioning development, or in this case, sustainable development, and the future that shape what is seen as desirable and governable within environmental policy and practice (Mitchell, 2002).

renewable future that seeks to transform Morocco's desert landscapes into sites of large-scale energy production by promising to power global markets while ostensibly preserving the environment through the reduction of CO2 emissions (Bakkoury 2020; Climate Investment Fund: Ouarzazate, n.d., Okpanachi et al., 2022).

The 21st century has seen climate anxieties manifest globally as more frequent and more severe heatwaves, forest fires, floods and droughts. The main drivers of increased global temperatures have been, and continue to be, CO2 emissions from the fossil fuel industry (Intergovernmental Panel on Climate Change, 2023). The emergence of the Sustainable Development Goals (SDGs) in 2012, at the Rio Conference of the Parties (COP) 15, ushered in a global commitment to holistic international development goals that recognized that economically driven development was causing environmental and socio-economic crises across the globe and particularly in the Global South (United Nations, n.d.; United Nations, 2012; United Nations, 2015).

In recent years, the international community, particularly governing bodies like the United Nations (UN) and global financing institutions, have become invested in collaborative sustainable development projects that implement climate mitigation technologies, which, in addition to promoting green alternatives, encompass social justice and democratization (Beardsworth, 2020; Biermann et al., 2017; Brugnach et al., 2014; Gupta & Sanchez, 2012; Raco, 2005). This has ushered in and intensified governance based on sustainable development and environmentalism. According to the International Institute for Sustainable Development (IISD) (Najam et al., 2006, p. 115), "Global Environmental Governance (GEG) is the sum of organizations, policy instruments, financing mechanisms, rules, procedures and norms that regulate the process of global environmental protection".

It encompasses a diverse array of international actors, agreements and processes that aim to integrate environmental and social dimensions into economic development paradigms (Dong et al., 2018; Morin & Orsini, 2014; Najam et al., 2006). Implementing climate mitigation technologies has been central to GEG's sustainable development policies and practices in the Global South, particularly those aimed at transforming agricultural and energy sectors. The World Bank, its Climate Technology Fund (CTF) and Green Climate Fund (GCF), as well as various regional development banks and global private actors, have invested heavily in the Global South states' implementation of climate mitigation technologies that aim to preserve water resources and

provide alternatives to fossil fuels. However, given the historically embedded role of multilateral funding institutions in shaping development trajectories across the Global South, the promise of a global environmentally sustainable transition requires closer scrutiny to examine how sustainability initiatives (re)distribute power and resources, and to identify who benefits and who bears the costs of these transitions.

A foundational premise of this research is that contemporary sustainability interventions do not emerge on a blank slate. Rather, they are embedded within longer histories of colonial resource extraction, hydraulic governance and development planning in the Global South, through which land, water and livelihoods are (re)organized in the service of capitalist accumulation and state consolidation (Moore, 2019). While contemporary top-down sustainability initiatives are framed as forward-looking and corrective, they often reproduce inherited colonial-capitalist logics through technocratic expertise and market-oriented financing mechanisms.[2]

Dissertation Topic and Research Questions

This dissertation situates Morocco's agricultural-energy (agri-energy) nexus within longer colonial-capitalist histories of hydraulic governance and agricultural modernization. I use the agri-energy nexus to describe how renewable energy development is made possible through the governance of land and water and how agricultural life is reorganized through the interconnected and compounding processes of agricultural modernization strategies, land tenure laws and energy and hydraulic infrastructures. Through these layered and entangled configurations of Morocco's agri-energy nexus, I argue that technocratic sustainability governance reorganizes land, water and rural livelihoods in ways that normalize socio-ecological loss for small-scale farmers, particularly women. This analytic of normalizing socio-ecological loss, I demonstrate, occurs through: 1) the

[2] By technocratic, I am referring to forms of governance that give authority to the knowledge of experts, bureaucracies, institutions, corporations and technical procedures. As I demonstrate throughout the dissertation, technocratic governance makes political decisions appear objectively truthful, neutral and necessary. By technoscien(ce)(tific) I am speaking to the forms of scientific knowledge outputs, such as measurements, modelling, mapping, metrics and project studies, among others, that are by state institutions, international financial institutions, renewable energy corporations and organizations, and technical experts to render land, water, energy and rural livelihoods measurable and legible.

production of desert landscapes as available for intervention; 2) the uneven governance of water and agricultural life; and 3) the deferral of responsibility through future-oriented promises of technological improvement and sustainable development.

I examine this process of socio-ecological loss through the GEG–sustainable development nexus, which I define as the convergence of climate finance, policy frameworks, expert practices, technoscientific tools, state agencies and renewable energy actors that authorize and legitimize sustainability interventions across global, national and local scales. This conceptualization of the GEG–sustainable development nexus builds on, but departs from, existing definitions of GEG as the organizations, policy instruments, financing mechanisms, rules and norms that structure environmental governance at the global level (Dong et al., 2018; Morin & Orsini, 2014; Najam et al., 2006).

The project therefore addresses **the following central question:** how is the GEG–sustainable development nexus enacted and legitimized through Morocco's renewable energy and agricultural modernization projects and how does this process organize land, water and livelihoods in hierarchically uneven and gendered ways? This larger question is guided by three interconnected questions:

1. How are these governance frameworks historically and discursively constituted through colonial and Orientalist imaginaries of the desert and water, and how have they developed in Morocco?
2. How is the GEG–sustainable development nexus made both legitimate and actionable through financing mechanisms, institutional arrangements and expert practices that structure climate mitigation in Morocco?
3. How do these governance frameworks marginalize subsistence farmers' place-based socio-ecological knowledge-practices, and what do these practices reveal about the limits of technocratic sustainability governance?

The latter part of the third question reflects the dissertation's effort to move beyond mere critique of capitalist-colonial and technocratic forms of sustainability governance, and to foreground how farmers' place-based knowledge-practices, particularly those of women, demonstrate other ways of understanding sustainability as lived and relational stewardship.

Throughout the project, I take seriously the ways in which 'environmental protection' is

embedded within development planning, climate finance, expert knowledge, state authority and longer colonial-capitalist histories of hydraulic, agricultural and energy infrastructure. Thus, rather than treating the GEG–sustainable development as impartial and historically detached, I approach it as a historically situated governing practice. Through this approach to sustainability governance, I examine how particular configurations of actors, institutions and forms of expertise define environmental problems, authorize technocratic solutions and reorganize land, water and rural livelihoods. I show how these processes make specific visions of development appear natural and necessary, even as they are continuously contested through alternative place-based knowledge-practices of care, stewardship and survival.

The socio-ecological normalization of loss is the main and overarching analytic of this project. In Morocco, the normalization of socio-ecological loss is assembled and governed through climate finance mechanisms, public–private partnerships (PPPs), environmental and social impact assessments, water scarcity metrics, renewable energy targets and sustainability narratives produced by global, national and regional institutions.

It is important to clarify that research does not aim to portray technocrats, international financial institutions, state bureaucracies or corporate actors as uniform, nor does it romanticize small-scale farmers as inherently virtuous subjects outside power. Instead, this dissertation is conscious of and attends to the contradictions and tensions of how particular institutional mandates, financing arrangements, expert practices and (sustainable) development imaginaries co-produce and legitimize dominant ways of knowing and governing land and water, while marginalizing others. My critique is therefore not of individuals as such, but of the governing rationalities through which sustainability governance constitutes socio-ecological loss as an acceptable condition of (sustainable) development. Likewise, farmers' place-based knowledge-practices and their stewardship of land are not treated as 'pure' or universally applicable alternatives to sustainability governance, but as situated liv(ed)(ing) practices that show a different way of understanding environmental governance, one that technocratic frameworks often ignore and devalue.[3]

[3] As I mention in Chapter 6, I define place-based knowledge-practices as situated, relational and intergenerational practices through which farmers learn to read, respond to and care for land, water, animals, families and community.

To trace how the normalization of socio-ecological loss becomes material and operational, I employ three analytically distinct yet interconnected conceptual lenses that are explored throughout the empirical chapters of this project. First, I develop the concept of *techno-political desert imaginaries* by drawing on Natalie Koch's (2021) theorization of deserts as techno-political zones, Timothy Mitchell's (2002, 2011) critique of techno-politics, and scholarship on colonial imaginaries that depict and deduce the desert as a vacant and governable site (El Guabli, 2024; Davis, 2007; Heffernan, 1991; Valcourt, 2025) to demonstrate how deserts are constructed as empty, degraded and optimizable landscapes through an assemblage of postcolonial representations, technoscientific tools such as mapping and environmental assessments and development finance mechanisms produced by GEG actors that position arid regions as renewable energy frontiers (Fairhead & Leach, 1995; Fairhead et al., 2012).

Second, I conceptualize *calculative loss* as a sovereign, technoscientific and technocratic mode of agri-energy hydraulic governance through which water access and agricultural eligibility are measured and classified in ways that deem the sustainability of small-scale farming as secondary to national development and global environmental goals. I build on scholarship on sacrifice zones, feminist political ecology and technocratic governance to frame calculative loss as harm that becomes spatially concentrated and gendered through colonially rooted administrative rationalities that determine which forms of farming are provisioned for and which are disciplined and/or invisibilized, thus making them increasingly difficult to sustain.

Third, I synthesize Ann Laura Stoler's notion of "imperial duress", critical development scholarship on depoliticization, post/decolonial critiques of linear and universal time, and analyses of postcolonial state-making to conceptualize *temporal (sustainable) development amnesia. Temporal (sustainable) development amnesia* names the governing practice through which unresolved and ongoing dispossession and socio-ecological losses are selectively remembered as either already addressed, merely technical, and/or temporarily unfinished, thereby deferring accountability while also legitimizing renewed intervention (Li, 2007). In whole, these analytical lenses allow me to trace how sustainability governance operates through the production and normalization of loss. They demonstrate how land and water are rendered governable so that

These practices are embodied ways of sustaining life that are communally held, cyclically renewed and grounded in long-standing relations with place and community.

dispossession becomes a calculative and administratively rational decision, and how time is politically ordered to position harm as inevitable and/or deferred into future forms of development redemption.

After delineating these governing processes, the dissertation's final chapter shifts the analytic scope away from institutional sustainability governance and toward the everyday, relational, place-based stewardship practices through which land and water are lived, cared for, and made accountable (Haraway, 1988; McGregor, 2013; Tynan, 2021). These knowledge-practices are by no means alternatives to contemporary and conventional approaches to sustainability governance. Rather, these top-down technocratic mechanisms exist in tension with women's place-based stewardship, which is grounded in the *dār–jnān* continuum that binds home and farmland, and in the spiritual-ecological governing knowledge-practices of *baraka* (blessing) (Von Denffer, 1978, p. 172; Nigst, 2025, p. 54), *amana* (sacred trust/responsibility) (Ou-Salah et al., 2024, p. 178) and *twizi* (collective labour/communal solidarity) (Mimouni, 2003).

Background and Case Study

Transitions from fossil fuels to clean energy have become a focal point of the SDGs and of governments worldwide. Previously existing renewable energy sources, like hydropower, as well as newer technologies like wind, solar and green and blue hydrogen, are currently being developed in much of the world, including many Southwest Asia and North Africa (SWANA) states, with Morocco being among the regional leaders in renewable energy endeavours (Tanchum, 2024). Hydropower has long existed in Morocco, first introduced by the French colonial administration and subsequently by King Hassan II in the postcolonial era, beginning in 1967 (Moore, 2019). In 2009, the Moroccan government developed a national new energy strategy (NES) and, in 2015, extended its commitments under the Paris Agreement to meet sustainability targets by 2030 (Sakhraoui, 2024).

These commitments were closely intertwined with, and partly constituted through, Morocco's longstanding engagement with multilateral financial institutions, whose financing frameworks and climate governance priorities have helped set the trajectory of the NoorO project since its inception. In 2009, Morocco announced plans to construct the first phase of a four-phase, large-scale concentrated solar power plant in the city of Ouarzazate, in the country's southeastern region (Rignall, 2016). The Moroccan initiative has received billions of dollars in funding from

various domestic and international public and private lenders and investors, administered through a public-private partnership (PPP) financing model between the debtor, the Moroccan Agency for Sustainable Energy (MASEN) and the Saudi private developer, ACWA Power. According to the World Bank completion report (2025) on the NoorO four-phase project, which started in 2016 and was completed at the end of 2019, the NoorO had received over 4 billion dollars in funding from various multilateral financial institutions.

These institutions include: the European Commission (approximately $100 million USD); the African Development Bank (approximately $400 million USD); the European Investment Bank (approximately $250 million USD); the French Agency for Development (approximately $140 million USD); the German Investment Bank (KfW) (approximately $945 million USD) and the World Bank (approximately $250 million USD) as well as the World Bank administered financing (approximately $120 million USD) (Frisari & Stadelmann, 2015; World Bank, 2025).[4] Interestingly, the Moroccan state did not contribute any funds to finance the project. The project's extensive funding was co-produced alongside narratives of the prospects for renewable energy production and export potentials, which featured the NoorO as a symbol of techno-futurism, where energy demands are met with sustainable solutions (Climate Investment Fund: Ouarzazate, n.d.; ESA, 2004).

That said, Morocco's renewable energy initiatives must be examined alongside broader rural 'sustainable' development projects since the French colonial period, particularly large-scale, historically embedded agricultural modernization strategies and transformative dam infrastructure. Long before sustainability and climate governance entered Morocco's development vocabulary, water control served as a central technology of territorial authority, especially in rural areas. Under French colonial rule, dams, as both energy and irrigation infrastructure, were introduced alongside land tenure laws to construct a hierarchical and centralized hydraulic system managed by the colonial administration (Moore, 2019). The main motive of the colonial administration's hydraulic control was to increase agricultural exports to the metropoles and the electrification of Morocco's mining industry (Moore, 2019; Swearingen, 1987). Through the capture, optimization and

[4] As part of a joint financial closing process led by MASEN, most institutions listed here pledged loans and commitments to the project between September 2014 (project approval) and December 2014 (signing of financing agreement) (World Bank, 2025).

redirection of Morocco's waterways, the colonial administration sought to privilege colonial settlers and Moroccan elites while limiting small-scale farmers' access to irrigation and water resources (Swearingen, 1987).

I draw on colonial and early postcolonial agricultural and (hydro)dam strategies and policies to demonstrate how historically sedimented the convergence of agricultural modernization strategies and hydraulic governance, or what I term here as the agri-energy nexus, is even prior to the introduction of a renewed agricultural strategy, the Green Morocco Plan (2008) and Morocco's renewable energy ambitions vis-à-vis the NoorO inauguration in 2009. Rather, the colonial-capitalist logics of Morocco's agri-energy nexus under French rule, enacted through technocratic and calculative governance, are temporally rearticulated under new promises of desert transformation and development deliverables, as well as technological innovation. The introduction of the GMP, a year before the announcement of Morocco's renewable energy ambitions, marked the largest agricultural development plan in Morocco's history. It sought to transform "its agricultural sector, thereby making [it] the main driver for economic growth and for the alleviation of rural poverty" (Mathez & Loftus 2023, p. 87). According to the African Development Bank, a funder of the GMP, "The specific objective [of the GMP] is to improve the business climate and ensure sustainable agricultural water management" (African Development Bank - Green Morocco Plan Support Program, 2015).

The GMP, like Morocco's renewable energy policy, its solar projects particularly, has also received immense funding from multilateral development banks like the World Bank (approximately $408 million USD), the Global Environment Facility (GEF) (approximately $4.35 million USD), the African Development Bank (more than $132 million USD) and the European Investment Bank financed the Programme National d'Économie d'Eau en Irrigation (approximately $47 million USD), as well as private international and national funders (African Development Bank, 2015; European Investment Bank, 2012; Ministère de l'Agriculture, 2019; World Bank 2011, 2013, 2016). During most of GMP's administrative years (2008–2020), Morocco's agricultural sector's GDP doubled, from US$1,727 in 2000 to US$2,948 in 2019 (World Bank, 2020).

However, according to the World Bank (2024), Morocco's agricultural industry, which exports roughly 40 percent of its produce, has faced significant pressure from declining rainfall, the COVID-19 pandemic and the war between Russia and Ukraine. These overlapping pressures

contributed to reduced agricultural output and rising food prices, with food price inflation reaching 15 percent. To address Morocco's agricultural sector volatilities, the Green Generation Strategy (GGS) was introduced in 2020 by King Mohammed VI with a presumed shift from the GMP shift of production-centred strategies to a people-centred strategy that seeks to address Morocco's agricultural crises with job creation, youth employment and human-capital development, particularly in disadvantaged rural areas (World Bank, 2024).

Morocco's Drâa-Tafilalet region has become a central site for articulating these agri-energy visions. The Drâa-Tafilalet region, located in southeastern Morocco, is largely semi-arid and has long experienced water scarcity. Since 1980, Morocco has experienced a more than 25 percent decrease in rainfall, and the Drâa-Tafilalet region, including much of Morocco's South, has been particularly affected (Balaghi et al., 2024). The World Bank ranks Morocco among nations with the lowest per capita water resources (Moutii, 2025). As such, the Drâa-Tafilalet region serves as a strategic site where large-scale hydraulic infrastructure, renewable energy megaprojects and multilateral development interventions converge and a critical empirical site for examining how multilateral environmental governance is translated into practice and lived locally.

In Morocco, small-scale livelihood farming accounts for 60 percent of farmers, and 79 percent of the 'poor' live in rural areas (Many, 2025; World Bank, 2024).[5][6] However, subsistence farmers are disproportionately marginalized within Morocco's dominant agricultural development imaginary, which privileges export-oriented, market-integrated and technocratically managed forms of farming (Akesbi, 2013; 2019; Faysse, 2015; Mathez & Loftus, 2023). Rather, large-scale agricultural farmers, metropolises and state elites have benefited from technocratic approaches to sustainable development and governance (Fico, 2022; Mekouar, 2018; Moutii, 2025; Yousifi, 2000). This raises the question of how technocratic climate and development solutions are experienced by those who live in proximity to them and how their relations to land and water are (re)shaped in the process. This question is particularly pertinent, as in many postcolonial patriarchal states of the Global South and particularly within rural small-scale farming

[5] Over 40 percent of the workforce is employed in the agricultural sector.
[6] Farming makes up a significant portion of Morocco's GDP (approximately 15 percent) (International Trade Administration, 2025).

communities, women are often those who care for land, water, livestock and their families (Bossenbroek & Ftouhi, 2021; Davies, 2023; Women Watch, 2011). Despite this, in much of the Global South, particularly in the SWANA region, rural women face compounding and exacerbating gendered inequalities, including a lack of access to education, land and social welfare and are largely excluded from decision-making and policies that affect their everyday lives (Charrad, 2001; Salime, 2016).

Studying the Agri-Energy Nexus through the NoorO

The NoorO provides a critical site for examining how the GEG–sustainable development nexus normalizes loss. The NoorO is presented here as more than technological infrastructure, arguably the largest CSP plant in the world, but as a focal site through which I examine the technocratic sustainability governance of renewable energy as part of a broader agri-energy hydraulic nexus. This nexus is constituted through the intertwined and historically sedimented governance of land and water, overlapping technocratic frameworks and temporal development objectives that link agricultural modernization to renewable energy ambitions.

Water is the thread that connects energy production, agricultural policy, land governance and the everyday ways farmers negotiate their survival. Paying attention to water makes it possible to trace how the turn towards technocratic sustainability governance relies on differentiated and selective access to land and water, and how this, in turn, normalizes the loss of agricultural livelihood and the ecological stability of semi-arid desert lands. This is especially visible across the liminal geographies of central and southeastern Morocco, where renewable energy infrastructures, water scarcity, agricultural modernization strategies and small-scale farming intersect.

This more nuanced reading of the NoorO and Morocco's renewable energy transition, and environmental governance more broadly, allows me to move beyond taking for granted who are deemed 'affected communities' in appraisal documents and environmental and social impact assessments (ESIAs), and the narrow institutional categories through which affected areas are assessed. Analyzing the enmeshment of the NoorO with agricultural and hydraulic infrastructures allows me to discern the historical and broader technocratic and infrastructural web through which socio-ecological loss becomes cumulative and cascading. Small-scale farmers, particularly women and the compounding gendered exclusions they face, are central to this analysis because their

experiences make visible forms of harm that are often displaced from official project boundaries, including: declining water access, altered agricultural livelihoods, gendered exclusions from land and state support, and consequently, the erosion of place-based knowledge-practices and lifeways.

Literature Overview

This dissertation is informed by and engages with three broad scholarly literatures: global environmental governance, sustainable development approaches and critiques, and place-based and relational epistemologies. These literatures inform my analysis of how the GEG–sustainable development nexus becomes legitimate and actionable through the technocratic organization of land, water, time and livelihood, and how this organization normalizes compounding socio-ecological loss as necessary, manageable and deferrable. Simultaneously, this literature allows me to centre the place-based knowledge-practices of small-scale farmers, particularly women, to both draw out the limits of technocratic sustainability governance and how their stewardship over land enacts 'sustainability' as a liv(ed)(ing) and collective practice of care to and for land, water and community.

To begin, mainstream GEG–sustainable development approaches conceptualize sustainability as a problem of institutional coordination, policy design and implementation across scales, which emphasize the role of international organizations, multilateral agreements, financing mechanisms and regulatory frameworks in facilitating cooperation toward shared environmental goals (Najam et al., 2006; Gupta & Sanchez, 2012; Biermann et al., 2017). This literature often assesses governance effectiveness by optimizing technological innovation and market-based solutions, such as PPPs (Andonova, 2010; Keohane & Victor, 2011; Young, 2008).

Critical political economists challenge mainstream institutional and technocratic governance frameworks by demonstrating how sustainability governance frequently depoliticizes environmental problems and reproduces existing inequalities. They note how the GEG–sustainable development nexus unfolds through project-based financing, loan conditionalities and expert-led development practices that privilege private and financial actors and redistribute responsibility and displace social and ecological costs disproportionately onto marginalized communities (Lohmann, 2011; Newell & Paterson, 2010; Newell, 2021; Gabor & Sylla, 2023).

What these scholars demonstrate is that while GEG–sustainable development scholarship has paid close attention to institutional design and governance processes, it has been less attentive

to how sustainability governance operates in practice through historically embedded relations of power and knowledge that structure institutional authority, and multilateral financing that redistributes risk onto already marginalized peoples. Building on the insights of the aforementioned literature, I examine how the GEG–sustainable development nexus is made in practice through the financing, assessment and implementation of Morocco's agri-energy and water governance projects. I illustrate how the GEG–sustainable development nexus is assembled and legitimized through the actors involved and their institutional technocratic outputs, including policy documents, environmental assessments, metrics and expert knowledge. These practices authorize intervention in Morocco's renewable energy transition and agricultural modernization policies by deeming socio-ecological losses measurable, manageable and administratively acceptable within top-down sustainability governance.

While critical political economy scholarship shows how mainstream environmental governance facilitates capitalist accumulation through market mechanisms, financialization and PPPs, it is less attentive to how particular environments are constituted as objects of intervention in the first place. In the Moroccan case, large-scale renewable energy projects do not proceed only through financing structures, investment logics and technocratic governance instruments; they also, as will be demonstrated subsequently, depend on prior representations of desert land, water scarcity and rural livelihoods that make these territories appear underused, deficient and available for transformation. To understand how projects such as the NoorO and Noor Midelt become legitimate sites of sustainability interventions, I turn to scholarly critiques of temporal colonial (environmental) imaginaries and (sustainable) development discourses on arid lands that examine how governance operates through historically sedimented logics.

Scholars interested in the temporal and epistemic foundations of international relations and development examine how global hierarchies are reproduced through the organization of time, knowledge and expertise. For instance, Anna M. Agathangelou and Kyle D. Killian (2011; 2016) show how the construction of universal scientific knowledge is inseparable from the secularization of universal time, which renders time linear and universal. Within this temporal framework, societies are positioned along a developmental continuum that casts Western experiences as the horizon of modernity while placing other societies as temporally lagging or suspended, thus requiring intervention (Agathangelou & Killian, 2011; 2016; Chakrabarty, 2000; Grovogui, 2006).

Scholarship on the politics of development governance further shows how these temporal hierarchies materialize through depoliticized, objective technocratic knowledge that presents development interventions as technical solutions, which foreclose the political and historical dimensions of the project. Timothy Mitchell (2002; 2011) demonstrates how development expertise relies on forms of knowledge that can be repeated across contexts, thus allowing governance models to circulate globally while detaching them from local histories and political struggles. Similarly, James Ferguson (1994) and Arturo Escobar (1995, 2011) both show how modernist development discourse reinterprets political contestation over land and resource extraction as technical problems of management and amelioration.

Scholars studying the historical roots of environmental governance in the SWANA explore how colonial environmental imaginaries depicted deserts and native land-use practices as degraded, poorly managed and unproductive landscapes in need of transformation (Davis, 2007; Swearingen, 1987). These portrayals justified colonial irrigation projects and agricultural development efforts aimed at controlling land and water use. More recent research shows that these imaginaries continue to influence contemporary sustainability governance, in which deserts are often seen as both fragile ecosystems and underutilized landscapes that require transformation through large-scale renewable energy infrastructure (Koch, 2021; Hamouchene, 2016; El Guabli, 2024).

These literatures are central to the analytics I employ in this dissertation as they demonstrate how intertwined temporal and spatial technocratic logics of sustainability governance (re)organize and govern certain landscapes and populations. However, this set of literature often leaves unexamined how ecological imaginaries are differentially lived and contested across social relations. In particular, they tend to overlook the ways in which governance distributes responsibility and loss along gendered lines. Here, feminist critiques of environmental governance provide key insights for this analysis on how land, water and energy governance are structured through gendered relations of power that influence and structure whose knowledges are considered legitimate, who is a recognized subject and whose losses are minimized within the GEG–sustainable development nexus.

Feminist scholars show how gendered hierarchies of power are embedded in postcolonial land and resource governance through gendered property regimes, exclusions from decision-making and hierarchies of knowledge production. Feminist postcolonial scholars demonstrate how

colonial land regimes institutionalized gendered exclusions that continue to structure access to land, compensation and participation in postcolonial contexts (Charrad, 2001; Bhandar, 2018; Salime, 2016; Kahlaoui, 2022). Feminist analyses of renewable energy and development projects further show how women are frequently marginalized from consultation, compensation and benefit-sharing processes, particularly where land acquisition intersects with collective or tribal land regimes (Ryser, 2019; Houdret, 2012). Feminist scholarship also highlights the knowledge-ordering dimensions of environmental governance. This is especially the case in Morocco, where scholars show how women's agricultural and everyday ecological knowledge-practices are routinely devalued within formal agricultural governance, especially when land ownership determines who is recognized as a legitimate development subject (Bossenbroek, 2016; Bossenbroek & Ftouhi, 2024; Fico, 2022; Ou-Salah et al., 2023; Najjar et al., 2023).

These critiques are foundational to this dissertation's analysis because they make visible how environmental governance distributes responsibility, loss and recognition through gendered ecological knowledge-practices. However, these critiques do not move beyond documenting exclusion within dominant sustainability governance frameworks. Thus, to move beyond this limitation, I turn to relational, Indigenous and feminist epistemologies to not only elucidate the limitations of technocratic forms of environmental governance but also to conceptualize the place-based knowledge-practices of small-scale farmers, particularly women, as collective and continuous forms of environmental governance.

Feminist, postcolonial and science and technology studies scholars challenge the presumed neutrality and universality of scientific knowledge that underpin environmental governance. This literature set demonstrates how dominant forms of expertise are embedded in colonial, capitalist, patriarchal and racialized power relations (Harding, 2008; Shiva & Mies, 1993). Claims to objectivity often function to diminish the social locations and relations from which knowledge is produced, while situating hierarchical Western epistemologies as universal.

For instance, the work of Agathangelou & Killian (2011; 2016) on "defatalization" challenges the fatalism of colonial and Western conceptions of universalism and the violent binaries they produce. For Agathangelou and Killian (2011, p. 4; 2016), "defatalization" exposes the contingencies of fatalistic logics that present existing political and social arrangements as inevitable and open the possibilities for alternative "multiple worlds" and futures. Central to this

project is the recognition that other future-making imaginaries require investigating alternative ways of knowing, particularly those obscured or marginalized by universalizing epistemologies.

Feminist scholars interested in questions of knowledge production and other-worldmaking show how situated epistemologies allow us to recognize knowledge as embodied and partial to specific social and ecological relations (Haraway, 1988; Salleh, 2017; Simpson, 2014, 2025; Starblanket & Stark, 2018). Specifically, Indigenous feminist scholars conceptualize knowledge as a lived and intergenerational practice grounded in relationships with land, water and community (Simpson, 2014, 2025; Starblanket & Stark, 2018).

I build on these epistemological interventions to critique the dominance of expert-led technocratic sustainability governance. I turn to place-based (eco)-spiritual knowledge-practices such as *baraka* (blessing) (Von Denffer, 1976; Nigst, 2025), *amana* (sacred trust and responsibility) (Gada, 2014; Ou-Salah et al., 2023) and *twizi* (collective solidarity/mutual aid) (Mimouni, 2003). In Morocco's agri-energy landscape, these concepts are practiced through everyday forms of care that organize land and water within the *dār–jnān* continuum. These liv(ed)(ing) practices, subsistence farmers, particularly rural Amazigh women, "defatalize" loss by refusing to treat drought, dispossession and state withdrawal as inevitable conditions (Davidson, 2011, p. 261; Agathangelou & Killian, 2011, p. 32; Agathangelou & Killian, 2016).

Methodology and Research Design Overview

This dissertation adopts a qualitative, multi-scalar research design grounded in feminist and decolonial epistemologies and their attentiveness to power, scale and knowledge production within the GEG–sustainable development nexus.[7] Empirically, it combines three primary methods: 1) semi-structured interviews with institutional and technocratic actors involved in Morocco's renewable energy, water and agricultural governance; 2) in-depth interviews with small-scale farmers, predominantly Amazigh women, living in regions directly affected by large-scale agri-

[7] By multi-scalar, I am referring to the process of tracing power across global institutions, postcolonial state structures, regional governance bodies and local livelihood practices to examine how sustainability governance is assembled, understood and contested across these interconnected sites and demonstrates how governance logics materialize differentiated outcomes across scales.

energy and hydraulic infrastructure; and 3) a systematic discourse analysis of policy documents, project assessments and institutional communications produced by state agencies, multilateral development banks and corporate actors between 2004 and 2024.

Fieldwork was conducted during multiple research trips to Morocco in 2023 and spanned national, regional and local scales, including Rabat, Casablanca, Marrakech, Midelt and the southeastern Drâa-Tafilalet region (Ouarzazate, Zagora and surrounding villages). Interviews with institutional actors are analyzed as situated expressions of technocratic expertise embedded within specific political–economic mandates as opposed to taken-for-granted accounts of policymaking.

Interviews with farmers are used as critical sites for elucidating how water scarcity, land insecurity and livelihood erosion are lived, negotiated and endured under longstanding agri-energy governance processes. These methods enable me to analyze how sustainability is imagined, legitimized and contested across scales and to link global climate finance, renewable energy infrastructure, water governance and farmers' everyday practices.

It is important to note that rather than separating methods by chapter, the dissertation mobilizes these approaches in different configurations across the empirical chapters to interrogate how renewable energy transitions reconfigure land and water within Morocco's agri-energy nexus.

Chapter Breakdown

This dissertation is comprised of seven chapters. After the introduction, Chapter 2 develops the dissertation's literature review and methodological approach. It situates the project at the intersection of GEG–sustainable development scholarship, postcolonial and feminist critiques of development and decolonial work on relational and embodied sustainabilities. The chapter also introduces the dissertation's empirical grounding in southern and central Morocco, particularly the Ouarzazate, Zagora, Midelt and their surrounding communities, where renewable energy expansion, agricultural policies, hydraulic governance and small-scale farming knowledge-practices converge in distinct but connected ways. It then examines the multi-scalar qualitative methods, field sites and analytical strategies that guide the chapters that follow.

Chapter 3 marks the beginning of the dissertation's empirical analysis by examining how the GEG–sustainable development nexus becomes, in part, legitimized through the co-production of the desert as a singular deprived site, and thus, an object of environmental intervention and transformative sustainable infrastructure. I develop the concept of *techno-political desert*

imaginaries to trace how colonial imaginaries, technocratic expertise, development finance, state-led renewable energy ambitions and sovereign performances work together to make large-scale solar infrastructure appear necessary, rational and sustainable. Through these intersecting processes, technocratic sustainability governance has contributed to the marginalization of the desert as a liv(ed)(ing) socio-ecological site that is produced through longstanding subsistence farming.

Building on the desert imaginaries established in Chapter 3, Chapter 4 introduces the concept of *calculative loss* to analyze how the gradual and compounding loss of small-scale farming is administratively produced and normalized within Morocco's agri-energy hydraulic governance. By centring water allocation, environmental assessments, infrastructure siting and dam release schedules, combined with land licensing and agricultural eligibility thresholds, the chapter shows how expert metrics and institutional narratives make the socio-ecological loss experienced by farmers appear as normal and manageable aspects of technocratic sustainability governance. These contemporary mechanisms of exclusion are rooted in colonial hydraulic regimes that centralized water control and prioritized export-oriented agriculture over small-scale farming practices.

Chapter 5 examines how GEG–sustainable development paradigms operate through temporal strategies that defer responsibility for socio-ecological loss. I conceptualize this as temporal (sustainable) development amnesia, which names the governing practice through which past and ongoing dispossession, environmental degradation and livelihood loss are selectively remembered in ways that make them politically untimely, framed either as already resolved or as transitional setbacks to be addressed through future technical reform. By focusing on project redesigns, financing renewals, assessment updates and policy "reform" narratives surrounding the NoorO and Noor Midelt solar complexes, the chapter demonstrates the ways in which governance failures are repeatedly absorbed into forward-looking sustainability narratives that maintain institutional legitimacy while avoiding structural accountability and redress.

Chapter 6 shifts the analytic lens from institutional and technocratic forms of governance to the place-based knowledge-practices through which land and water are lived, cared for and made accountable. The chapter explores rural women's embodied accounts of socio-ecological stewardship, using ethnographic narratives and semi-structured interviews. It highlights concepts such as *baraka* (blessing), *amana* (sacred trust and responsibility) and *twizi* (collective

solidarity/mutual aid). These knowledge-practices of relational ethics exceed the technopolitical, calculative and temporal amnesia of sustainability governance and illuminate what technocratic sustainability governance overlooks.

Chapter 7 concludes the dissertation by synthesizing its central argument that Morocco's renewable energy transition must be understood within a broader agri-energy hydraulic nexus, in which technocratic sustainability governance reorganizes land, water and livelihoods. The chapter outlines the dissertation's contributions, policy implications and limitations.

Chapter 2: Literature Review and Methodology

Literature Review Introduction

This literature review is organized around three broader scholarly works: mainstream approaches to the GEG-sustainable development nexus, critiques of GEG–sustainable development and place-based relational epistemologies, giving specific attention to the latter two. These literatures help explain how the loss of land and water becomes depoliticized and institutionalized through technocratic sustainability governance, and where/how dominant mainstream approaches do not adequately take into consideration the historically sedimented power relations that are imbricated within environmental governance

Building on this literature, the dissertation understands sustainability governance as a historically situated governing practice that serves as a site through which specific universalist and technocratic visions of development futures are pursued and naturalized as beneficial and necessary. The dissertation focuses on Morocco's agri-energy nexus to demonstrate how sustainability governance is structured by the entanglements and tensions of colonial governance and development interventions and how these histories and their sustained logics contribute to the ongoing normalization of socio-ecological loss. It ends by examining how small-scale farmers, particularly women, enact place-based practices of stewardship and survival of otherwise marginalized forms of sustainability.

Review of Global Environmental Governance – Sustainable Development Approaches

Overview of Mainstream Approaches

Mainstream approaches to GEG-sustainable development provide the lens from which to better understand the institutional and market-based means by which global environmental goals are interpreted into national policies. For instance, liberal-institutionalist approaches to the GEG–sustainable development nexus advocate strengthened, well-designed institutions to resolve collective action problems by aligning state interests with global environmental goals (e.g., Andonova 2010; Keohane & Victor 2011; Stavins 2000; Young, 2008). This can be seen in the work of Oran Young (2008), who underscores the impetus for robust institutional arrangements that are able to adapt, problem-solve and accommodate diverse interests and scales of

environmental governance. Moreover, Robert O. Keohane and David G. Victor, in their text "The Regime Complex for Climate Change" (2011), like Young (2008), discuss the "regime complex" of climate governance as a fragmented, overlapping set of institutions and agreements. They argue that a decentralized, complex regime offers benefits to climate governance that accommodate diverse interests and foster cooperation among states. Mainstream approaches and their emphasis on institutional cooperation are often accompanied by an increasing reliance on market-based neoliberal mechanisms. In Morocco, market-based approaches, such as public-private partnerships (PPPs), are especially pertinent to understanding the ways in which large-scale renewable energy projects such as the NoorO and the Noor Midelt are financed and governed through partnerships among the state, international financial institutions and private firms.

Market-centred approaches to addressing climate change utilize a liberal international relations framework that is based on economic incentives as a means of promoting sustainability. For instance, Robert N. Stavins (2000) highlights how market-centred approaches like carbon pricing, cap-and-trade systems and renewable energy credits incentivize innovation and allow for flexibility in achieving environmental goals. Moreover, Liliana B. Andonova (2017) notes that PPPs, such as those used in Morocco's renewable energy endeavours, foster innovation in the renewable energy sector. For Andonova, international organizations like the World Bank and the United Nations serve as entrepreneurs by facilitating these partnerships to mobilize resources, improve policy implementation and tackle complex environmental challenges, such as climate change and biodiversity loss.

While this GEG–sustainable development scholarship has embraced market-based mechanisms as solutions to global climate challenges, critical scholarship challenges this by contending that market-driven climate governance further entrenches power asymmetries by privileging economic growth over socio-environmental justice.

Critical Political Economy Critiques of GEG–Sustainable Development Approaches

The work of critical political economists provides the theoretical grounding from which I move from examining how sustainability governance is institutionally organized to explaining who benefits from these governance structures and how costs and risks are distributed. Critical political economy approaches to environmental governance analyze how climate-centred approaches within mainstream approaches of GEG–sustainable development initiatives are embedded within

capitalist relations of accumulation, privatization and financialization that privilege profit and growth over sustainability and equality (e.g., Boehmer-Christiansen, 1999; Escobar, 2018; Ervine, 2007; McAfee, 1999; Newell, 2008; Okereke, 2007; Swyngedouw, 2015). Peter Newell, for example, argues that liberal institutionalism often overlooks the influence of private power networks, such as multinational corporations and multilateral development banks, which can prioritize economic growth over sustainability. Similarly, Chujwumerije Okereke (2007), in his book *Global Justice and Neoliberal Environmental Governance,* critiques what he terms "neoliberal environmental governance" by noting that dominant approaches, such as liberal-institutionalist approaches to sustainable development, are rooted in neoliberal interpretations of justice. According to Okereke (2007, p. 9), such approaches are "… elitist, technocratic and undemocratic", and easily become "instrument[s] of domination…in the hands of the more powerful".

Katherine McAfee's (1999) work further extends critiques surrounding neoliberal approaches to GEG. McAfee's critique of green developmentalism is especially useful for understanding how environmental protection can be made compatible with market-led development. For McAfee, green developmentalism "⋯attempts to maintain a separation between environmental problems and broader political-economic issues" and promotes "a bias toward technological solutions and away from social-structural change" (1999, p. 135). Through her intervention, McAfee demonstrates the ways in which green developmentalism operates by isolating nature from its spatial and socio-historical context.

Kate Ervine (2007), in "The Greying of Green Governance", provides a more contemporary critical examination of GEG and neoliberalism, specifically through the World Bank's Global Environment Facility (GEF). Ervine demonstrates how, while the GEF ostensibly promotes sustainability, it often serves to entrench power hierarchies and neoliberal market logics and thus exacerbates socio-environmental inequalities. This is further articulated by Sonja A. Boehmer-Christiansen (1999), who examines the World Bank's involvement in climate change initiatives and its implications for global environmental governance. Boehmer-Christiansen (1999) discusses how the Bank's climate initiatives often reflect a neoliberal agenda which prioritizes economic efficiency, privatization and the expansion of global markets over equitable and community-driven sustainability solutions. She provides the example of the Bank's yearning "to

take control of the international carbon trading market worth [at the time] 90 billion pounds by 2020", which she notes benefits powerful economic actors and neglects to address the root causes of global environmental degradation (Boehmer-Christiansen, 1999:28).

Overall, critical political economy interventions to environmental governance demonstrate that neoliberal GEG–sustainable development paradigms are largely structured through institutional arrangements that (re)distribute authority, risk and accountability in ways that privilege powerful economic and political actors. When using a critical political ecology lens to examine the Morocco case, the issue does not become solely about (re)distribution, but about how the terms of distribution are defined, whose claims are recognized and, consequently, whose losses become normalized within sustainability governance. This requires attention to the specific governance instruments through which neoliberal power is operationalized in practice. To understand how these governance logics are enacted on the ground, it is therefore necessary to examine governance mechanisms, such as PPPs, through which environmental and energy transitions in the Global South are financed and implemented.

PPPs are especially important to my analysis because they are a principal mechanism through which Morocco's large-scale renewable energy transition is financed and implemented. I therefore draw on critical scholarship on PPPs to analyze how these partnerships are positioned within sustainability governance, how they redistribute authority and financial risk, and the accountability issues they raise among the actors involved. Scholars examining PPPs in environmental governance highlight their limitations, particularly regarding the consolidation of neoliberal power structures, which results in an accountability vacuum (e.g., Bäckstrand, 2008; Pattberg & Widerberg, 2015; Fuchs et al., 2011). For instance, Karin Bäckstrand (2008) critiques the privatization of environmental governance through the dominance of PPP funding structures, whereby decision-making authority shifts from public actors (states and international organizations) to private actors (e.g., corporations), leading to a democratic deficit where affected communities have limited participation. Moreover, Doris Fuchs, Agni Kalfagianni and Tetty Haksavinga (2011) examine how corporate actors leverage PPP collaborations to steer sustainability agendas that align with their profit-driven interests. They highlight how corporate actors use sustainability initiatives to enhance their public legitimacy while maintaining unsustainable practices that contribute to environmental degradation.

When examining renewable energy transitions, critical political economists draw on various case studies to demonstrate that the governance of these transitions is not as 'green' as purported or advertised. Through their case studies, they provide a bleak picture that demonstrates how energy transition governance is embedded in global capitalist and hierarchical structures that prioritize profit and growth over sustainability and equity (e.g., Bebbington, 2012; Flores-Fernandez, 2020; Furnaro, 2020; Lohmann, 2011; Newell & Paterson, 2010; Newell, 2021; Michalena & Maxwell Hills, 2013).

For instance, Larry Lohmann (2011) shows how carbon trading commodifies climate governance by converting complex socio-ecological processes into abstract, tradable units, thereby depoliticizing issues of inequality and creating new markets and opportunities for accumulation. This allows climate governance to postpone fundamental decarbonization efforts and shifts pollution and remediation responsibilities onto poorer societies. Peter Newell & Matthew Paterson (2010) similarly contextualize the rise of emissions trading and the Clean Development Mechanism (CDM) within the neoliberal restructuring of the global economy. For Newell & Paterson (2010), partnership-based governance turns carbon-reduction goals and climate action more broadly into opportunities for investment and market expansion. Peter Newell's later work (2021) extends this critique by showing how contemporary energy transitions are increasingly organized through the de-risking of investment, the creation of enabling environments for private capital to dictate the type and scope of transitions, and the production of new asset classes. This, in turn, often shifts risk onto the public domain.

Within the realm of renewable energy transition governance, Andrea Furnaro's (2020) case study of Chile illustrates the ways in which neoliberal governance approaches can stimulate rapid growth in utility-scale renewable energy. Alternatively, according to Furnaro (2020), this model increases socio-ecological impacts on both the environment and nearby communities, particularly around issues of land-use displacement and conflict. Christian Flores-Fernandez (2020), who also examines the case study of Chile, provides further details on the local, social and environmental impacts of neoliberal energy transitions. He shows that the expansion of renewable energy projects, driven by market liberalization and private-sector participation, has often benefited private entities and large funding institutions while the needs of local communities are often neglected or forsaken. Flores-Fernandez notes that wind and solar farms require substantial land

areas, often leading to land-use conflicts with local communities and biodiversity loss in the region.

Building on the impacts of neoliberal logics in renewable energy transitions, scholars have recently begun to link large-scale renewable energy interventions with the concept of 'sacrifice zones' to describe how environmental harm is unevenly concentrated in vulnerable communities for the benefit of capitalist expansion (Bullard, 1990; de Souza, 2021; Lerner, 2010; Wallace et al., 2025). For instance, Ross Wallace et al. (2025) provide an analysis that demonstrates how renewable energy frontiers can reproduce familiar patterns of peripheralization, wherein rural regions are positioned as expendable landscapes for national decarbonization goals and investor returns. This literature is relevant to my conceptualization of calculative loss in Chapter 4, which pivots the focus from where socio-ecological harm is concentrated to the governance processes that institutionalize and justify such losses.

While this body of literature is crucial for showing how renewable energy governance reproduces global inequalities through neoliberal marketization, financialization and partnership-based governance, it does not grapple with how capitalism's embeddedness in GEG–sustainable development's longer histories of colonialism, resource control and dispossession. In the Moroccan case, the issue is not just about redistribution per se, but the particular and layered ways in which redistributive arrangements are situated within the hierarchical and technocratic governance of the French administration and, consequently, in the postcolonial moment, structured through unequal power, limited participation and export-oriented development priorities that displace costs disproportionately onto rural communities. I draw on and extend these critiques through my examination of Morocco's large-scale renewable energy projects – the NoorO, whose first phase became operational in 2016 and the Noor Midelt, whose construction is ongoing. I show how these projects utilize neoliberal renewable energy governance through PPPs, financialized investment structures and technocratic assessment frameworks that prioritize economic efficiency and foreign capital over social and ecological redistribution. Thus, when examining the NoorO alongside the Noor Midelt solar plant, the patterns of colonial-capital accumulation emerge as continued land dispossession, water diversion and (re)allocation, and the consequential intensification of the loss of small-scale farming livelihoods in the Drâa-Tafilalet region.

Whereas critical political economy scholarship demonstrates how neoliberal environmental governance promotes global capitalist imperatives through market tools such as

financialization and risk deferral, critical development scholars make the argument that these processes are sustained because development serves as a governing framework. This depoliticizes the socio-ecological losses associated with development paradigms and justifies ongoing interventions in the Global South.

Postcolonial Critiques of GEG–Sustainable Development Approaches: Time, Technoscience and the Depoliticization of Development

Postcolonial scholarship provides the lens from which to analyze the ways in which contemporary interventions are rooted in and structured through longer colonial histories of development and technoscience. Postcolonial international relations scholars argue that temporal ordering is a key mechanism through which global hierarchies and interventionary authority are sustained. For instance, Anna M. Agathangelou and Kyle D. Killian (2011; 2016) show how the construction of Western universal scientific truth is inseparable from the secularization of time, a process that constitutes the measurement of time as neutral, linear and globally applicable. As they posit, this temporal regime functions as a Cartesian grid through which difference is mapped and governed, thus positioning certain societies as fully modern while others are fixed as temporally lagging or suspended in an "eternal present" (Agathangelou & Killian, 2011, p. 14). This temporal regime structures governance by relegating certain peoples, knowledges and lifeways to the past, while simultaneously legitimizing intervention in the name of progress. Siba N'Zatioula Grovogui (2006) similarly emphasizes that the contemporary global political order is structured through temporal hierarchies produced through colonial encounters. For Grovogui, postcoloniality marks "a temporal fissure in modernity", through which time was ideologically deployed in the service of Europe, and later the broader West, to construct a typology of civilizational development in which humanity was cast along a single continuum of progress (Grovogui, 2006, p. 54). Therefore, for Grovogui (2006) and Agathangelou & Killian (2011; 2016), time is a tool of hierarchical classification that positions Europe as the temporal horizon toward which all others must move to achieve modernity.

Building on this critique, Dipesh Chakrabarty (2000) theorizes how history and time are co-created in modern politics to privilege the Euro-American experience as the universal measure of development and flatten plural historical trajectories. He draws on Benedict Anderson's "'imagination' … to describe roles the novel, the newspaper, the map, the museum and the census

play in creating the empty, homogenous time of history that allows the different parts of a nation to exist all at once in some nationalist imaginary of simultaneity" (Chakrabarty, 2000, p. 149). According to Chakrabarty's later work, *The Climate of History in a Planetary Age* (2021), this temporal violence persists in contemporary environmental governance, with Western-led environmental policies continuing to perpetuate global inequalities by blaming developing countries for rising emissions and simultaneously absolving themselves of their historical and ongoing extractive practices.

Ann Laura Stoler's (2016) work, In *Duress: Imperial Durabilities in Our Time,* offers an important conceptualization of time through 'forgetting' as an active political practice in which imperial histories are retained in fragments that are selectively cut, sutured and domesticated to fit contemporary political projects. She names this "imperial dispositions of disregard" and defines it as "calibrated practices of disremembering that make colonial histories appear irrelevant to present-day governance while quietly sustaining the conditions of imperial power" (Stoler, 2016, p. 9). The aforementioned literature on developmental time within international relations and the practices of historical forgetting allows me to show how development interventions are presented as both necessary and new.

These temporal and discursive hierarchies are constituted through technocratic forms of governance that present development interventions as neutral, technical solutions rather than historically situated political projects (Escobar, 1995, 2011; Ferguson, 1994; Mitchell, 2002). For instance, Timothy Mitchell (2011) examines how expertise and science employ a temporal and universalist approach to detach governance models from local histories. Mitchell (2011, p. 3) demonstrates how development relies on ideas that can be "…repeated from one context to another", thus freeing themselves from material and historical specificity. This, according to Mitchell, is rooted in the ways in which technocratic developmental logics embedded in energy infrastructure have used technoscience and European secular time to depoliticize the energy economy. For instance, in *Carbon Democracy* (2011), Mitchell demonstrates that the governance of energy industries is entrenched in political systems structured by the material properties of energy sources. He argues that "political possibilities were opened up or narrowed down by different ways of organizing the flow and concentration of energy" (Mitchell, 2011, p. 8), and that these arrangements were inseparable from "systems of finance, expertise and violence" forged through colonial and imperial projects. Mitchell further writes, "…it was the movement of

concentrated stores of carbon energy that provided the means for assembling effective democratic claims" (Mitchell, 2011, p. 9), thus underscoring how material infrastructures have historically structured who could make political demands and on what terms. A related but distinct intervention appears in Mitchell's earlier work *Rule of Experts* (2002), where he traces how development expertise emerged through colonial encounters and continues to universalize Western experiences as the template for scientific and policy knowledge and practices.

Expanding on Mitchell's insights, critical development scholars show that development depoliticizes inequality by reducing historical and distributional conflicts to technical management and improvement problems (Escobar 2011; Ferguson 1994). For James Ferguson (1994, p. xv), development is characterized as an 'anti-politics machine' and makes the argument that development "…depoliticizing everything it touches, whisking political realities out of sight…".

Arturo Escobar (2011) similarly demonstrates how development discourses construct "underdevelopment" as a natural rather than a historically produced condition. This allows development narratives to dismiss alternative ways of living by depicting them as static. As Escobar (2011, p.74) notes, the logic of universal development presumes that "…before development, there was nothing: only reliance on natural forces, which did not produce the most happy results… The country must thus awaken from its lethargic past and follow the one way to salvation". Escobar (2011) explains how this depoliticization of development allows it to operate as a chameleon, taking on new forms and sites of extraction. He posits that development persists as a historically situated project precisely through its capacity to regenerate itself via 'new' discourses, particularly around women, peasants and the environment, that repeatedly constitute these domains as problems requiring improvement (Escobar, 2011).

Anna Zalik complements Escobar's critique of depoliticization by showing how development adapts through participatory models. For Zalik, development project consultations in the Global South are a means by which to suppress broader contestation of large-scale extractivist projects. Zalik looks to the Niger Delta to show how partnership-based development initiatives suppress broader contestations over resource extraction by shifting them away from their political roots and into administratively manageable forms of participation, such as localized community participation. Zalik (2004, p. 409) draws on Shell's community development model, which emphasizes community "buy-in" and "empowerment" through workshops and training, to

demonstrate how it is used to discipline communities into accepting "long-standing social structures…by promoting non-confrontational, respectful negotiations with authority".

Escobar and Zalik demonstrate that contemporary forms of development continue to be a historically situated projects that are reinvented through new discourses and participatory governance. Cowen and Shenton (1996) expand on this critique by highlighting a key paradox of development by noting that it often claims to remedy underdevelopment but actually reproduces the very historical relations that initially caused it.

Michael P. Cowen and Robert W. Shenton (1996) expand on the persistent re-emergence of development and sustenance of underdevelopment as a taken-for-granted condition. For Cowen and Shenton (1996), underdevelopment is a positivist, historical process that began prior to 1945 and is situated within Western colonial interference and the capitalist expansion of the West. They draw on the work of Andre Gunder Frank and use the case study of Latin America to show how "any development which could be experienced as economic and social improvement, or envisaged as part of the intention of the state to develop newly fledged nation states was the development of the original condition which blocked the reintegrative process of development" (Cowen & Shenton, 1996, p.77-78). This quote illustrates the paradox of development that Cowen and Shenton bring to the fore, in which development is repeatedly presented as a route out of underdevelopment while simultaneously maintaining the historical relations that produced it in the first place.

Scholars of the postcolonial state, such as Sara Salem (2020) and Omnia El Shakry (2007), show how the logics of development's renewal persist through postcolonial state authority and institution-building. For instance, El Shakry (2007) highlights the ways in which post-independence Egypt's nationalist project inherited colonial categories of governance, thus embedding Western epistemologies into postcolonial state-making. Moreover, Salem notes how the afterlives of colonially enforced class hierarchies are ever-present through Egypt's nation-building endeavours, whereby the postcolonial state mobilizes development to consolidate elite power while reproducing class inequalities. Salem (2020, p. 84) notes that "…the colonial international….mediates anything and everything the postcolonial state does," making it a neocolonial subject in the postcolonial moment. She argues, "Egypt has become increasingly entangled within global capitalism in ways that have diminished its people and its potential… This unites linear narratives of progress and European imperialism; imperialism progresses as time

moves forward – its colonies regress" (Salem, 2020, p. 277). These scholarly works on imperial duress and historical forgetting, the depoliticization of development, universal developmental time and postcolonial state-making provide the conceptual grounding for what I term as *temporal development amnesia,* introduced in Chapter 5*,* through which I examine how successive development interventions are presented as new responses to contemporary problems while the histories and losses/effects of earlier interventions are minimized or completely obscured.

These theoretical critiques of development, temporality and technocratic governance are reflected in concrete analyses of energy infrastructures and environmental governance, particularly in North Africa and Morocco. For instance, Sharlissa Moore (2019) examines Morocco's energy transition to the colonial period. Through her work, she underscores the extractivist nature of the colonial administration's drive to electrify the state. Moore notes that, "…from a development perspective, Morocco was not electrified under the protectorate. Rather, electrification was a 'colonial character', meant to serve extractive industries and an agricultural export industry rather than to power Moroccan households" (Moore 2019, p. 145).

Hamza Hamouchene (2016) extends postcolonial critiques to contemporary renewable energy governance in North Africa, arguing that large-scale solar and wind projects reproduce extractivist relations under the banner of sustainability. He demonstrates how these development projects prioritize export-oriented growth, foreign investment and energy security for external markets while marginalizing local communities and intensifying pressures on land and water (Hamouchene, 2016; 2022). Hamouchene describes this as a form of green neocolonialism, where renewable energy infrastructure perpetuates colonial patterns of resource control and unequal exchange rather than dismantling them. Complementing this intervention are the works by Jamea El Mostafa, Driss Zejli and Nadejda Komendantova (2019) and Amale Laaroussi, Ouiame Laaroussi and Abdelrhani Bouayad (2023), which show how renewable energy governance in Morocco often overlooks fundamental social and environmental factors. The mentioned works on the postcolonial developmental state provide the framework to understand how Morocco's current renewable energy shift is intertwined with historical development and resource management, where land and water are made ready and extractable for state and global capital visions.

Building on these critiques, I see environmental governance as more than just managing ecological systems; it is a space where scientific knowledge, political power and development paths are co-produced. Environmental governance projects often universalize particular scientific

understandings of nature and embed Western visions of development, thus making specific trajectories of progress appear natural and, therefore, necessary and unavoidable. Through environmental expertise, technical planning and sustainability interventions, particular futures are normalized while alternative socio-ecological relations are marginalized. My dissertation examines how these undercurrents of Morocco's renewable energy transition unfold and their enmeshments within longer trajectories of colonial and postcolonial environmental governance.

In Morocco, these dynamics are visible in the ways renewable energy projects reorganize land and water through technocratic planning, financialized infrastructure and state-led development strategies that privilege export-oriented growth and international investment. My research situates these often naturalized processes within enduring colonial imaginaries and epistemic hierarchies that portray desert landscapes and rural livelihoods as governable and in need of intervention. By tracing how these historical and representational logics configure decisions over land acquisition, water allocation and participation in renewable energy projects, the dissertation demonstrates how sustainability initiatives can reproduce longstanding patterns of dispossession and marginalization in the Global South.

The next section builds on the aforementioned postcolonial critiques of GEG–sustainable development approaches by drawing on Edward Said's analysis of Orientalism to demonstrate how environmental governance frameworks often justify universalist climate policies through stereotypical and reductionist representations of non-Western societies and natural resources as mismanaged or underdeveloped. These logics are rooted in colonial-era assumptions about nature and development and continue to structure the top-down environmental governance strategies that dictate the Global South's responses to climate change.

Colonial Environmental Imaginaries in GEG–Sustainable Development Approaches

Environmental Orientalism and Colonial Imaginaries of the Desert

In Edward Said's *Orientalism* (1978, p. 423), Orientalism is defined as a "regularized writing, vision and study" shaped by Western ideological biases toward the Orient. Said highlights how colonial power was reinforced by European knowledge production that framed the Orient as an object of domination. Said (1978, p. 424) states that the construction of the Orient was presented as "objective discoveries" that "…are and always have been conditioned by the fact that its truth". For him, Orientalism functions as a mode of governance in which knowledge production

authorizes political control. By delineating the Orient as knowable through Western scientific, administrative and developmental expertise, Orientalism transforms domination into a technical necessity and conceals its hierarchical social-political choices.

Contemporary scholarship on environment, development and Orientalism examines how colonial-Orientalist themes continue to inform global environmental discourse. Suzana Sawyer and Arun Agrawal (2000), for instance, argue that environmental Orientalism persists through Western narratives of local mismanagement, resource misuse and environmental destruction. Scholars of environmental governance in the Maghreb add to this critique by showing how these Orientalist logics materialized through colonial environmental policies that reorganized land, water and rural livelihoods in the name of progress. For instance, Diane Davis (2004) and Will D. Swearingen (1987) demonstrate the ways in which, during the French Protectorate, colonial authorities portrayed Indigenous land and water practices as environmentally destructive and economically irrational, narratives grounded in Orientalist assumptions of native mismanagement. In later works, Davis (2007) highlights how images were used as a representational tool to assert Orientalist logics of resource mismanagement and the need to transform the desert. She argues that these environmental imaginaries facilitated imperial rule under the guise of "environmental improvement" (Davis, 2011, p. 2).

These visual and representational practices became institutionalized within environmental expertise and development policies and consequently play a role in shaping how ecological crises in the Global South are diagnosed, narrated and governed in the present. This is evident in scholarship on land governance, renewable energy transitions and the political ecologies of the SWANA region, which shows how the region is repeatedly imagined as both environmentally degraded and economically promising. They note that imaginaries of the region's mismanagement, hostility, alienness and bareness, with regard to its nature and environmental preservation, are often juxtaposed with optimistic imaginaries of its use and potential (e.g., Al-Marashi 2019; Bengezi 2022; Davis 2007; 2011; 2020).

Morocco's desert is a key site through which these colonial environmental imaginaries are reproduced in contemporary renewable energy governance. Brahim El Guabli's (2024) work consolidates the Orientalization of nature, particularly of desert landscapes and renewable energy expansion, through what he terms "Saharanism". Saharanism, according to El Guabli, is a pervasive ideology that casts deserts as empty and interchangeable spaces through which they are

effectively transformed into *res nullius* (property of no one). Such imaginaries, El Guabli argues, remove desert landscapes from ethical and environmental consideration, legitimizing experimental and extractivist interventions that persist into contemporary sustainability and renewable energy projects.

Natalie Koch (2021, p. 4) extends these critiques by arguing that deserts are "…not just ecological zones but highly charged technopolitical zones". She highlights how deserts are produced by dominant forces vis-à-vis governance, infrastructure and geopolitical imaginaries, and thus, in the context of renewable energy governance, deserts are often transformed into sites of state power and legitimacy, as well as resource control and capital accumulation. These scholarly works, alongside earlier discussion of technopolitics and depoliticized expertise, provide the conceptual grounding for what I theorize in Chapter 3 as *technopolitical desert imaginaries*: the representational and institutional practices through which desert landscapes are made legible as empty or underutilized, making large-scale technological intervention appear necessary and legitimate.

Scholars examining the specific locality of Morocco's desert and its interaction with renewable energy governance highlight the ways in which the Moroccan government and international institutions have created a paradox when it comes to the acquisition and exploitation of Moroccan tribal land for renewable energy projects (Cantoni & Rignall, 2019; Ryser, 2019; Rignall, 2016). For instance, Karen Rignall (2016) notes how these actors facilitate land acquisition for renewable energy projects by creating tension between making land legible for capital accumulation and resisting local claims to it. However, as this project demonstrates, the production of the desert as a site of renewable energy potential is not just a question of land but also a question of how water is governed, for whom and toward what ends.

Water, Scarcity and Hydraulic Governance

While literature on past and present imaginary-making of the desert provides the theoretical setting from which to understand how land is understood and what it is used for, scholarly works on water governance demonstrate the ways in which scarcity is made technoscientifically calculable and thus used to justify how water is allocated. Political ecologists interested in questions of land and water governance, such as Jennifer C. Franco et al. (2013), challenge myths surrounding land grabbing, including the notion of 'empty land' and the belief that large-scale

investments are essential for development. They note how land and water grabbing are frequently intertwined, with investors prioritizing access to water resources for their activities. Similarly, Rignall (2016, p. 543) notes how the making of an empty desert, devoid of productive use, allows governance systems to prioritize renewable energy projects that promise "value creation" over subsistence-based water uses.

Rather than treating scarcity as a natural condition, literature on hydraulic infrastructure and its convergence with colonial-capitalist logics shows how technocratic framings of water diminish the socio-political dimensions of hierarchical and historically sedimented regimes of water access (Bakker & Bridge, 2006; Bakker, 2012; Barnes, 2009; 2012; 2017). Water, like the desert, is seen as a politically and economically constructed phenomenon that serves to justify state interventions, market-based governance and resource enclosures.

For instance, Jessica Barnes' (2009; 2012; 2017) work on irrigation governance in both Syria and Egypt demonstrates how hydraulic planning frameworks translate complex social and ecological relations into simplified, calculable units, making water shortages appear as technical constraints rather than outcomes of political and institutional decisions (Barnes, 2017). In the case of Syria, Barnes (2009) notes that Syrian officials presented water scarcity as a product of geography and population pressure, thereby depoliticizing and obscuring the ruling regime's complicity in water shortages. As Barnes highlights, Syria's scarcity was "far from a 'natural' characteristic of the country's limited resources… Rather, much of that scarcity [was] attributable to the government's promotion of the irrigated agriculture sector" (Barnes, 2009, p. 515).

These insights converge with critiques of agri-hydraulic development in Morocco. For instance, Moroccan agricultural economist Najib Akesbi (2012, p. 17; 2013; 2019) argues that the Green Morocco Plan (GMP) employs technocratic approaches long abandoned by Western states for their heavy reliance on pesticides and water-intensive methods, which "recall the mistakes of the past". The GMP, like the agricultural policies before it, has, according to Andrea Mathez and Alex Loftus (2023), largely privileged monocropping and export-oriented agribusiness. Merouan Mekouar (2018) expands on Akesbi and Mathez & Loftus' critiques of the GMP, analyzing it through the lens of Morocco's neoliberal turn, the increased privatization of public companies, and the further entrenchment of elite co-optation. For Mekouar (2018, p. 3), the GMP is symbolic of "bureaucratic duplicity between the administration and private actors…through which the

resources of the state are mobile[z]ed to protect specific commercial enterprises through fiscal and administrative exceptions and/or privileges". Materially, this "alliance between the palace and some of the country's economic elite" looked like the allocation of "some of the country's best rural land" to those close to the regime for "a below market price" (Mekouar, 2018, p. 3).

When examining renewable energy water projects, such as hydropower, Sarah Pritchard's (2012) historical analysis of French colonial hydrology shows how colonial water governance was produced through scientific research, engineering expertise, and the material construction of dams and river-management projects designed to discipline SWANA ecologies into productivity. Pritchard (2012) emphasizes how these technocratic regimes have endured and remained functional beyond formal colonial rule, as seen in postcolonial development trajectories and sovereign-securing projects centred on dams and large-scale water control.

This is further noted by scholars interested in water and land governance in Morocco who demonstrate how the French colonial administration privileged the allocation of water and energy resources through modernized irrigation systems and hydropower dam-making projects to large-scale farmers, French settlers, and to fuel French industries (Moore, 2019; Swearingen, 1987). More recently, scholars have criticized Morocco's concentrated solar power (CSP) projects, which require substantial water to operate due to the choice to use CSP rather than photovoltaic solar power. Moroccan water and energy experts (Belghazi & Sammouni, 2020; Haddad et al., 2022; Hanger et al., 2016; Hamouchene, 2016; Laaroussi et al., 2023) have observed that these projects receive priority in water allocation over the needs of neighbouring small-scale farming communities (Hamouchene, 2016; Rignall, 2016). This body of literature on hydraulic governance, agricultural modernization and renewable energy development provides an important conceptual contribution for what I introduce in Chapter 4 as *calculative loss*. My analysis elucidates how these three sectors converge through technocratic governance, in which technical assessments and bureaucratic criteria determine which uses of water are deemed productive and sustainable, and which forms of agricultural life can consequently be allowed to diminish.

In the cases highlighted above, which span the Global South, environmental issues related to resource scarcity and energy alternatives amid intensifying climate change are framed as technical problems requiring managerial solutions. Through these technical solutions to environmental issues, sustainability governance models reinforce depoliticized extractivist logics that consolidate access to land and water for institutional actors. Building on these critiques of

environmental governance in the SWANA region, my dissertation examines how desert landscapes in Morocco are framed within GEG–sustainable development imaginaries as simultaneously desolate and indispensable to addressing climate change through large-scale renewable energy deployment. These imaginaries emerge at the intersection of environmental governance and development discourses, where ecological concerns such as desertification, water scarcity and climate change are framed as problems requiring large-scale infrastructural development and economic transformation.

Within these governance processes, water and its scarcity emerge as key sites of tension through which Orientalist binaries of tradition versus progress and waste versus productivity are invoked by GEG–sustainable development actors in different but mutually coalescing ways. By elucidating how these colonial logics are rearticulated in contemporary renewable energy governance, my research shows how technocratic forms of sustainability governance reproduce colonial-capitalist hierarchies of value that deem certain landscapes, livelihoods and knowledge-practices less visible. I expand on these critiques by highlighting that these imaginaries are also gendered and that women's subsistence practices and ecological knowledge are systematically devalued and excluded within the GEG–sustainable development nexus. To do this, I draw on feminist critiques of environmental governance and feminist political ecology, which expand on postcolonial, political ecology and political economy analyses by highlighting how environmental policies and sustainability initiatives are influenced by gendered power dynamics.

Feminist Critique of Environmental Governance – Sustainable Development Approaches

A feminist intervention becomes necessary here to highlight how the dispossession elucidated by critical political economy and postcolonial political ecology is not experienced uniformly. The gender question is crucial analytically because it highlights the ways in which access to land and formal recognition within agricultural and environmental governance are gendered, including whose knowledge is prioritized in decision-making. Feminist scholars extend critical political economy, postcolonial and political ecology critiques by examining how global environmental policies and sustainability projects reinforce gendered hierarchies. These policies often exclude women and marginalized communities from decision-making processes, particularly in land governance and resource management. Their work highlights how colonial legacies and

masculinist governance structures continue to shape contemporary environmental policies that have and continue to perpetuate dispossession and inequality.

For instance, Brenna Bhandar's (2018) book, *Colonial Lives of Property,* highlights the current racial and gendered regimes of land ownership that date back to the colonial era and exclude women from land ownership. The questions of gender, land and governance have been explored by SWANA feminists, such as Soraya El Kahlaoui (2022), Zakia Salime (2016; 2019) and Mai Taha and Sara Salem (2019), who are interested in tracing current land and property governance back to colonial administrative governance. These scholars note the ways in which British and French institutions hierarchically and legally entrenched gendered property relations through processes of domestication and gendered colonial land laws that excluded women's access to fair inheritance of land upon division (Kahlaoui, 2022; Taha & Salem, 2019; Salime, 2016). Morocco-specific literature highlights how colonial policies historically sought to modernize Moroccan lands, which resulted in the alienation of women from land ownership and excluded them from decision-making processes (Charrad, 2001; Kahlaoui, 2022; Salime, 2016).

These policies laid the groundwork for contemporary governance frameworks that continue to marginalize rural women, particularly in Morocco's agri-energy hydraulic governance. For instance, research on Amazigh women in rural Morocco adds another layer to the compounding forms of exclusion faced by rural women. Loubna Ou-Salah et al. (2023) demonstrate how Amazigh women in Souss-Massa experience heightened marginalization arising from the intersections of gender, Indigeneity and geographical remoteness. Their study shows that women's adaptive capacities and agricultural roles are constrained by economic pressures, exacerbated by climate change, as well as linguistic, societal and household barriers (Ou-Salah et al., 2023). Moreover, in examining Amazigh women's education, Bochra Laghssais and Irene Comins-Mingol (2021) posit that gendered norms governing rural education, along with limited access to infrastructure, have often limited women's opportunities to participate in formal agricultural programs or decision-making spaces.

Scholars have noted that these exclusions have become increasingly intensified with the emergence of Morocco's renewable energy transition (Ryser, 2019; Salime, 2016). For instance, Sarah Ryser (2019) uses the case study of Morocco's NoorO solar power plant to highlight how local women, particularly those from the Aït Oukrour tribe and surrounding areas, faced compounding exclusions from not just land-acquisition decision-making processes, but also

gendered dispossession of land and a gender gap in adequate compensation. Ryser (2019, p. 3) notes how local women were promised "…opportunities for the redistribution of access to 'new' resources, such as job opportunities or benefits from CSR schemes", which Ryser goes on to critique as something "…that often come at the cost of common-pool resources for women".

Additionally, in rural small-scale farming communities, women who perform agricultural labour and hold place-based agricultural knowledge are often not regarded as farmers (Najjar et al., 2023; Najjar et al., 2025). According to Dina Najjar et al. (2023), Moroccan women possess extensive knowledge of food processing and crop sustainability. However, they are often excluded from formal knowledge systems because of land privatization and ownership policies that deny women access to land, thereby limiting their ability to participate in formal agricultural endeavours such as cooperatives, access to credit/loans and agricultural training.

Women's exclusion from land, water and environmental policies more broadly is not unique to Morocco but is evident across the Global South. For instance, Maria Mies and Vandana Shiva (1993) provide a temporal dimension to understanding how colonial-capitalist logics of resource extraction and the subordination of other ways of knowing and being operate. They note that the "myth of catching-up development", which has now seeped into environmental governance, depends on the gendered and ecological dimensions of temporal hierarchies. They show this through development discourses' continued binary categorization, in which industrialized centers are deemed the apex of human evolution, while colonized peoples, particularly women, peasants and subsistence communities, are positioned as temporally behind and in need of transformation. Mies & Shiva (1993, p. 55) highlight how, despite the repeated failures of the 'development promise', where "nowhere has it led to the desired goal", the myth of catching up continues to structure contemporary political–economic interventions in the Global South.

Building on this feminist literature, my research contributes to these critiques by showing how cumulative gendered dispossession is produced through the representational and temporal logics of technocratic governance of renewable energy transitions. I demonstrate how sustainability governance itself, vis-à-vis Morocco's agri-energy nexus, rearticulates colonial and patriarchal hierarchies under the banner of 'environmental sustainability'.

While feminist critiques of environmental governance offer important insights into how gendered, colonial and neoliberal logics influence land dispossession and resource management,

an emerging body of scholarship advances this analysis by emphasizing place-based embodied and relational knowledge systems as sites of alternative sustainabilities and world-making. Rather than solely focusing on the exclusions and marginalizations produced by patriarchal technocratic governance structures, these scholars point to how women, Indigenous communities and subsistence farmers continue to maintain their place-based knowledge-practices rooted in relational stewardship (Bourhrous, 2023; de la Cadena, 2015; George & Wiebe, 2020; Kirtland, 2022; Ou-Saleh et al., 2024; Salleh, 2017; Simpson, 2014; Starblanket & Stark, 2018). This literature allows me to demonstrate how situated knowledge-practices of sustainability continue to withhold concession to and put pressure on the universalist claims of scientific rationality and neoliberal technocratic sustainability paradigms.

Place-based Relational Epistemologies

The preceding literature allows me to develop my analysis of how socio-ecological loss is produced, normalized and sustained in sustainability governance. This section shifts from viewing small-scale farmers, especially women, only through the lens of sustainability governance and its exclusions. Instead, it takes seriously their everyday practices of ecological care and continuance as situated and legitimate forms of knowledge. It does so by using feminist scholarship on place-based relational epistemologies to ask what becomes visible when sustainability is approached from the situated knowledge-practices of those living through these transformations.

Feminist postcolonial and science and technology studies scholars challenge the presumed neutrality and universality of scientific knowledge by demonstrating how dominant forms of expertise are embedded in colonial, capitalist, patriarchal and racialized power relations. For instance, Sandra Harding (2008) critically combines feminist theory, postcolonial studies and the philosophy of science to challenge the so-called "neutrality" and the universality of Western scientific knowledge by demonstrating how scientific knowledge is produced within historically situated power relations. Harding argues that science, while often positioned as an objective and value-free enterprise, is deeply embedded in historical and social power structures, including colonialism, capitalism, patriarchy and racial/gendered hierarchies.

This is supported by Maria Mies and Vandana Shiva (1993, p. 56), who note that Western scientific knowledge is rooted in historical power structures and persistent binaries such as "colonial relationship[s]…between man and nature, between men and women, between urban and

rural". Similarly, Donna Haraway (1988) terms this depoliticization of universal knowledge production as 'the god trick'. She notes that the 'god trick' allows dominant epistemologies to render themselves as neutral as a means by which to erase the positionality of the knower. Haraway (1988) advocates for what she calls 'feminist objectivity', which encompasses a commitment to partial, situated perspectives.

Expanding on this, Indigenous scholars like Linda Tuhiwai Smith (2012, p. 24) argue that to center marginalized knowledges and reclaim histories, presents and futures, we must revisit "…a combination of the time before, colonized time, and the time before that, pre-colonized time" (Smith, 2012, p. 24). In revisiting time differently, Smith points to a rupturing of history's chronology that considers events to be "located at a point in time" (Smith, 2012, p. 30) and everything before European time to be "prehistorical" and "belonging to the realm of myth and traditions" (Smith, 2012, p. 31).

Revisiting time in this way also raises broader epistemic questions about whose knowledge counts within dominant frameworks of development and environmental governance. Through the hierarchical disavowal of non-Western forms of knowledge, colonial-capitalist modernity arranges societies along temporal hierarchies that marginalize the ways of knowing, being and doing of the masses. Post/decolonial and Indigenous feminist scholars therefore call for the (re)centring of alternative forms of knowledge that "defatalize" the marginalized subject (Agathangelou & Killian, 2011; Agathangelou and Killian, 2016; Bengezi, 2023) and open space for different understandings and imaginings of the world (e.g., de la Cadena, 2015; Simpson, 2014; Starblanket & Stark, 2018).

Agathangelou and Killian (2011; 2016, p. 16) ask what it means to "defatalize" in contexts marked by structural violence and historical dispossession, posing the question: "How do people invent meaningful approaches that do not turn their lives fatal amidst the multiple violences they inhabit?" In response, Cliff Davidson responds by defining "defataliz[e][ation][ing]" as:

> …a subversion of structural influence and individual acceptance of fate, whereby agency is reified at the individual level. Defatalization dismantles the metastructure of control and acceptance and engenders an individual narrative, one that invokes purposeful agency within individual social acts. If fatality is death, defatalization is bringing life back into that which was dead (Davidson, 2016, p. 261).

In the above excerpt, Davidson defines “defatalization” as a rejection of structural and historical processes as ‘fate’ by centring the everyday social practices that reanimate life within conditions that have been given a political and social death sentence.

Indigenous and decolonial feminist approaches home in on and give prominence to place-based everyday forms of knowledge-practices as a methodological and epistemic site through which alternative ways of knowing and sustaining life emerge. Thus, rather than treating marginalized communities as passive victims of top-down governance of land, water, ecologies and people, these scholars emphasize how Indigenous peoples and rural communities maintain relational knowledge systems grounded in reciprocity with land, water and more-than-human life (e.g., de la Cadena, 2015; Simpson, 2014, 2025; Starblanket & Stark, 2018; George & Wiebe, 2020).

For instance, Indigenous feminist scholars advocate for the reclamation of alternative, embodied and relational ways of knowing by centring the everyday as a methodological site from which to understand women and marginal communities and centre their distinct voices and epistemic knowledges (de la Cadena, 2015; Simpson, 2014; Starblanket & Stark, 2018). Leanne Betasamosake Simpson, in her text *Land as Pedagogy: Nishnaabeg Intelligence and Rebellious Transformation* (2014, p. 7), highlights how marginal knowledge practices, such as those of Indigenous peoples, are “… generated and regenerated continually through embodied practice within each family, community and generation of people”.

Gina Starblanket and Heidi Stark (2018, p. 179) expand on the need to centre relational epistemologies, arguing that “story is also practice. It is rooted in relationality, in our relationships with one another and with creation”. Stories, for Indigenous feminists such as Starblanket and Stark (2018), function as ethical frameworks that ground communities in deep relationality with the land, the more-than-human lifeworlds and their own histories. These knowledge-practices are passed down through observation, inquiry, practice and love, embedding them within lived experience.

Decolonial Indigenous feminists further theorize water as a relational and life-giving entity. For instance, Rachel Yacaaʔał George & Sarah Marie Wiebe (2020, p. 499) provide insights into how water serves as a life-giving force and a relational site from which to theorize differently. In their work, they draw on the knowledge-practices of Secwepemc land defender, mother and birth-

worker Kanahus Manuel, whose ethos reflects a "reciprocal relationship to the environment [that] refuses extraction to center cultivating and tending to land and waters…". This, according to Simpson's most recent work, *Theory of Water* (2025), is the critique of capitalism that was inherent in and embodied by Indigenous peoples for centuries. She uses Indigenous spirituality and storytelling to provide insights into how water is a teacher, a theory. Through one of the origin stories that centres *Nibi* (the Ojibwe word for water), Simpson speaks to its imperative in world-making and to what the story teaches us about otherworld-making. She states:

> World-making requires love, kindness and care. It requires collectivity and relationality, and these practices generate the knowledge needed to proceed to the next step. There are many origins. The land and the waters, the universe, hold all the knowledge we need to make other worlds. World-building is a difficult, global work. It is a sacrifice, both collective and individual. It requires difference and diversity. (Simpson, 2025, p. 34)

In this excerpt, Simpson (2025, p. 34) speaks of plural world-making alternatives predicated on "love, kindness and care" and sustained through collective relationality. This plurality works in tandem with more-than-human life to acknowledge land, water and the ecologies that live through them and imagine alternative ecological and political futures.

The plurality that Simpson speaks of is also enacted in the relational cosmologies of land and water in the SWANA region, particularly in Morocco. For instance, Loubna Ou-Salah, Gert Verschraegen and Lore Van Praag (2024, p. 178) demonstrate the ways in which rural Moroccans interpret drought, rainfall and environmental degradation through concepts such as '*Tawhid'*, which is the oneness of *Allah* (God) and the unity of all creation and '*Khalifa'*, the human role as steward of the earth. In their study, respondents understood water scarcity and drought simultaneously as both the divine will and the consequences of human negligence. In doing so, they frame environmental care as a spiritual duty and an ethical act of reciprocity. These Islamic spiritual worldviews echo Indigenous spiritual and ecofeminist articulations of relationality by designating responsibility, humility and interdependence as foundations for sustainable life.

The cyclical relationality embedded in small-scale farmers' spiritual-ecological practices endures in Amazigh rituals such as *Tlaghenja* (Bourhrous, 2023; Kirtland, 2022). Tlaghenja is

often performed before the sowing season and involves women parading a wooden doll symbolizing an Amazigh girl as the bride of *Anzar*, the rain god, singing and gathering donations for a communal meal held near a water source, often a *khattera* channel, as a collective invocation for rain.[8] Today, the tradition continues to be practiced with Islamic elements such as prayers to *Allah* and *sadaqa* (charitable giving).

Building on these interventions, this dissertation critiques technocratic visions of sustainability that legitimize extractivist practices and contribute to the displacement of subsistence farmers within Morocco's agri-energy nexus. It shows how colonial-Orientalist logics continue to structure the GEG-sustainable development nexus by privileging expert-led and technocratic forms of intervention. These interventions, deployed through technocratic, calculative and temporal processes, have intensified socio-ecological loss for small-scale farmers, particularly women and their ways of knowing, being and doing. I draw on the women's testimonies, observations of their movement between the *dār* and the *jnān,* and scholarly and vernacular understandings of *baraka* (blessing) (Von Denffer, 1978, p. 172; Nigst, 2025, p. 54), *amana* (sacred trust and responsibility) (Ou-Salah et al., 2024, p. 178) and *twizi* (collective labour/communal solidarity) (Mimouni, 2003). Through their movement and passed-down eco-spiritual knowledge-practices, I demonstrate how women have learnt, maintained and continue to engage in farming practices of relationality, care and continuance despite the fatalizing enclosures of technocratic sustainability governance (Agathangelou & Killian, 2011, p. 8; 2016). By giving prominence to the everyday place-based practices of subsistence farmers, particularly women, the dissertation responds to feminist and decolonial calls to take seriously other ways of knowing, governing and sustaining ecological life, despite and in spite of ongoing loss. As noted in the introduction chapter, this project does not claim that these practices offer a universal alternative to sustainability governance; rather, they narrate forms of care and ecological reciprocity that unsettle extractivist logics and reframe sustainability as a lived and historically accountable practice.

[8] The *khattera* (also more widely known as *qanat*) systems of North Africa, allowed for a trans-Saharan diffusion of Oases across desert-landscapes. Essentially, the *khattera* is an underground tunnel system, with ventilation shafts and vertical wells "that connect a point on the surface with groundwater, creating a slope" wherein "the extracted water is distributed to the fields through channels and gravity-based irrigation systems" (Esenarro et al. 2023, p. 2).

Methodology and Research Design

As a woman of North African descent with longstanding personal and familial connections to the region, my methodological approach is grounded in critical feminist and decolonial epistemologies that are attentive to power, scale and knowledge production in both research, daily life and the ordering of world politics. This positionality informs my commitment to a multi-scalar approach, which I understand as an analytical strategy that traces how global climate governance frameworks, national development agendas and everyday community practices are mutually constituted rather than operating in silos. My attention to multiple scales allows me to examine not only how climate mitigation policies are designed and legitimized at the global and state levels, but also how they are experienced, negotiated and contested in localized contexts that are informed by uneven histories of development and dispossession.

My methodological framework draws on feminist anti-racist and anti-imperialist standpoint theory (Hill Collins, 2000; Sandoval, 2000; Smith, 2012), which denotes the relationship between structural power, systemic exclusions and lived experiences. This approach centers questions of whose knowledges are valued and legitimized, through what epistemic standards and with what material and political consequences, particularly within the intricacies that emerge through the GEG–sustainable development nexus.[9] This approach also allows for a critical examination of technocratic expertise that questions its universality and to understand how forms of knowledge are situated and shaped by histories of colonialism and gendered power relations.

Methodologically, this research adopts a qualitative, multi-method case study approach (Flyvbjerg, 2001; Gerring, 2004, 2007) to interpret the complexity of environmental governance across scales. The case study enables an in-depth examination of Morocco's renewable energy transition while also taking into consideration broader global governance processes. I employ interpretive methods that analyze policy texts, institutional narratives and institutional elite decision-making. I understand and define elite decision-making broadly, but not monolithically, to

[9] As mentioned in the introduction, by multi-scalar I am referring to the process of tracing entanglements of power across global institutions, postcolonial state structures, regional governance bodies and local livelihood practices to examine how sustainability governance is assembled and contested across these interconnected. This allows me to discern how governance logics materialize differentiated outcomes across scales.

include state officials, policy actors, financial institutions and corporate actors whose authority is exercised through both individual decisions and institutional arrangements. Rather than treating these actors as a unified bloc, I examine how their mandates, expertise and political-economic positions configure the ways development priorities, financing agreements, project designs, environmental assessments and categories are set. This definition guides the analysis of interviews and institutional material in terms of how they authorize, measure and govern land, water and rural livelihoods.

I employ these methods along with interpretive and feminist ethnographic approaches that center the lived experiences and knowledge practices of marginalized communities, such as ethnographic interviews and sustained time with rural women. Through this methodological approach, I am able to be attentive to non-Western and relational modes of knowledge production, including oral histories, storytelling and poetic forms, as analytically rigorous sources of insight (Kahlaoui, 2022; Ozkazanc-Pan, 2012). This methodological orientation reflects a commitment not only to the critique of dominant technocratic governance frameworks but also to taking seriously other forms of epistemologies that are often rendered unintelligible within technocratic sustainability discourse.

Rather than separating methods by chapter, each chapter mobilizes these approaches differently to interrogate how sustainability is imagined, governed and contested within Morocco's agri-energy nexus.

Research Design, Fieldwork Scope and Methods

Fieldwork and Data Collection

Fieldwork for this dissertation was conducted over multiple research trips to Morocco in 2023 (early January to the end of March 2023 and early May to the end of June 2023) and involved qualitative data collection across national, regional and local scales. This includes major cities (Rabat, Casablanca, Marrakech) for interviews with renewable energy experts, academics and institutional actors. The majority of my interviews took place in the Drâa-Tafilalet region (Figure 2.1). Interviews with regional and local bureaucratic actors were conducted in Ouarzazate and Midelt, while interviews with farmers, particularly small-scale farmers, were conducted across several localities in southeastern Morocco. These included Ouarzazate, Amerzgane, Tarmigt and

surrounding upstream and downstream communes, as well as Agdz, a town located between Ouarzazate and Zagora. In the Zagora region, interviews were conducted in Zagora, Amazraou, Tamegroute and Feija.[10] These sites were selected because they sit at the intersection of agricultural reform, such as the GMP, state-led water governance, most notably the El Mansour Eddahbi Dam, and large-scale renewable energy development through the NoorO (see Figures 2.2 and 2.3).

Whereas downstream communities (Agdz, Zagora, Amazraou, Tamegroute and Feija in the Southeastern Drâa-Tafilalet region) have been significantly affected by climate-induced drought conditions and Morocco's agri-energy governance practices, upstream communities, such as Amerzgane, have also been affected. The river basin, considered among the world's driest river basins, relies on both surface water and groundwater, and as drought intensifies, extractive agri-energy projects have affected aquifer levels upstream and downstream (Kaczmarek et al., 2025). The majority of the literature focuses on downstream oases that rely on dam releases and intermediary communes (see Figures 2.4 and 2.5) (Johannsen et al., 2016; Kaczmarek et al., 2025; Moumane et al., 2025). These localities are situated closer to the dam and rely on a combination of surface water, episodic flows, as well as shallow alluvial aquifers recharged by *wadis* (riverbeds) such as the Ouarzazate *wadi* (Johannsen et al., 2016; Kaczmarek et al., 2025).

Similarly, in the central Drâa-Tafilalet region of the Midelt province, water governance is structured by a combination of large-scale hydraulic infrastructure, groundwater extraction and formal irrigation perimeters linked to the Hassan II Dam (see Figure 2.4). Interviews with farmers in Aït Ben Yacoub, Zaida, Boulaajoul and Aït Izdeg show how communities with differential hydrological positioning within the Upper Moulouya basin experience uneven impacts of dam-centred governance. Whilst the localities of Zaida and Aït Ben Yacoub are directly shaped by regulated surface flows and irrigation allocation regimes, Boulaajoul and Aït Izdeg are affected indirectly through basin-scale groundwater depletion, declining base-dam flows and increasing reliance on wells.

[10] Small-scale farmers are defined as individuals cultivating limited plots (two hectares or under), often without formal land titles or agricultural licenses, and whose livelihoods depend primarily on subsistence agriculture (Agrisud International, 2022; Fico, 2022.

Figure 2.1. Location of the study area of the Drâa-Tafilalet, Morocco. The highlighted area indicates the Ouarzazate–Zagora and Midelt area study sites. Source: accessed and edited from Google My Maps on May 15th, 2026.

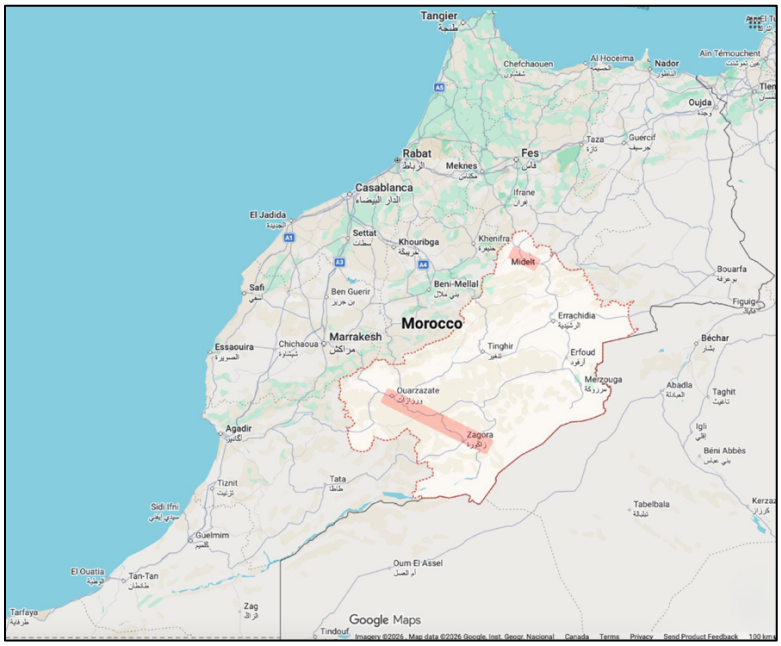


Figure 2.2. Map of the southeastern Drâa-Tafilalet region with pinned rural field sites and their proximity to key water and energy infrastructures. Source: accessed and edited on Google Maps on January 2nd, 2026.

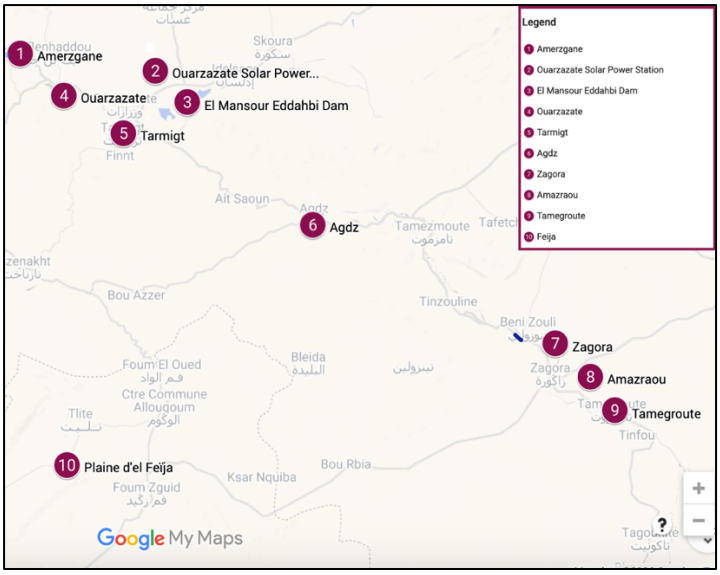


Figure 2.3. Map showing hydrological network (perennial, episodic and controlled rivers) connections and major settlements across the Southeastern Drâa Basin. Source: Heidecke et al. (2010).

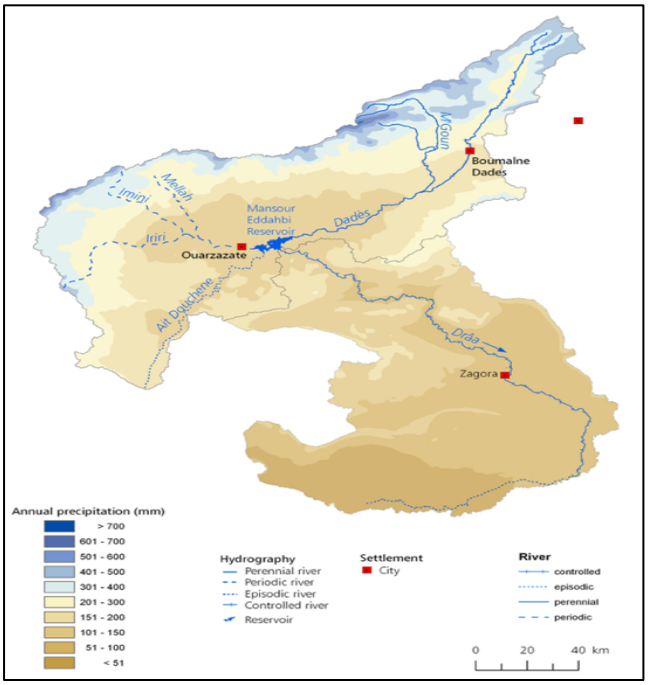
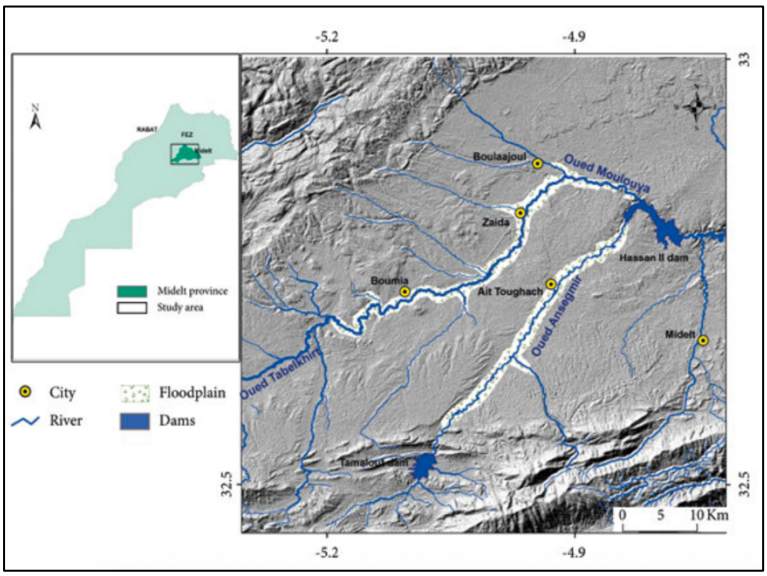


Figure 2.4. Map of the central Drâa-Tafilalet region with pinned rural field sites and their proximity to key water and energy infrastructures. Source: accessed and edited on Google Maps on January 2nd, 2026.



Figure 2.5. Map of the Upper Moulouya basin and sites connected to the Hassan II Dam (Midelt Province, Morocco). Source: Squalli et al. (2022).



The combined above figures situate the field sites within Morocco's agri-energy hydraulic landscape and make visible the differentiated hydrological positions (upstream, downstream and intermediary) through which water and energy governance is experienced. Moreover, the research design reflects a multi-scalar approach to understanding how agri-energy governance is produced, negotiated and experienced across institutions and everyday livelihoods.

Having outlined the scope of fieldwork and site selection, I now turn to the three main data collection methods used in this dissertation: interviews with institutional actors, ethnographic interviews with farmers and discourse analysis of institutional documents and promotional materials.

Data collection methods

Institutional and Expert Interviews

I draw on semi-structured interviews with institutional and expert actors positioned across or in relation to Morocco's renewable energy, water and agricultural governance landscape. These included officials, consultants, development practitioners and bureaucratic representatives whose work is embedded in the organizations, agencies and financing structures that are key in shaping Morocco's agri-energy nexus. I also conducted interviews with scholars and journalists whose expertise provided critical context on the political, social and historical dimensions of these processes. I am cautious not to assume all participants are equally positioned within Morocco's agri-energy sector and its connections to broader GEG-sustainable development goals by viewing

interviews as reflecting diverse levels of expertise and authority. These interviews were conducted between January and June 2023 and are distinct from the ethnographic interviews conducted with small-scale farmers, which I will highlight subsequently.

Selection of Institutional Actors

I conducted thirteen semi-structured interviews with governance officials, technical experts and informed observers involved in or closely familiar with Morocco's renewable energy, water and agricultural governance. These included a senior official from the World Bank, directly involved in the planning, financing and PPP structuring of the NoorO solar complex and subsequent renewable energy initiatives; national energy and water authorities: One MASEN (Moroccan Agency for Sustainable Energy) and two ONEE (Office National de l'Électricité et de l'Eau Potable); an official from the Hydraulic Basin Agency of Drâa–Oued Noun, responsible for basin-wide water allocation, well permitting and drought governance; agricultural governance bodies: An official from the Office Régional de Mise en Valeur Agricole (ORMVA) and two representatives from the Chambers of Agriculture, one in Ouarzazate and Midelt; four prominent renewable energy scholars and policy experts are working at Moroccan universities and policy research institutes; and a Moroccan journalist who writes about Morocco's renewable energy transitions for a widely read online newspaper.

Governance actors were selected because they occupy institutional positions through which water scarcity, land use, technological choice and sustainability are formally defined, measured and justified. Moroccan renewable energy scholars and the journalist were included because their work offers critical insight into the political, historical and public narratives surrounding Morocco's renewable energy transition. Instead of considering these interview perspectives as definitive explanations of "how things work", I interpret them as context-specific expressions of technocratic reasoning embedded within specific institutional mandates and political–economic constraints (Mitchell, 2002). As noted in the introduction, my analysis focuses on institutional logics rather than individual motives, and therefore does not assume that participants' personal experiences or intentions are identical to the mandates of the institutions they represent.

Interview Approaches and Methods

All interviews were semi-structured and conducted in either English or Darija (the Moroccan dialect of Arabic), depending on participants' preference. They were conducted in Rabat, Casablanca, Marrakech, Ouarzazate, Midelt and on Zoom throughout most of my fieldwork (February - June, 2023). Interviews lasted between 1 and 2 hours. Interviews focused on project planning and technology choice (e.g., wet vs. dry cooling; concentrated solar power [CSP]vs. photovoltaic [PV]); institutional interpretations of water scarcity and hydrological data; access to land, water, financing, permits and agricultural or infrastructural support; rationales for PPP financing structures; assessments of social and environmental impacts; and narratives of success, failure and 'learning' across renewable energy projects. I was able to access these actors through a combination of professional networks, direct institutional/personal outreach and referrals. Interviews were audio-recorded with consent and transcribed for analysis.

Analytical Significance of Institutional Interviews

Methodologically, these interviews fulfill three specific analytical functions. First, I view them as key sources for examining how technocratic expertise is employed to frame water scarcity, land dispossession and financial risk using institutional language related to planning, assessment and project governance. Institutional actors consistently described scarcity using metrics, proportions and efficiency standards, such as dam volume percentages, cooling efficiency, and 'minimal' water impact. These framings give way to an understanding of how socio-ecological loss is made to appear as a result of the technical dimensions of project planning rather than of political choices about whose water use, livelihoods and ecologies are given significance.

Second, institutional interviews disclose the internal contradictions and forms of foreknowledge absent from official policy texts and public communications. For example, interviews with former ONEE and World Bank officials exemplify how water scarcity and financial risk were anticipated during the early project-planning stages, even as public documents later framed these issues as negligible or resolved. These moments are analytically central to my concept of *calculative loss* because they show how anticipated harm is channelled through technical and administrative procedures that acknowledge water scarcity only through deferred responsibility, measurement and technocratic oversight.

Third, these interviews allow for a comparative analysis of institutional narratives across various governing levels, such as multilateral development banks, corporations, national energy and agricultural agencies, and regional water and agricultural authorities. By comparing statements from international financiers, national agencies and regional water authorities, I show how scarcity is managed differently, though not necessarily in contradictory ways. Rather, institutional framing converges by operating through complementary framings and producing outcomes that legitimize uneven water allocation.

These interviews are analyzed alongside project appraisal documents, environmental and social impact assessments (ESIAs), completion reports and press releases produced by the same and adjacent institutions. This triangulation allows me to identify where institutional narratives align and diverge, as well as how legitimacy is constituted and, connectedly, how responsibility is redistributed across documents and expert authority. During fieldwork, I also obtained internal planning materials from regional institutions, such as the *Hydraulic Basin Agency of Drâa-Oued Noun's Master Plan for the Integrated Development of Water Resources* (2022), as part of the National Water Plan 2020 – 2050, which provides basin-level modelling of water availability.

Feminist Ethnographic Approach and Interviews with Farmers

This dissertation also draws on feminist ethnographic methods that centre small-scale farmers', particularly women's, place-based knowledge-practices as sites through which environmental governance is lived, negotiated and sustained. I conducted fieldwork between March and June 2023 across rural and oasis communities in southeastern and central Morocco (see Figures 2.1, 2.2 and 2.4 for exact localities). Interviews were embedded in everyday spaces such as the *dār* (home) and the *jnān* (small farmland) to allow the farmers' knowledge-practices to emerge relationally through storytelling, humour, prayer, silence, labour and embodied observations. Participant observation and sustained conversations with women farmers of different generations demonstrated how knowledge of place and care is transmitted through everyday practice and intergenerational memory. By paying close attention to these relational knowledge-practices, I was able to analyze how governance is experienced temporally and materially in daily life, particularly under conditions of water scarcity, land dispossession and agricultural restructuring.

Interviews with Farmers: Lived Experience and Community-based Knowledge

This project is attentive to the local level through liv(ed)(ing) and situated experiences as a critical site through which we can better understand the mechanisms of multi-scalar technocratic sustainability governance, especially as they pertain to socio-ecological loss of livelihood. Through qualitative field research with farming communities, I examine how large-scale agri-energy and water governance are experienced on the ground, and how local sustainability visions both intersect with and exceed these dominant neoliberal and technocratic sustainability governance.

At the local level, I conducted 50 semi-structured interviews with farmers across three regions central to Morocco's agri-energy nexus: Midelt, Ouarzazate and Zagora, as well as surrounding rural villages. These sites were selected because they sit at the intersection of historical dam-based development, contemporary renewable energy expansion (the NoorO and Noor Midelt), and agricultural reform projects under the GMP (2008) and the Green Generation Strategy (2020). This site selection enables a comparative analysis of how sustainability discourse and infrastructure (re)shape water access, land use and livelihoods across distinct ecological and political contexts.

Field Sites and Sample Distribution

The interviews were distributed as follows:

- Midelt region (13 participants): Aït Ben Yacoub, Boulaajoul, Fleelo and Zaida
- Ouarzazate region (19 participants): Amerzgane and Tarmigt
- Zagora region (18 participants): Agdz, Zagora, Amazraou, Tamegroute and Feija

These interviews were conducted across multiple research visits: In March 2023, I spent two weeks in Ouarzazate and one week in Zagora. I returned to both regions in May 2023, spending an additional two and a half weeks between Ouarzazate and Zagora. The remainder of the fieldwork was conducted in the Midelt region, where I spent the end of May and most of June 2023.

Gender, Ethnicity and Farming

Of the 50 farmers interviewed:

- 34 participants (68%) identified as women
- 16 participants (32%) identified as men

With the exception of one woman who identified as Sahrawi Arab, the vast majority of participants identified as Amazigh. This is analytically significant, as farmers in the region, many of whom are Amazigh, have historically been marginalized, especially women, within state land regimes, development planning and environmental governance, despite their central role in sustaining oasis and subsistence farming systems (Fico, 2022; Ou-Salah et al., 2023; Teixidor-Toneu, 2020).

I also interviewed three large-scale farmers, one in Zagora, one in Ouarzazate and one in Midelt, all of whom were male, had finished high school and had accessed land and water through state-supported agricultural schemes, including the GMP. I chose to include these actors because their input allowed for a grounded comparison between the logics of subsistence and commercial farming and the ways state policy redistributes access to land and water under the guise of sustainability and productivity.

Gendering the Agri-Energy Nexus: Education and Land Tenure

Most participants, especially women engaged in subsistence farming, had little to no formal education. This pattern was most evident among women aged 50–59 and 60+. This reflects enduring structural gender inequalities in rural Morocco and is central to my analysis of how technocratic sustainability governance systematically disadvantages women by privileging bureaucratic legibility, land titles and formal market participation.

Consistent with broader patterns in Morocco, most women did not own land. Instead, they worked on family land (their husband's or husband's family) or laboured on others' land for a limited return. These gendered land structures are crucial for understanding how women are removed from consultation over land use and are limited in access to water and agricultural support.

Similarly, there are glaring gender disparities in water access, with all the rural women relying predominantly on rain-fed agriculture and shared water infrastructures. In contrast, seven men, including the three large-scale male farmers I interviewed, had access to alternative and 'modern' forms of water sources.

Analytical Contribution of Farmer Interviews

Methodologically, interviews with small-scale farmers serve two important functions. First, they are treated as critical sites for tracing how scarcity is lived, negotiated and endured under agri-energy and water governance regimes. Women farmers described everyday experiences of water shortages, land insecurity and livelihood erosion. These interviews tell us something about the institutional and policy frameworks that treat scarcity as a technical variable to be managed through infrastructure and efficiency.

Second, these interviews function as epistemic sites through which rural women develop situated understandings of land, water and survival grounded in eco-spiritual principles that have been passed down. However, and crucially, these interviews carry nuance and tension in the ways women negotiate their gender roles, state provisioning, or lack thereof, and sustain their place-based farming knowledge-practices despite cumulative socio-ecological loss. These tensions are important to discern because they show that place-based knowledge-practices do not exist outside power, but are lived within the uneven conditions of agri-energy governance. Interviews with women farmers also provide a different understanding of land, water and survival that is not shared by dominant technocratic GEG-sustainable development frameworks.

Institutional Discourse Analysis Approach

In addition to interview methods, I utilize a systematic qualitative discourse analysis of policy documents, project assessments and institutional communications that collectively structure Morocco's renewable energy transition and its integration within the GEG–sustainable development nexus. I analyze a defined corpus of institutional texts produced between 2004 and 2024, which were selected because they function as the primary instruments through which land, water, technology and social impacts are rendered governable, legitimate and techno-scientifically and economically rational within Morocco's agri-energy hydraulic governance nexus. Methodologically, this analysis closely examines language, visual framing, quantification and narrative sequencing to examine how particular understandings of land, water, risk and responsibility are produced and stabilized, while alternative relations and knowledges are rendered marginal.

First, to situate contemporary renewable energy governance within a longer historical trajectory, I draw on historical scholarship that examines French Protectorate-era (1912 – 1956)

hydraulic and agricultural governance, which framed Morocco as a potential 'Granary of Rome' and sought to make Morocco 'green again' by reorganizing land and water through centralized irrigation and resource control. Building on the colonial beginnings Morocco's agri-energy nexus, I analyze post-independence Moroccan agricultural and hydraulic policy frameworks from the late 1960s onward, alongside development and environmental policy documents produced by international institutions, including World Bank reports on drylands and desertification (1988) and pre-project renewable energy planning documents such as the European Space Agency (ESA) and European Aeronautic Defence and Space Company's *Solar Power from Space: European Strategy in Light of Sustainable Development* (2004). These texts are seen as part of the longue durée of environmental rule through which land, water and desert ecologies are rendered governable.[11] When analyzed in tandem, these texts demonstrate how contemporary renewable energy narratives draw on earlier colonial and postcolonial logics of transforming barren lands into green dreamscapes through hydraulic control, which are now reframed through the language of climate mitigation and sustainable development.

Second, I examine institutional communications and promotional materials, including a MASEN promotional video (2018), an IRENA press release (2018) and the Climate Investment Funds project webpage (2018). These materials are analyzed within the same governance apparatus as formal policy documents. I use these texts as narrative and visual technologies that perform important political work by staging Morocco's solar projects as symbols of progress, novelty and national leadership, while simultaneously reproducing Orientalist imaginaries of the desert as idle and awaiting technocratic restoration. These sources are crucial for understanding how legitimacy is produced not only through policy and finance, but through spectacle, scale and capitalist development futurites.

Third, I examine multilateral development bank projects and financing documents associated with the NoorO and Noor Midelt solar complexes. These include, but are not limited to, the World Bank's 'Project Appraisal Document for Noor Ouarzazate' (2014), the 'Integrated

[11] I use longue durée throughout this dissertation as part of a wider lexicon that draws on Fernand Braudel's (1960) account of slow-moving, interwoven historical processes and structures. Here, the term refers specifically to the governing logics that endure across formal political structures and specifically, the continuities between colonial and postcolonial land and water governance.

Safeguards Data Sheet' (2014), the 'Project Paper on a Proposed Additional Loan' for the NoorO (2018), 'Implementation Completion and Results Report' for Noor Ouarzazate (2025), and 'Additional Financing' for Noor Midelt (2018). I also analyze four project preparation, appraisal and completion documents produced by the African Development Bank (2014–2021), the European Investment Bank (2012) and the Climate Investment Funds (CIF) program and project materials produced between 2013 and 2018. These texts are central to my analysis because they establish the official problem definitions, such as 'arid land', 'minimal water impact', 'bankable innovation', and 'limited social disruption', through which large-scale solar projects are justified and financed.

Fourth, I analyze four Environmental and Social Impact Assessments and related safeguard documents produced by financiers, state agencies and project developers for the NoorO and Noor Midelt solar complexes. This includes ACWA Power's ESIA for NoorO I (2012) and Noor III (2015), the African Development Bank's 'Summary of the Environmental Social Impact' for Noor II (2014), the World Bank's Environmental and Social Review Summary for Noor Midelt (2018), and the Specific ESIA for Noor Midelt I produced and disseminated by the MASEN-led public–private consortium, including MASDAR (UAE), EDF Renewables (France) and Green of Africa (2019), the European Investment Bank's (EIB) 'Environmental and Social Data Sheet' (2019) and the KfW's 'Ex Post Evaluation of Noor I' (2022). These reports are methodologically significant because they function as temporal and administrative technologies, by way of assessment and regulatory procedures that make socio-ecological harms seem quantifiable, manageable and actionable. These institutional regulatory mechanisms define what counts as harm, when harm is said to begin and end and which forms of dispossession are framed as already mitigated, manageable and/or outside the project's scope. I read these assessments to show how land loss, water use, and the consequent ecological and social disruptions they cause, especially along gendered lines, are treated as non-issues and are depicted through narrow, procedural indicators that do not adequately capture structural inequalities. In this way, ESIAs allow me to chart the ways in which contemporary sustainability governance manages failure through selective recognition, technical redesign and the continual renewal of intervention.

Finally, I read renewable energy policy and project documents alongside the national two agricultural strategies, most notably the GMP (2008) and its successor, the GGS (2020). I include these texts because they were launched in parallel with Morocco's renewable energy expansion

and explicitly seek to increase agricultural productivity while promoting 'environmentally sustainable solutions, especially in addressing and mitigating water scarcity. This enables me to analyze how sustainability is imagined across sectors and how competing demands on land and water are reconciled through technocratic planning and governance that privileges export-oriented agribusiness and energy infrastructures.

Recruitment and Sampling

Research participants were recruited through purposive and snowball sampling. This strategy was used because it reflects the institutional, geographic and social diversity of actors who govern and experience Morocco's agri-energy nexus. Snowball sampling was particularly effective in facilitating access to participants across different governance levels, especially in contexts where formal access pathways are limited and/or mediated by trust, reputation and social/personal networks.

At the local level, recruitment was facilitated through collaboration with community interlocutors in Zagora, Ouarzazate and Midelt. These collaborators were locally known individuals with deep ties to farming communities through tribal affiliation, agricultural backgrounds and long-standing community engagement. Their involvement supported ethical recruitment by introducing me to farmers through existing relations built from trust and advising me on socio-culturally appropriate ways to approach farmers and community members who might otherwise be excluded from research encounters. All community collaborators and participants were compensated for their time and knowledge contributions. At the national and international levels, policy actors and experts were recruited through professional networks and institutional outreach, and contacted via email and LinkedIn. These included officials and experts working within Moroccan state institutions, public agencies, research institutes and international development organizations involved in renewable energy, water governance and agricultural policy.

Data collection relied primarily on semi-structured interviews, which ensured analytical consistency across interviews and also flexible enough to accommodate participants' priorities, experiences and forms of expertise. Interview guides were tailored to each participant group, with distinct guides developed for policy actors and farmers.

Ethics, Consent and Language

This research was conducted in accordance with York University's institutional ethics approval and guided by a grounded feminist ethical commitment to care and accountability. All participants were informed of the purpose of the research, the voluntary nature of participation and their right to withdraw at any point. Consent was obtained verbally and/or in writing, depending on participant preference and literacy considerations. For many small-scale farmers, especially women who lack formal education and cannot read, consent was carefully read aloud to them, explained and recorded.

Language was treated as both a methodological and ethical consideration. Interviews with policy actors were often conducted in English or Darija, according to the interviewee's preference. Moreover, interviews with farmers were conducted primarily in Darija. Although Tashelhat and Tamazight are widely spoken in the southeastern Drâa and Midelt regions, language barriers were addressed by collaborating with local research assistants who were familiar with these languages and embedded in local communities. Where Tashelhat/Tamazight were used, interpretation was conducted in situ, and key meanings were discussed collaboratively to preserve contextual nuance.

Throughout the fieldwork process, I was mindful of power dynamics shaped by gender, age, institutional affiliation and my own positionality as a researcher from a Western institution. In addressing this, I approach the research as relational and context-dependent, with trust, legitimacy and knowledge exchange negotiated across different interview settings.

Confidentiality and Anonymization

To protect participants' privacy and minimize potential risks associated with discussions around land, water, provisioning, governance and place-based knowledge-practices, all research participants are anonymized. Pseudonyms are used for farmer interviewees and identifying details, such as specific job titles, institutional roles and personal characteristics, have been modified or withheld where disclosure could reasonably lead to identification. This is particularly important given the political sensitivity surrounding land tenure, water allocation and provisioning governance and their entanglements with Morocco's agricultural modernization policies and renewable energy projects.

I treat anonymization as an ethical commitment to accountability and participant safety. In line with feminist research ethics, I thoroughly discussed confidentiality with participants during

the consent process and took care to balance analytical specificity with protection against potential social, economic and political repercussions. Even when participants explicitly expressed comfort with attribution, pseudonyms were retained to ensure consistency and to safeguard against unintended exposure across different sites.

Data Analysis and Coding Strategy

Qualitative interview transcripts and fieldnotes were analyzed using NVivo to support systematic engagement with a large qualitative dataset. Codes were developed as analytic devices to delineate recurring narratives, silences and contradictions across interviews and policy texts. Core analytic codes focused on land access and tenure, water distribution and scarcity, gendered divisions of labour, forms of subsistence farming, state and corporate governance practices and techno-political narratives surrounding renewable energy and sustainability. Additional codes captured differentiation among farmers, including distinctions between small-scale farmers and large-scale agricultural producers. Codes were iteratively refined throughout the analysis and were used to develop higher-order analytical categories that structure the empirical chapters.

The analysis of this project is conducted through a repetitious process of sense-making that moved between interview transcripts, fieldnotes, institutional documents and visual materials. Rather than treating interviews or texts as discrete data points, they were read relationally by analyzing closely the contradictions and tensions that play out within Morocco's GEG–sustainable development nexus across sites, scales and institutional settings. These concepts did not emerge fully developed but rather evolved gradually through repeated interactions with similar narrative structures, silences and contradictions observed in empirical data. Over time, this process of identifying patterns across diverse sources made recurring ways of framing land, water, loss and responsibility analytically significant. Therefore, theory was mobilized as a heuristic for thinking with the material, rather than an explanatory template imposed in advance. In this way, analytic concepts function as interpretive tools grounded in the empirical material that emerged from sustained engagement and were refined through dialogue with feminist and decolonial theory and lived experience.

With that said, I now turn to the research obstacles, my positionality as a researcher in Morocco, and the fieldwork constraints I faced during my time there.

Research Obstacles, Positionality and Fieldwork Constraints

During my fieldwork, I encountered several research obstacles related to data access, language, positionality, gendered vulnerability and care responsibilities as a sole parent. Instead of treating these challenges as limitations external to the research, I approach them as integral to the conditions under which knowledge was produced and, in the case of my positionality and access, as analytically generative for understanding how power, expertise and legitimacy operate within Morocco's agri-energy and water governance landscape.

Access to Institutional Actors and Data

While I initially intended to interview a larger number of actors from the World Bank and other multilateral development banks, access was difficult despite repeated outreach through personal networks and professional platforms such as LinkedIn. This constraint reflects the highly mediated and selective nature of access to global development institutions, whereby key players in renewable energy transitions and the governance of sustainable development are made nearly inaccessible, especially to junior and critical scholars.

I addressed this obstacle methodologically by conducting an extensive discourse analysis of institutional documents produced by multilateral development banks, including project appraisal documents, safeguard frameworks, evaluation and completion reports and press releases. I read these texts critically to discern how expertise is performed and how development interventions are legitimized through technical assessments, risk calculations, environmental safeguards and development narratives

These textual sources were supplemented by in-depth interviews with a World Bank actor closely involved in the NoorO project, as well as interviews with international development organizations working in renewable energy and sustainability in Morocco. This combination enabled me to triangulate institutional narratives, examine the rationalities of their decision-making and critically assess how international expertise is articulated and authorized.

Temporal Constraints and Fieldwork Design

Despite careful preparation, I was unable to schedule many national-level interviews before my arrival in Rabat, as I was often asked to connect once I was on the ground. This delayed my initial interview timeline and reflects common gatekeeping practices within state and policy

institutions. Once access was secured, I compensated for lost time through an intensive interview schedule.

Additionally, due to care responsibilities in Canada, my fieldwork was conducted across two separate trips. While this required additional financial and logistical planning, the temporal break turned out to be methodologically productive as it allowed me to reflect on early findings, revise my ethics application, add Midelt as a research site and refine interview questions based on emerging patterns. This iterative approach strengthened the coherence of the research design and enhanced comparability across field sites.

Shifting Positionality and Linguistic Register

A central methodological challenge and insight was the need to shift my positionality depending on the research context and interlocutor. By this, I mean that my social location, language use and modes of self-presentation were not fixed but relational, conditioned by the power dynamics of each interview setting.

When engaging with policymakers, engineers and senior officials, many of whom were Western-educated men, I leaned on my Western academic training, technical vocabulary and fluency in English to establish credibility and legitimacy. Moreover, I observed early in the fieldwork that outreach messages written in English received significantly higher response rates than those written in Arabic. During interviews, English was often encouraged, with one participant explicitly stating that “English is the language of science”. Western language preferences among technocrats reinforce how authority and epistemic legitimacy within technocratic governance are linguistically and culturally coded.

In contrast, during interviews with farmers, my positionality shifted toward my North African identity. I conducted interviews using a mix of Libyan and Moroccan Darija and incorporated limited Tashelhat/Tamazight filler words where appropriate, which helped create a sense of shared cultural references. Many participants were older and, relationally, viewed me as a daughter figure, which influenced the tone and depth of the interviews. I approach these interviews as situated encounters that informed what could be shared, under conditions of familiarity and trust. These conditions provided the space for women to detail, with vulnerability, their understanding of and responses to technocratic sustainability frameworks.

Language, Translation and Local Collaboration

My very limited knowledge of Tashelhat/Tamazight was an anticipated research obstacle, particularly in the Drâa-Tafilalet region. I addressed this early on by working closely with local research assistants and community collaborators who are members of local tribes and farming communities and fluent in Tamazight. Their role extended beyond translation, as they helped contextualize idioms, clarify land and water practices and navigate community norms. This collaboration ensured that interviews were conducted in a linguistically and culturally appropriate manner, thereby mitigating the extractive risks often associated with external research.

Moreover, owing to the historical Arabization of North Africa and the marginalization of the Amazigh language and culture, many participants, despite limited formal education, were able to communicate in *Darija*, thereby facilitating direct interaction. This linguistic layering is analytically important, as it reflects broader political histories of erasure and accommodation that also structure access to state institutions and development programs, especially for Amazigh women.

Gendered Vulnerability and Safety

As a woman conducting solo fieldwork, I encountered instances of sexual harassment, particularly in urban centers and during travel. I prepared for this by carrying personal safety tools and adopting precautionary travel strategies. I generally felt safe in rural villages, where most of my fieldwork took place and where I was often accompanied by women farmers. These experiences deepened my understanding of how men and women navigate public space and development projects differently, a theme that emerges implicitly in my analysis of rural women's constrained access to land and water.

Care Responsibilities and Fieldwork Research

Finally, conducting fieldwork as a single mother and the primary caregiver for my then five-year-old son was the most personally challenging aspect of the research. With the support of my parents, who cared for my son during my absence and brought him to visit me in Rabat, I was able to continue my fieldwork in accordance with my planned schedule. Splitting the research into two rounds allowed me to remain present as a parent as well as exceed my initial interview targets. This experience reinforced the importance of recognizing care as a structuring condition of

academic labour, one that remains largely invisible in methodological accounts, despite shaping who can do fieldwork, where and for how long.

Chapter 3: Techno-political Desert Imaginaries in the Making of Morocco's Renewable Energy Futures

On a sun-drenched February day in 2016, the Moroccan King, Mohammed VI, set out to make his vision for renewable energy part of his monarchical legacy. Dressed in a tailored grey suit and a golden headdress, a symbol of royalty, he proudly extends his arm, holding the Moroccan flag as it waves in the gentle breeze. Encircling him are international dignitaries, officials and financiers, draped in suits and traditional garments, smiling and applauding. A large black-and-gold backdrop with stylized solar rays around the words *NOOR OUARZAZATE I* hangs in the background.

Beneath this carefully orchestrated image lies a deeper political performance, one where the Moroccan state, through the figure of the King, enacts a narrative of enlightened sovereignty and global belonging. Here, sovereignty is performed not through overt territorial conquest but through the orchestration of technocratic expertise in development finance and renewable energy infrastructure that frames the desert as a site of transformation. The desert, once imagined in colonial texts as lifeless and bare, and therefore in need of transformation, is now reimagined as a national resource and site of solar potential to be harnessed in the name of climate mitigation and economic growth. The King's gesture of raising the national flag is not only a performative act of reclamation, in which the desert is seized as a national asset, but also a form of territorialization of sovereign achievement that seeks to transform a globally financed energy installation into a marker of national modernity.

This highly choreographed tableau situates renewable energy at the center of a state-led development narrative that invites both national and global audiences to imagine Morocco as a forward-looking climate leader. The inauguration consolidates a colonial-modernist imaginary in which sustainability becomes the vehicle through which the desert is reterritorialized by state power, capital investment and technological spectacle. Sovereign authority is projected through the transformation of the desert and materially sustained through multilateral development banks, climate funds and European energy market potentials. Accordingly, sovereignty here is intertwined with and articulated through global capital.

In this chapter, I argue that large-scale renewable energy intervention becomes legitimate through what I term *techno-political desert imaginaries*. Through these imaginaries, desert

ecologies and the water that sustains them are represented by corporate, transnational and state development actors, as well as multilateral development banks, as underused and therefore in need of technocratic transformation through renewable energy infrastructure. I develop the analysis of *techno-political desert imaginaries* by bringing colonial environmental imaginaries of the desert, theories of techno-politics and technocratic governance, and Natalie Koch's conceptualization of deserts as techno-political zones. I use this conceptual framework to show how technocratic sustainability governance produces desert as an object of mediation, through which its land and limited waterscapes become ethically and politically available for large-scale renewable-energy interventions.

Techno-political desert imaginaries are co-produced through visuals, documents, policies, financial logics and state performances, and together they imagine deserts as empty, available spaces in need of intervention. In the case of Morocco's renewable energy transition, techno-political desert imaginaries leverage visual cartographies, feasibility studies, environmental assessments and policy rhetoric to construct the desert as both an ailing site and a void space that can be restored by being made productive. They are 'imaginaries' insofar as they rely on representational practices that make the landscape legible in particular ways and 'techno-political' because these representations enable and naturalize specific infrastructural imaginaries as technical, ecological and social necessities rather than political choices.

Methodologically, this chapter operates on three registers: global, national and local. At the global scale, I examine how institutions such as the World Bank, the African Development Bank, the Climate Investment Fund and the European Space Agency (ESA) frame the Sahara as a strategic solar frontier. At the national scale, I analyze MASEN's institutional apparatus, Moroccan state policy, the sovereign staging of the NoorO and interviews with policymakers and energy experts. At the local scale, I draw on fieldwork and interviews in the Drâa-Tafilalet region to examine how these imaginaries intersect with lived agricultural, pastoral and communal land relations. This multi-method approach, when brought together, shows how techno-political desert imaginaries are produced textually, visually and institutionally; made durable through finance, spectacle and sovereign narratives; and materially enacted on the lives and ecologies of those who inhabit the desert.

By characterizing this as an analytic, I show how representational regimes (re)produce the desert as an object of intervention. This process is formative to the legitimation of the broader

GEG–sustainable development nexus. While this chapter focuses on the ways in which the desert is made legible as a site of renewable energy intervention, its broader significance is illustrated in the chapters that follow. These chapters trace how the legibility of land through capital-colonial and technocratic logics comes to material fruition through the entangled and calculative governance of water vis-à-vis hydraulic infrastructure, on which the NoorO depends, and 'sustainable' agricultural modernization schemes.

Techno-political desert imaginaries are historically layered in the ways they move across time and are kept alive by colonial environmental narratives, the global desertification industry and contemporary renewable energy transition planning. In this study, their emergence is indicated by colonial environmental narratives that framed North Africa as mismanaged and encroached upon, most famously through the "Granary of Rome" myth, which, as mentioned in the introduction, cast the desert as degraded and in need of restoration. These representational logics were later revived with the rise of the global desertification agenda, where the desert was reframed as a measurable ecological crisis requiring technocratic intervention. It is within this broader GEG–sustainable development architecture that renewable energy imaginaries emerge as extensions of sedimented histories of hydraulic governance and agricultural modernization, and of the underlying and sustained attempts to repair the desert.

Thus, this chapter addresses the first two research questions of this dissertation. The first question examines the ways in which Morocco's renewable energy governance is historically and discursively structured by colonial and Orientalist imaginaries of the desert. It shows how GEG-sustainable development actors lean on Orientalist binaries of the desert as "barren", void of life, and consequently, a prime site for intervention. This analysis also speaks to the second research question by illustrating the ways expert practices, cartographic tools, financing documents and sovereign performances make the GEG–sustainable development nexus appear legitimate and their visions implementable in Morocco's renewable energy transition.

I demonstrate how techno-political desert imaginaries unfold throughout various temporal moments, beginning with the colonial period. First, I briefly situate my analytics of *techno-political desert imaginaries* within colonial environmental imaginary-making regimes and techno-political scholarship on the depoliticization of technocratic expert governance. I then go on to demonstrate how the rise of techno-political desert imaginaries within the GEG–sustainable development nexus intersects with desertification narratives and renewable energy ambitions. I

show how these narratives together draw on colonial representations that frame the desert as mismanaged and encroaching, as a means by which to legitimize its technocratic (re)structuring and transformation.[12] Subsequently, I demonstrate how the formation of Morocco's renewable energy apparatus, formed through colonial imaginaries of the desert and, subsequently, by the global desertification agenda, began years prior to the construction of the NoorO, as evidenced by scientific reports that visualized solar irradiance and subsequently rendered the desert as a suitable location for renewable energy.

Following project approval, these representational regimes were institutionalized through promotional materials, feasibility studies and environmental assessments that reiterated the desert's aridity and presumed uninhabitedness. Upon the project's approval, these imaginaries were sustained throughout the construction phase and its aftermath with promotional materials and co-produced alongside feasibility studies on the project's social and environmental impacts. To conclude, I situate these representational practices alongside women's reflection on their lived and relational connection to the desert as a site of multitude. This concluding section challenges dominant techno-political desert imaginaries that circulate within the GEG–sustainable development nexus and opens space to imagine the desert otherwise.

Techno-political Desert Imaginaries as an Analytical Framework

To understand how the NoorO complex becomes thinkable, fundable and materially legitimate, I conceptualize techno-political desert imaginaries by bringing together Natalie Koch's formulation of deserts as techno-political zones (2021), Timothy Mitchell's account of techno-politics and depoliticized expertise (2002, 2011) and scholarship on colonial environmental imaginaries that constitute the desert as vacant, mismanaged and governable (El Guabli, 2024; Davis, 2007; Heffernan, 1991; Valcourt, 2025).

[12] As mentioned in the introduction, I use the term GEG–sustainable development nexus to describe the contingent alignment of GEG frameworks, international finance institutions and (sustainable) development agendas that, in specific contexts, converge around particular environmental problems. In Morocco, this alignment materializes around desertification and renewable energy.

I build on these literatures to show how the desert is rendered legible through hierarchical epistemologies and translated into a governable technical object. Technopolitical desert imaginaries thus naturalize large-scale interventions by presenting them as scientifically and economically justifiable. This process becomes visible in irradiance cartographies that reduce the desert to solar metrics, feasibility studies that classify land as 'unused' and 'non-agricultural', and development finance criteria that frame renewable megaprojects as inevitable solutions to climate and energy insecurity. These practices privilege export-oriented solar futures that obfuscate existing pastoral, agricultural and communal land relations.

Colonial Environmental Imaginaries of the Desert

Central to the production of an empty, threatening desert ripe for transformation are the ways in which colonial powers construct the desert through visual and textual regimes. For instance, Brahim El Guabli (2024, p. 26) highlights how the French dictionary defines "…the *désert* (desert) in terms of uninhabitedness, void and lack of human activity". This, according to El Guabli, is in contrast to the ways in which Arabic and Tamazight languages depict the desert through a multitude of adjectives that describe its versatility and "emphasi[ze] a plurality of relational meanings that involve different elements" (El Guabli, 2024, p. 27). By looking at how the desert is defined in both languages, El Guabli (2024, p. 27) elucidates that for those who call it home, "The desert is not really deserted. It is a locus for the millennial production and transmission of knowledge, traditions and know-how".

Similarly, but on a separate register of visual representation, Diane Davis (2007) shows how French colonial administrators used photographs and documents to depict Moroccan landscapes as "arid and denuded". One such image appears in the French Protectorate Treaty, captioned "An arid and denuded landscape," and depicts an undated black-and-white photograph of the Moroccan village of Imilchil (Davis 2007, p. 54). Michael J.Heffernan (1991, p. 38) adds to the interpretive work of Orientalist art by noting the dualities they seek to produce, where the desert was often depicted and rendered as "a barren, sunbaked and lifeless wilderness... entirely devoid of hope" and as a site of salvation through "the heroic efforts of mankind and particularly through the energetic activities of Europeans".

Tracy Valcourt (2025) expands the visual mean-making regimes of the Western gaze through aerial images. Valcourt utilizes W.J.T. Mitchell's (2002, p. 136) "dreamwork of

imperialism" to demonstrate how aerial images of the desert is an expansion of colonial-Orientalist art in that it "echoe[s] the oft-portrayed architectural degradation of North African cities, which advanced the notion that the Orient could be salvaged from ruin by European civilization, while discreetly absenting the local populations that were subject to colonial violence".

These combined scholarly contributions demonstrate how the desert's 'emptiness' justified colonial authority and ecological (re)ordering, and how such visual regimes continue to be mobilized and co-produced by the GEG–sustainable development nexus. Expanding on their work, I demonstrate how the (re)making of a desert ripe for renewable energy imaginaries is contingent on colonial-capitalist logics whereby techno-scientific tools, such as visual maps, and policy language are harnessed to coproduce a diluted desert and thus site from which 'economic growth' and 'export potential' can be envisioned and made plausible (Hendriks et al., 2004; World Bank 2011; World Bank 2018).[13]

Techno-Politics and Depoliticization

Building on the colonial genealogies outlined above, techno-political desert imaginaries, produced through Western scientific methods, must appear both natural and inevitable. In both *Rule of Experts* (2002) and *Carbon Democracy* (2011), Mitchell shows that technical systems seek to depoliticize the choices embedded within them by presenting ecological and social disruptions as engineering challenges and how technocratic institutions convert political contestations into matters of calculation, optimization and technical necessity. Mitchell (2002) demonstrates how development projects like the Aswan Dam generated the very crisis they claimed to solve, only to present techno-scientific intervention as the sole remedy.

Mitchell further argues that techno-politics is inseparable from infrastructures of energy. He explains that "political possibilities were opened up or narrowed down by different ways of organizing the flow and concentration of energy" (2011, p. 8) and that these arrangements were constructed through finance, expertise and violence. Concentrated carbon energy, he notes, structured the conditions under which democratic claims could be assembled (2011, p. 9).

[13] In the next chapter, I shift from this representational genealogy to examine how these imaginaries materialize in water governance practices, where their effects become unevenly experienced.

James C. Scott (1998) shows that modern states depend on techniques that simplify complex ecologies and the multitude of life-worlds into abstract and manageable forms. This narrowing of vision, what he calls “tunnel vision”, is foundational to technocratic governance. For Scott (1998, p. 11), simplification “brings into sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality”, making phenomena more “susceptible to careful measurement and calculation” and enabling “a high degree of schematic knowledge, control and manipulation”.

Koch’s (2021) work cements the ways in which these techno-political mechanisms manifest in contemporary desert governance. Koch (2021, p. 87) conceptualizes the desert as ‘techno-political zones’, in which deserts are not merely passive backdrops but active arenas where geopolitical strategies and state-making processes unfold and are “actively constituting and constituted by relations, identities, and potentialities across time and space”.

These scholarly insights highlight two key dimensions of techno-political desert imaginaries. The first is the ways in which the state imagines and materializes its desired futures through infrastructure projects. The second is how these futures become depoliticized and appear natural and inevitable. In the Moroccan case, solar infrastructures similarly organize the flow of power, both literal and political, by aligning GEG and national (sustainable) development narratives around a techno-scientific reimagining of the desert. This fusion of scientific knowledge production (e.g., irradiance mapping, feasibility modelling, environmental impact metrics) and technological intervention (e.g., solar infrastructure, storage systems) creates the conditions from which the desert becomes a justifiably governable site. My framework extends these insights by showing how these processes are spatially, visually and historically anchored in colonial environmental imaginaries and sovereign performances specific to the Moroccan desert.

By drawing and building on these scholars, I conceptualize techno-political desert imaginaries as a constructed zone of intervention that relies on the co-production of techno-scientific visual and (policy) textual regimes that deem the desert a deficient site in need of intervention and, in doing so, delegitimize and invisibilize the desert’s pluralities as lived and experienced by small-scale farmers who have long called it home.

The Genealogy of the Empty Desert: Colonial Environmental Imaginaries and the Making of Arid Lands

Making Morocco Green Again: The Revival of the 'Granary of Rome' Narrative

Widespread 'scientific' claims about the threat posed by the desert and the need to transform it have roots in colonial narratives of desertification produced alongside technoscientific claims. The French administrators frequently invoked the myth that North Africa had once been the "Granary of Rome," a fertile agricultural heartland supposedly ruined by centuries of Arab and Amazigh nomadic and pastoralist mismanagement of the land (Davis, 2004, 2011; Swearingen, 1987). For instance, Paul Boudy, the colonial forestry director of Morocco and the man responsible for the 1917 Moroccan forest code, employed statistics and correlative assumptions that substantiated already harboured Orientalist stereotypes about the inhabitants of the desert and the desert itself. For instance, he claimed that two-thirds of Morocco's forests had been destroyed by the Arabs and that "there exists, in effect, a very tight correlation between the nomadism of Semites and the devastation of vegetation" (Davis, 2011; Davis, 2004, p. 378).

According to Davis (2011), the 'Granary of Rome' vision was often pitted against a dire dystopic vision of an encroaching desert. This is evident in the ways French colonial 'experts' described the desert, in eerily similar ways to the contemporary desertification industry, but slightly more unfiltered in its Orientalist undertones. For instance, Dr. Paulin Trolard, a colonialist and adviser in Algeria, warned that if left untouched, "the Sahara, this hearth of evil, stretches its arms towards us every day; it will soon enclose us, suffocate us, annihilate us" (Davis, 2011, p. 65). His dystopian rendering of the desert was met with a dual vision that introduced a reclaimed 'Granary of France' by transforming the desert back to the "…original [Roman] fertility…" through the planting of trees throughout it (Davis, 2011, p. 65). Such assertions of an encroaching desert, which were rarely supported by historical or ecological evidence, played a significant role in the legitimization of the French administration's environmental redemption narratives (Davis, 2007). These colonial representational regimes demonstrate how desert 'emptiness' is embedded in Western universalist logics that naturalize intervention, and continues to be galvanized by contemporary GEG–sustainable development discourses.

Colonial Afterlives in the Global Desertification Agenda

Fast forward to the early 1970s and 1980s, and the emergence of the global sustainable development agenda in tandem with the global desertification industry. The alarm bell of desertification, which links environmental degradation, poverty and utopian imaginaries of development through scientific rhetoric, complemented by data, gave rise to a global sustainable development agenda contingent on the need to combat desertification (Adams, 2011). Beginning with the Sahel drought of 1972-1974, which arguably galvanized much of the international environmental concern, desertification became a key focus of the UN and the World Conservation Strategy and the subsequent GEG agenda, which includes state, non-state and supra-state actors like private corporations and international funding institutions (Adams, 2011).

In the aftermath of the Sahel drought, a key report by the World Commission on Environment and Development, titled "Our Common Future" (1987), rang the alarm on desert lands by noting that "each year another 6 million hectares of productive drylands turns into worthless desert" (Brundtland, 1987, p. 2). Since then, desertification has been widely labelled a crisis and a threat to humanity and the environment, with scientists reporting that approximately 70 percent of the world's arid and semi-arid land now suffers from "varying degrees of desertification" (Davis, 2020). However, Davis (2020) points to how these data points are produced and disseminated despite the term "… having no agreed-upon definition or standard measure".

This lack of a standard, along with the co-production of the desert as an environmental threat, revived by international scientific and policy communities and the media, has served international institutional goals and paved the way for neoliberal extractivism to enter the realm of climate mitigation and environmental protection. This can be seen in the ways in which international institutions, which later became instrumental in the (re)making of the desert through renewable energy projects, have shifted their rhetoric on the 'threat' of desertification.

For instance, in 1988, a year after the Brundtland Report was published, the World Bank produced a report titled "Dryland Management: The 'Desertification' Problem" (Nelson, 1988). The report claimed that a 1975 study purporting to show that "the Sahara Desert is advancing south at 5.5 km/year" was in fact disputed and that there is little evidence to support this claim. However, fast forward to 2022, when the World Bank produced a piece titled "Driving Transformation: A

Climate Roadmap for the Middle East and North Africa" (2022), where they described desertification as "encroaching" and how solar energy as necessary to the prevention of desertification, among other implications of climate change. The featured piece ends by stating "at this critical moment for battling climate change, we look forward to working with policymakers, members of the private sector and development practitioners to create a greener, more resilient MENA" (World Bank, 2022). This discursive flexibility, whereby desertification shifts from a narrative of environmental crisis in 1988 to one of renewable energy opportunity in 2022, illustrates how technocratic authority shifts its framing without altering its core logic of intervention.

Although the policy object shifts from desert encroachment to climate transition, the desert remains positioned as a site that requires external expertise and financing to imagine and fund its transformative future. For example, in its 2023 *"*Climate and Development in the Middle East and North Africa" brief, the World Bank highlights rising temperatures, droughts and water scarcity, while positioning climate action as central to economic transformation in the SWANA region through the deployment of renewable energy. In doing so, the Bank reinscribes itself as an arbiter of what is knowable and doable by framing solar infrastructure as both an environmental necessity and a force for regional development and export-oriented growth.

What this section has shown is how colonial-Orientalist imaginaries of the desert have been mobilized by contemporary global environmental discourses, which similarly narrate the desert binary language of crisis and improvement. As I will demonstrate next, the desertification industry does not only operate through the textual regime of reports and institutional press releases. Rather, it is also co-produced with promotional media campaigns that circulate exaggerated visuals paired with rhetoric that echoes the desert's degeneracies.

Manufacturing the Desert as a Problem: Crisis and Techno-Salvation

Like the 'Granary of Rome' imaginary, the binary and colonially derived narrative of an 'encroaching' desert, co-produced by GEG–sustainable development actors, is disseminated through widely used visual-discursive tools. This can be seen in the ways that mainstream media absorbs techno-scientific discourse to (re)articulate a colonial imaginary of the desert as both a site of crisis and an opportunity.

Headlines such as “Here’s How to Make the Sahara Desert Green Again” (Geggel, 2018), “Solar Power: Taking Advantage of Desertification” (DeAngelis, 2010) and “Morocco Turns the Sahara Desert into a Solar Energy Oasis” (Villamizar, 2018) work to dramatize scarcity and barrenness as preconditions for techno-salvation. By repeatedly describing the Sahara as ‘empty’, ‘barren’ and ‘unused’, and omitting any reference to existing farmers and pastoralists, the visual–discursive productions of the desert by mainstream media do the important political work of normalizing intervention and consequently the loss associated with its transformation (Fairhead & Leach, 1995).

A 2018 NPR feature, for instance, pairs imagery of the Sahara “creeping” toward a palm grove with speculation that covering the desert in solar panels could reverse desertification (Charles, 2018). Drawing on the work of atmospheric scientist Eugenia Kalnay, the article mobilizes technoscientific modelling to infer that darkened solar surfaces could induce rain-producing air currents, which in turn transform so-called wasteland into fertile land. This speculative techno-political desert imaginary presents large-scale solar infrastructure as a plausible tool for ecological salvation while simultaneously reinforcing the colonial-Orientalist perception of an empty desert.

An important caveat to underscore here is that this work does not deny the reality of desertification or its consequences for those who live with and through desert ecologies. These colonial-Orientalist articulations of the desert show how the contemporary sustainability industry has mobilized these logics and representational tactics to imagine, justify and market renewable energy potentials as solutions to the desert’s threats and techno-capitalist shortcomings.

While this section demonstrates how media narratives popularize the desert as a binary site of crisis and salvation, in the next section, I demonstrate how the one-dimensional imaginary of the desert is produced through official reports and co-produced by international funding organizations, state agencies, regional bureaucratic bodies, corporations and consultancy firms. I do so by disclosing how these institutions imagine cartographies of the desert and how accompanying pre-project narratives use such visual and technocratic language to simplify intervention imaginaries and depoliticize the (re)making of the desert as a renewable energy hub.

Desert Cartographies and the Making of Renewable Energy Potentials

Visualizing the 'Empty' Desert and its Iridescent Potentials

> [Colonial] repression fell above all, over the modes of knowing, of producing knowledge, perspectives, images and systems of images, symbols, modes of signification, over the resources, patterns, and instruments of formalized and objective[z]ed expression, intellectual or visual. (Quijano, 2007, p. 171)

Twelve years prior to the official launch of the NoorO and five years before the King's sovereign-performative inauguration of Morocco's shift towards renewable energy, the European Space Agency (ESA), Europe's main institution for space exploration, along with the European Aeronautic Defence and Space Company, produced an extensive scientific report titled *Solar Power from Space: European Strategy in Light of Sustainable Development* (Hendriks et al., 2004). Although framed as a comparative technical assessment between terrestrial solar systems and futuristic space-based solar power satellites, the 2004 report was, at its core, political, as it offered European and North African governments and private corporations an authoritative knowledge base for evaluating the Sahara Desert as an ideal site for large-scale energy projects.

Central to the imaginative workings of the report are the continuous visual elements that envision the energy possibilities when solar energy is extracted into space and exported to Europe. Concept images of technologies, maps of solar-optimized localities and demand-supply graphs are used throughout the report to detail the ideal technological landscape and economic model that situate techno-scientific desert imaginaries by optimizing North Africa as a site from which aerospace techno-futures are imagined and ultimately materialized.[14] This is illustrated by an image showing where concentrated solar power (CSP) can be best exploited. The reduced map of North Africa and Europe shows North Africa in red, indicating high CSP optimization and Europe in green and blue. Under the map is an analysis that reads:

> A strategic partnership between the European Union (EU), the Middle East (ME) and North Africa (NA) is a key element of such a policy for the benefit of both sides:

[14] Throughout this chapter, I trace how cartographies and mapping are used in the conceptualizing and planning stages of the NooorO project. I do not analyze them as part of a constellation of discursive and representational acts that together co-produce a singular void desert in need of resuscitation.

> MENA has vast resources of solar energy for its economic growth and as a valuable export product, while the EU can provide technologies and finance to activate those potentials and to cope with its national and international responsibility for climate protection – as documented in the Johannesburg agreement to considerably increase the global renewable energy share as a priority goal. (Hendriks et al., 2004, p. 5)

The above excerpt from the *Solar Power from Space* report frames the Sahara as a site of exchange from which both the EU and the MENA region can mutually benefit through the exchange of land in the SWANA region, which it deems to have 'vast resources of solar energy', while the EU provides techno-economic support. This 'strategic partnership' is justified using the language of 'environmental protection' and 'responsibility'.

Through the capitalist-driven rhetoric of equal benefit, the report rearticulates colonial-capitalist logics, in which the Sahara is reduced to meteorological data and renewable energy potential. To this extent, the desert is presented in the report as a site for which value lies in meeting European energy needs. This can further be seen in how the report addresses the question of land through economic graphs comparing land costs in Europe and North Africa and colour-coded maps (Figures 3.1 and 3.2 below), where white denotes the absence of human, industrial and agricultural activity. Such visual renderings reduce the complex pastoral and agricultural land uses to mere white dots. These Orientalist depictions of the region are further articulated through the accompanying analyses of the map, which position the Sahara as a "widely available" and "unused" zone that could "cover the whole electricity demand of Europe" (Hendriks et al., 2004, p. 64).

Figure 3.1: Availability of Land in Northeast Africa Suitable for Solar Power Plants. Source: Hendriks et al. (2004).

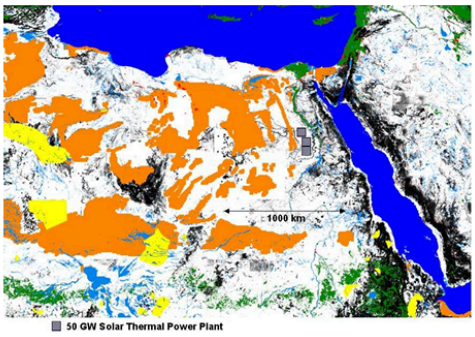


Figure 2. Availability of land in Northeast Africa: white area is suitable for the construction of solar power plants. Base load full supply (150 GW) of solar thermal needs only a small portion of available land

Figure 3.2: Map of annual Direct Normal Irradiation (DNI) across North Africa. Source: Hendriks et al. (2004).

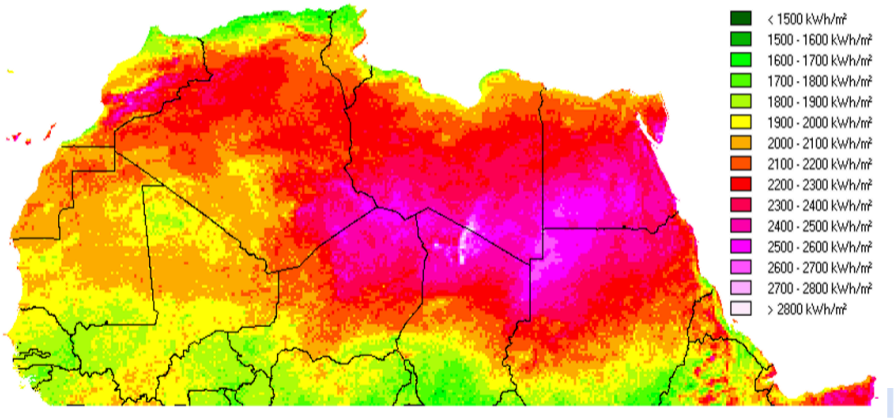


Figure 38. Map of the annual Direct Normal Irradiation (DNI) sum of northern Africa

The (re)making of an empty desert through techno-scientific tools such as satellite-based solar irradiance mapping, cost-efficiency modelling, land-use suitability assessments and energy yield simulations does not occur in isolation. These calculative practices are further legitimized through comparisons with “high population density”, “little available land”, and “higher cost of land” in Europe (Hendriks et al., 2004, p. 1). Within this comparison, European land seems densely populated both socially and economically, whereas North African desert land is made to appear vacant, inexpensive and thus an available site for “climate protection”. The report, therefore, identifies which industries, agricultural lands and people are deemed worthy of protection and which are deemed disposable within the techno-political imaginaries it seeks to materialize.

Moreover, the social and environmental dimensions of the report are further delegitimized by its focus on the technological and economic dimensions of renewable energy. This allows it to reassert, through maps, graphs and tables that serve as factual universal truths, a clean slate and a singular desert, devoid of ecosystems and life and consequently, readily available to produce and export energy. Through its mapping of the highest levels of solar irradiance, the report concludes that fifteen sites across the Sahara are optimal for large-scale renewable energy interventions, with Ouarzazate, where the NoorO now sits, ranking third.

This is not as surprising, as the report featured technical experts on CSP from various countries, including the National Energy Research Center (NERC) in Jordan, the New and Renewable Energy Authority (NREA) in Egypt, the New Energy Algeria (NEAL) in Algeria, and the Centre National pour la Recherche Scientifique et Technique (CNRST) in Morocco. The CNRST was established in 1972 by Royal Decree No. 1-72-314 under King Hassan II to create a public scientific institution mandated to fund, support and regulate scientific and technical research.

Such mapping strategies have since been employed by state agencies to legitimize the exploitation of the desert. According to a former top-ranking official at Morocco's centralized energy company, the National Office of Electricity and Drinking Water (ONEE), along with international organizations, began 'research' on solar irradiance in Morocco's desert in the 1990s to determine site and technology choice:

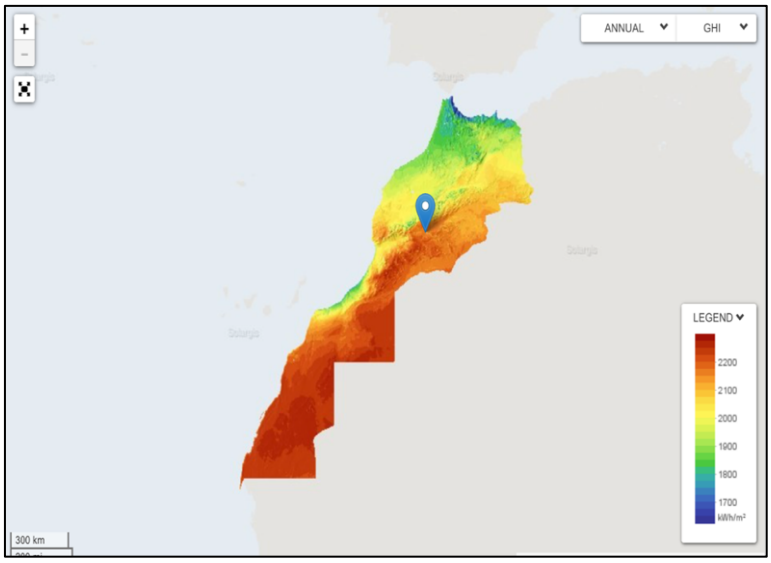
> "[The] choice of technology was due to the solar research back then, it was told that Ouarzazate was a prime location in terms of solar irradiation. Back in the 1990s, an assessment was carried out in Ouarzazate to develop a similar plant, but it was much smaller. It was not complicated in terms of location, access to grid, etc., and in terms of the CSP - in Noor 1, CSP was chosen by ONEE based on the studies carried out back then, and the subsequent phases are MASEN [Moroccan Agency for Sustainable Development]". (Interview, former senior ONEE official, Rabat, Morocco, February 17, 2023).

The interviewee frames site selection as a purely technical decision, grounded in solar irradiance and proximity to the grid. The statement that Ouarzazate was "not complicated in terms of location, access to grid" insinuates that the desert's acquisition was a straightforward process.

This logic is further exemplified in the senior officials' discussion of the CSP choice, in which the technology selection is presented as the outcome of prior technoscientific assessments. Ultimately, what the mapping of the desert shows is how technopolitical desert imaginaries utilize technoscientific instruments deemed 'scientific', and thus 'neutral' and truth-bearing, as legitimate tools that justify and sanction technocratic intervention. These strategies have since been taken up by state agencies to legitimize large-scale intervention in the desert.

Since then, MASEN, which was created through Morocco's Royal Decree on Renewable Energy Strategy, has reproduced on its website a "Solar Atlas of Morocco", (see Figure 3.3) featuring solar meteorological maps and tables that measure the sun's irradiance in Morocco aimed at supporting the first and, arguably most important phase of a power plant, which tracks the "prospection, prefeasibility and site selection" (MASEN: Solar Resource Atlas of Morocco, 2025).

Figure 3.3: Annual Global Horizontal Irradiance (GHI) Map of Morocco. Source: MASEN Solar Resource Atlas (2025).



These state-produced solar atlases similarly follow the visual regimes of techno-political desert imaginaries produced by the ESA. Through meteorological cartographies, the desert becomes a technical energy landscape vis-à-vis irradiance metrics, reduced to a repository of solar

fuels and made governable through dense layers of satellite-derived data and simulation algorithms.

This is not to suggest that administrative simplification is unique to renewable energy development. State-led development projects more broadly rely on data capture, classification and abstraction to make complex social and ecological relations governable. What distinguishes Morocco's renewable energy development from other forms of state-led intervention is not the use of administrative simplification itself, but the way the desert is reimagined as a strategic site for climate protection and energy production. Through the language of 'environmental protection' vis-à-vis decarbonization, solar irradiance and the presumed aridity and vacancy of the desert are transformed into assets that position desert landscapes as sites of national modernization and global environmental governance.

When looking at the NoorO project specifically, colonial desert imaginaries, climate mitigation claims, solar cartographies and sovereign energy ambitions come together to make intervention a necessary component of technocratic sustainability governance. However, and notably, whereas MASEN's atlases employ comparable irradiance-mapping and feasibility-modelling techniques to those of the ESA, their political framing differs. On the one hand, the ESA report emphasizes trans-Mediterranean export potential; while on the other, MASEN seeks to embed solar cartography within a narrative of national development and energy sovereignty. Highlighting these differential framings, supported by similar technoscientific outputs, provides nuance to understanding how legitimacy is sought and gained within the GEG–sustainable development nexus and how it is produced through multiple registers. Another caveat is that these differences do not point to a disconnect in their making of technopolitical desert imaginaries. Rather, they help co-produce one another by (re)constructing the Sahara as a technically suitable and economically viable site for renewable energy intervention.

The ESA's, MASEN's and other international institutions', like the World Bank's, adoption of irradiance mapping and prefeasibility cartographies cannot be understood as isolated institutional decisions but as extensions of a broader GEG–sustainable development technocratic rhetoric and logics that hinge on the reconfiguration of the Sahara into a renewable energy frontier embedded in extractive political economies and Europe-facing energy markets (World Bank, 2011). A glaring example of the ways in which this is done is the World Bank's commissioned report on the manufacturing potential of CSP in the MENA region, "…with donor support from

the Energy Sector Management Assistance Program (ESMAP)", carried out by the French branch of the consultancy firm Ernst & Young as well as the German Fraunhofer Institute (World Bank, 2011, p. 2). The report, accompanied by yet another visual cartography of North Africa's CSP potential vis-à-vis projections of solar irradiance, notes "The MENA region has amongst the world's best conditions for CSP: abundant sunshine, low precipitation, plenty of unused flat land close to road networks and transmission grids. It is also close to Europe, where green electricity is much valued" (World Bank, 2011, p. 2). The report's site selection category uses visual and discursive Orientalist, oversimplified binary framings of the desert, complemented by taken-for-granted techno-scientific outputs and the subsequent depoliticization of large-scale interventions.

Overall, this section has shown how mapping and modelling visual representations, substantiated by techno-scientific textual analysis, produce the desert as a techno-political frontier to show how techno-political desert imaginaries become naturalized in renewable energy pre-planning. With that being said, I now turn to how this imaginary becomes a vehicle not only for European export potential, hinted at in pre-planning reports through the (re)making of the desert with CSP technology, but also for sovereign ambitions. Here, the desert becomes more visibly a geopolitical and political-economy project that consolidates a trifecta of sovereign security, European energy security and export-oriented development through climate finance.

Securing Sovereign and European Energy Futures

This section moves from the technical visualization of the desert to the political-economic projects that such visualizations make possible. The imaginary (re)making of Morocco's desert as a renewable energy hub through techno-scientific framings is inseparable from the choice of technology itself. The decision to pursue CSP, a relatively new technology at the time, became a key thread in the technocratic research and scientific cartographies.[15] CSP's towers offered what photovoltaic (PV) technology, the tried-and-true solar technology, could not: the ability to store energy for numerous hours. Here, the selection of both technology and locality, anchored in claims of 'optimal solar irradiance', becomes especially significant when examining economic outputs and their linkages to global capital and sovereign-making legacies. I demonstrate this by

[15] By 'scientific cartographies', I am referring to satellite-derived irradiance maps and feasibility models used to quantify solar potential and are conducted by national and international actors.

examining how CSP, owing to its storage capacity, becomes part of a broader narrative of national progress, economic modernization and sovereign vision, including praise for the King as an indispensable figure guiding Morocco's energy and economic futures.

These technological decisions are also embedded within the wider geopolitics of Morocco's renewable energy strategy and are closely aligned with European markets and institutional partnerships. For instance, in speaking with the lead of Research, Development and Innovation (RDI) at Morocco's Research Institute for Solar Energy and New Energies (IRESEN), the lead frankly explains how the country's technological partnerships continue to follow long-standing historical relationships:

> "Generally, Morocco is more oriented towards Europe; we have more partnerships with Europe than with Arab League states… Call it geographical and political reasons. Maybe because we have been in contact with Spain and France since the colonial era… it is a heritage that we have to follow" (Interview, IRESEN RDI Lead, Rabat, February 21, 2023).

Here, the RDI lead matter-of-factly explains how Morocco's renewable energy partnerships remain embedded in historically sedimented colonial relationships that continue to shape contemporary environmental and technological alliances, as well as the country's positioning in global renewable energy markets.

However, it is worth noting that Morocco's longstanding relationship with Europe requires a geopolitical nuance that goes beyond colonial inheritances and externally imposed mechanisms. This is especially the case with Morocco's desire for energy security, which has led the state to seek broader geopolitical partnerships with Europe, supranational institutions and Gulf nations (Moore, 2021; Youssef, 2023). As Sharlissa Moore (2021, p. 121) argues, Morocco's energy policy is shaped by a "…conglomeration of competing forces" that include "achieving domestic sustainable development and industrial policy goals, securing international financing and managing domestic energy prices, and grappling with domestic resource scarcity and complex dynamics among the African Union, European Union, and Algeria". Algeria is a key player in Morocco's diversification, given Morocco's high dependence on fossil fuels and its historically fraught reliance on Algerian natural gas (Fakir, 2023; Moore, 2021; Youssef, 2023).

These diversification ambitions are intricately linked to Morocco's broader sovereign-security project. For instance, Intissar Fakir (2023, p. 54) argues that Morocco's foreign policy evolution has been shaped by the need to "diversify their global partnerships" as well as Morocco's desire to expand its role in Africa and gain support on the issue of the Western Sahara. The latter is particularly important because Western Sahara is both an external diplomatic concern and a domestic legitimacy project, whereby externally, it remains central to Morocco's diplomatic strategy, while internally, it is, as Fakir notes, "at the heart of the monarchy's domestic legitimacy" (Fakir, 2023, p. 54).

Morocco's geopolitical diversification has also been shaped by globalized renewable energy finance, including development banks, climate finance, Gulf-state aid and corporate capital. Moore (2021, p. 124) notes that external financing became both "a goal of Morocco's renewable energy policy and an outside influence", which included "aid from the Gulf states". Saudi Arabia is especially significant because it appears as an influential actor on both sides of Morocco's energy strategy. For instance, data from the World Bank's World Integrated Trade Solutions (2023a) shows that Morocco imported approximately US$1.53 billion in fuels from Saudi Arabia in 2023. Moreover, Saudi Arabia's water and utility company, ACWA Power, has expanded regionally and plays "…a major role in Morocco's renewable energy development" through projects such as Jbel Khalladi wind farm, the NoorO and more recently, the acquisition of the Noor Midelt solar power plants (Moore 2021, p.125).

This brief overview intends to show how Morocco's renewable energy strategy is shaped by a web of geopolitical relations among European institutions, Gulf capital, development banks and corporate energy actors. Here, Morocco's renewable energy endeavours do not break from its previous dependency patterns. Rather, its dependency shows up through new financial, technological and trade relations. With that said, Europe remains a central actor in Morocco's renewable energy endeavours through energy-security partnerships, which provide Morocco with Western techno-political expertise that dictates where and how renewable energy development is modelled and justified. These framings, as seen in the ESA and World Bank reports commissioned by Western consultancies, revise older colonial ideas that viewed North African deserts as underused resource frontiers, where their value could be unlocked through external technical efforts. Through techno-economic modelling that combines feasibility assessments, donor-backed financing structures and cost-efficiency calculations, CSP is framed as the 'optimal' technology

for desert deployment and the mechanism through which the sun's energy can be harnessed to light up Europe "1.6 times" over (Hendriks et al., 2004). This logic is implemented in the planning and materialization of NoorO I, as reflected in an interview with a World Bank senior official who explains how the Bank supported both the financing and promotion of CSP precisely because:

> "European companies can go to North Africa, set up large solar power plants, and export power into Europe in order to clean [the] European energy system" (Interview, senior World Bank official, Zoom, March 15, 2023).

The quote above demonstrates that, by supporting large-scale CSP technologies, the World Bank both finances and facilitates European penetration into North Africa through transnational energy markets to meet European demand. The underlying logic here is that North Africa's desert localities are readily available for strategic and extractive use. As such, the choice of CSP technology reflects a broader political project that, in part, remains tied to inherited colonial relationships and sovereign authority. The state latches onto 'new technology', old colonial powers and Orientalist imaginaries of the desert to project technological modernity, attract international investment and position itself within global energy markets as a means of displaying its (sustainable) development potential.

Beyond export potential, the lure of renewable energy becomes a pathway to sovereign security. For the King, transforming the desert into a renewable energy hub is not only a developmental goal but a question of sovereignty itself. A Moroccan journalist critical of the NoorO, specifically its technological choice and its promises of energy independence, framed this succinctly:

> "[The NoorO] is a political project, not a sustainable one…. Morocco is a monarchy, and every monarchy has to leave a legacy. The former King had the dam project as his legacy and now the project of this King is the project of renewable energy". (Interview, Moroccan journalist, Casablanca, February 1, 2023).

Here, the Moroccan journalist recontextualizes the NoorO as a monarchical legacy-making project rather than a climate one. This view was echoed by the senior World Bank official, who did not

share the skepticism of the Moroccan journalist, but rather saw the underlying logics driving the project as 'foresight' by the King, noting that:

> "Climate policy was not the priority [for the King]. It was energy security and industrialization through CSP, which was a fairly new technology, so his majesty had the foresight to see that maybe Moroccan manufacturers could get to start having a leg up in the supply chain..." (Interview, senior World Bank official, Zoom, March 15, 2023).

This admission, similar to the sentiments shared by the journalist, unsettles the official narrative of NoorO as a climate-focused initiative and instead highlights how renewable energy has been used to push Morocco toward industrialization and achieving long-term energy independence, which in turn strengthens the King's sovereignty claims. Together, the two interview excerpts demonstrate the ways in which climate discourse functions more as a legitimizing rhetoric in retrospect than as a main driving force. By invoking international investment and technological scale, the King articulates a vision of Morocco as a modern, globally competitive energy hub and, as such, is able to reposition the nation from an energy-dependent periphery to a renewable energy leader. The state is represented by the monarchy and functions as a strategic architect and guarantor of development. As such, sovereignty is articulated outwardly through spectacle and export-oriented energy infrastructure that positions Morocco as a strategic locality for European and global energy markets.

The King's 2016 Throne Speech, which he delivered as the final phase of the 3,000-hectare project was underway, illustrates how renewable energy is mobilized within a broader assemblage of sovereign, developmental and techno-economic narratives. In his speech, the King boasted that "the largest solar power farm in the world" had attracted interest from "a number of international companies" (Morocco World News, 2016). By using his throne speech to mention international investment and technological scale, the King articulates a vision of Moroccan modernity as a globally competitive energy hub, removed from the dependent energy periphery it once occupied.

Moreover, this articulation of hybrid development and energy sovereignty, produced through the desert as a site of renewable energy production, is reinforced discursively through the King's performances but also through the performances of international actors and promotional materials that advertise the completion of subsequent phases of the NoorO project, particularly the highly

anticipated NoorO II and NoorO III. In addition to the World Bank senior officials' praise of the King's foresight, he mentions the King five times in the interview, in relation to his "decision to champion renewable energy" and "King's approach to transforming Morocco to become a renewable energy champion" (Interview senior World Bank official, Zoom, March 15, 2023). The continuous mention of the King in relation to the NoorO situates the NoorO project within a narrative of enlightened, forward-looking sovereignty that aligns Morocco with global climate ambitions.

This is amplified on ceremonial stages such as the 19th Throne Day, on July 30th, 2018, an annual reaffirmation of sovereign continuity, during which high-profile dignitaries, including the Director-General of the International Renewable Energy Agency (IRENA), Adnan Z. Amin, appeared alongside Moroccan officials. Shortly after attending the King's Throne Day ceremonies, Amin took a flight to the heat-hazed city of Ouarzazate for a photo-op and a short news story that linked Morocco's magnificent technological conquest to sovereign legitimacy, whereby he celebrated Morocco's "national achievement" in becoming "a leader in the new energy age" (International Renewable Energy Agency [IRENA], 2018). The first visual displayed on IRENA's webpage titled, "IRENA Director-General Visits World's Largest CSP Site in Morocco" reproduces the now-familiar imaginary of a gleaming, almost translucent tower encircled by rows of mirrors oriented upward in reverence to its height (see Figure 3.4) (IRENA, 2018). Subsequent images show Director Amin, at times alone or accompanied by Moroccan engineers, standing amid the solar panels with the monumental tower repeatedly positioned in the background or studying a digital rendering while an engineer gestures enthusiastically toward the screen (see Figures 3.5 and 3.6).

Figure 3.4: IRENA article headline about Director-General Adnan Z. Amin visiting the NoorO. Source: International Renewable Energy Agency (2018).



Figure 3.5: IRENA Director Adnan Z. Amin pictured at NoorO III with solar panels and CSP tower in the background. Source: International Renewable Energy Agency (2018).



Figure 3.6: IRENA Director Adnan Z. Amin with a Moroccan engineer examining digital renderings of CSP technology. Source: International Renewable Energy Agency (2018).



The gesture of attending the Throne Day, followed by a visit to the NoorO and the accompanying rhetoric, accomplishes two interconnected types of political work. First, and as previously stated, it explicitly links the Noor complex to the King's sovereignty, portraying the monarchy not only as a patron of technological advancement but as its architect and guarantor.

Second, the featured imagery makes visible the recent, at the time of Amin's visit, commissioning of Noor's Phase II and III technologies, thus flaunting to the world the much-publicized NoorO II's and its parabolic CSP system's seven-hour sunlight capacity (200 MW) and NoorO III's 150 MW central tower system. The emphasis on storage capacity, scale and innovation reinforces the techno-political desert imaginary through which the NoorO is narrated as a site where sovereignty, global capital ambitions and technoscience are co-constituted. This demonstrates how power attaches itself to infrastructure and why infrastructures matter to a political imagination that is discursively depoliticized.

This brings me to the ensuing section, where I turn to the NoorO as the material and visual consolidation of these imaginaries. I show how large-scale solar infrastructure is staged as proof of Morocco's green modernity and, in doing so, eclipses the land, water and livelihood relations through which the project is made possible. Through the examination of ESIAs, project appraisal documents and project completion reports by MASEN and multilateral development banks, I demonstrate how technopolitical desert imaginaries are (re)produced through documents that classify land, water and livelihoods in ways that make the desert available for intervention.

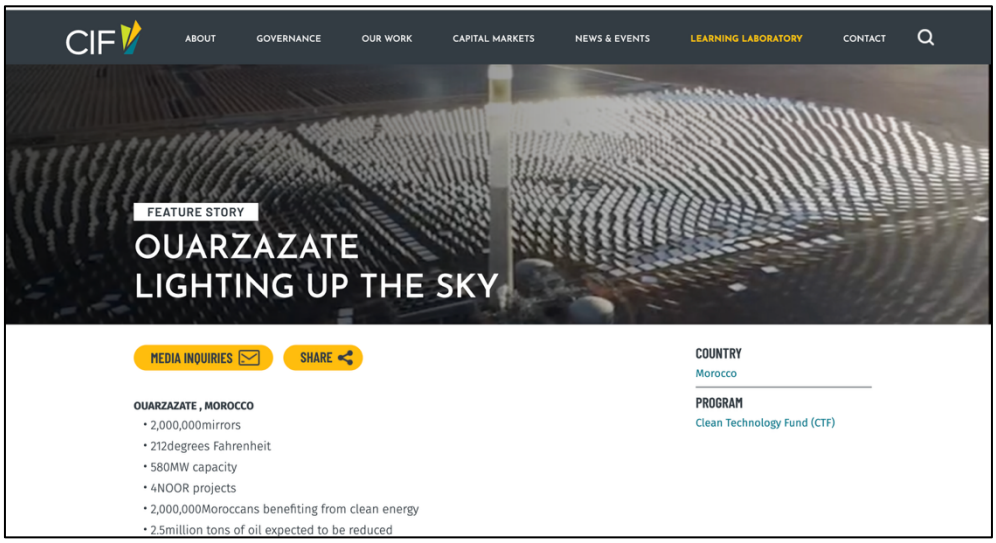
The Material Implications of the NoorO's Construction

Manufacturing the Desert and its Techno-Scientific Rescue

The NoorO marks the point at which techno-political desert imaginaries are inscribed in built infrastructure, visual spectacle and development narratives by national and international funding actors, who frame the project as evidence of Morocco's green modernity. For instance, upon entering the CIF's "Ouarzazate, Morocco" webpage, you are immediately drawn to several futuristic animations of the NoorO Solar Power Plant. One takes a bird's-eye view of the total of two million solar mirrors arranged in a circle, gazing towards a tall central tower. The other allows you to follow the length of the central tower, which moves outward to display the massive circular constellation of solar panels against the backdrop of an empty desert and distant mountains. The

caption plastered across the moving visuals reads, “Lighting up the Sky” (see Figure 3.7) (Climate Investment Fund: Ouarzazate, n.d.).

Figure 3.7: A screenshot still from the Climate Investment Fund’s featured story webpage titled “Ouarzazate: Lighting Up the Sky”. Source: Climate Investment Fund (n.d.)



In addition to the dualities displayed on the webpage, a simple gray map of Morocco shows a turquoise circular dot indicating the location of the NoorO. Under the map, the words “Imagine a solar plant the size of around 3,500 soccer fields, an area almost equivalent to that of San Francisco….[f]iction this is not”. Reiterating the King’s words, the webpage claims the NoorO is “…the largest solar complex of its kind in the world” and how it seeks to “Benefit [the] local economy with direct and indirect employment opportunities”. Along with numerous mentions of its size and the innovative technological choice used for the NoorO, is the contrasting image of the location chosen for its implementation, where Ouarzazate is described as “…a city that sits at the doorstep of the Sahara”, and its landscape as “arid” (Climate Investment Fund: Ouarzazate, n.d.). Through scale comparisons (3,500 soccer fields; the size of San Francisco), hyperbolic epithets (“Lighting up the Sky”) and minimalist cartographic cues that reduce Morocco to a gray silhouette marked by a single turquoise dot, the desert is depicted as an empty canvas saved by the innovation of technoscience and technocratic governance. This binary approach helps depoliticize the plant by framing its presence as a natural extension of the desert environment rather than a political

intervention. The desert's 'aridity' then becomes both an aesthetic backdrop and a developmental rationale that paves the discursive ground for the governing logics of dispossession exemplified in later institutional texts.

This is also seen with MASEN's promotional material, which intensifies these imaginaries by staging and articulating a binary between untouched nature and technocratic rescue. One YouTube video published by MASEN in 2018 depicts the institution's rise alongside its goal of transforming the desert. It does so by demonstrating the visual contrasts between advanced technology and dull, brown desert landscapes, with a single isolated tree amid the expanse, a contrast openly acknowledged by the British male narrator. The narrator highlights that Morocco's abundant renewable energy resources are generated on "arid plains completely untouched by human activity" (MASEN, 2018).

Moreover, the narrator frames the absence of technoscientific intervention as the problem, positioning the NoorO, with its cutting-edge CSP technology and its fusion of geopolitical ambition and sovereign aspiration, as a necessary solution. With accompanying visuals, the narrator notes, "The wind flew through the mountains without turning a blade of a single turbine, and the rivers flowed without encountering a single dam" (MASEN, 2018). The video continues by emphasizing the technical expertise of engineers and policymakers who assessed how to harness these natural resources that had previously gone "unutilized". The narrator states that through environmental and social impact feasibility studies of land and surrounding nature, technical experts determined that certain sites can leverage nature's chaos and "… [offer] the best potential for clean energy production" (MASEN, 2018). Through such public-facing promotional communications, MASEN and the CIF, among others, once more recreate the binary story of nature versus technology. Through this exaggerated, oversimplified narrative, technoscientific expertise becomes the ultimate hero for both sustaining the plant's operation and conferring technological legitimacy.

In the next section, I demonstrate how the visual spectacle of the NoorO, set against a hollow desert, is mirrored and further substantiated in the textual documents of international organizations, development finance and the state. Development finance documents, produced by GEG–sustainable development institutions, such as project appraisal documents, safeguard reports and environmental assessments, constitute techno-scientific documents based on research and studies conducted by said institutions or a 'third party' on the social, economic and environmental

impacts of large-scale development projects. However, when viewed through the lens of techno-political desert imaginaries, these documents reiterate the colonial fiction of desert vacancy, erasing local ecologies and human presence near the power plant.

Institutional Narratives of Vacancy and Benevolent Dispossession

In taking the land from the natives, we are assisting them.
A.Bondis, La Colonisation au Maroc, Rabat 1932

In 2014, prior to the project's launch, the World Bank produced an appraisal document that characterized the region as unproductive and semi-arid. Under "Project Beneficiaries," the report reaffirmed both the technological and economic rationale for the project, stating that "local authorities and the population" would benefit from the "economic and social development opportunities, particularly with regard to playing a catalyst role in the development of this semi-desert region" (World Bank, 2014a, p. 14). The implication being that a semi-arid region did not produce viable or productive industries worth noting, and thus development projects, such as the NoorO, would provide a booming economy and social development opportunities.[16]

This framing draws on a long history of World Bank-proposed land reform agendas that have continually remade communal and tribal lands as available and in need of technocratic intervention. Since the 1990s, the World Bank and the IMF have imposed Structural Adjustment Programs (SAPs), which have increasingly eroded customary land systems and promoted individual property titling, particularly on tribal and pastoralist lands (Catusse, 2008). Zakia Salim (2016, p. 35) notes that World Bank-mandated privatization policies "accelerated the liberalization of land and the uniformity of legal frameworks regulating various modes of land tenure".

These long-standing reforms shape not only the legal conditions of land acquisition but also the discursive landscape through which contemporary development projects are justified. This becomes evident when examining the rhetoric employed in the NoorO's project approval and post-implementation reports, such as the World Bank's 2014 "Integrated Safeguards Data Sheet" and the 2018 additional loans proposal document. The former highlights how, "The land acquired for the site consisted entirely of communal land and is of uninhabited, arid, non-agricultural nature

[16] In Chapter 4, I provide details on the social and economic shortcomings of the NoorO.

with limited revenue potential"; while the later notes that the land's lack of revenue potential was rescued by a "willingly buyer" who purchased "this arid unoccupied land" (World Bank, 2014b, p. 4; World Bank, 2018b, p. 18). Subsequently, the ESIAs by funding institutions such as the African Development Bank (AfDB) (2014) and ACWA Power (2013), the Saudi-based company that is developing and operating the project, echo the desert's aridity as a means to justify the power plant's scale. For instance, the AfDB (2014) Phase II Summary of the Environmental and Social Impact Assessment frames the land surrounding the NoorO as "uninhabited" and a "desert plateau" (p. 3) previously used for grazing and thus, "will require no destruction of habitat, no displacement of communities, and no loss of economic activities" (p. 22). Similarly, ACWA Power described the area as a "sparsely vegetated plateau" with "no permanent settlements" (ACWA Power, 2012, p. 7).

Overall, these textual strategies produce unintelligibility around the social worlds that inhabit and depend on the land. They do so by primarily recognizing communities located within the designated project area, leaving broader claims to land, water and livelihood largely outside the scope of assessment. By scripting the desert as 'non-agricultural', 'unproductive' and 'uninhabited', institutional documents foreclose the possibility that grazing lands, seasonal mobility, customary tenure and Amazigh social organization constitute forms of value, stewardship or belonging (Hamouchene, 2016; Rignall, 2016; Ryser, 2019). As a result, the Orientalist framing of the desert makes it difficult for those impacted, and especially those not featured in these reports, to have their claims recognized and heard.

For instance, Karen Rignall (2016) and Sarah Ryser (2019) show how not only were traditional herding pathways disrupted, but even the Aït Oukrour Toundout, the tribe whose communal land now hosts the NoorO, was excluded from meaningful negotiations. The financial transaction itself, which followed Protectorate protocols and was deposited into a Ministry of Interior account in the tribe's name but without their access, echoes colonial legal structures in which the colonial administration maintained tutelary authority over tribal lands.

Importantly, and as demonstrated previously, the economic potential of the NoorO has often been paired with the technological capacity of CSP in the reimagining of the desert, with the aim of creating both local and national economic prosperity; however, this has not been realized. For instance, the Aït Oukrour Toundout Amazigh community was repeatedly assured by state actors, national officials and international donors that NoorO would deliver jobs and a 'new

common' capable of generating ongoing revenues and social uplift, thus positioning dispossession as a sacrifice that would be rewarded (Ryser, 2019, p. 2). Yet, as Ryser (2019) demonstrates, such promises have remained largely unrealized.

This narrative emptying provides a crucial political function where, once land is stripped of meaning, its acquisition is then deemed by state, international and corporate actors as a benevolent site of development intervention. Having traced how techno-political desert imaginaries operate as visual and discursive tools that repeatedly co-produce the desert as vacant and optimizable in the name of technical intervention, I now turn to the desert as a dynamic site of plurality. The following section brings in the voices of small-scale farmers living in the vicinity of the NoorO and who have often been left outside of the techno-political desert imaginaries that gave way to its construction.

A Narrative of a Desert Otherwise

Ask about the desert, for its sands hold treasures	دفائنها رمالها ففي الصحراء، عن سل
Their worth is gold and the soul finds solace in them	تهواها والروح ذهبٌ، قيمتها
You, who intend to touch them, slow down and be gentle with them	بها وارفق تمهّل لمسها، ينوي من يا
For their land is a delight to the eye, and the heart yearns for them	يهواها والقلب للعين، متعةٌ فأرضها
The grains of their dust are pure gold	لونُ فاقعٌ ذهبٌ ترابها حبّات
A cure for the mind and guidance for the lover	هداها وللمحبّ للعقول، شفاءٌ
For the soul yearns for them instead of pitying them.	عليها تشفق أن بدل تهواها فالروح

This poem was shared with me in March of 2023 by Asma, a 42-year-old small-scale farmer from Amerzgane, and was written by her farmer-and-poet friend from Agdz, a commune located between Ouarzazate and Zagora. Asma, a co-founder of a small women's farming collective that preserves ancient local seeds and emphasizes place-based, passed-down farming and subsistence practices, showed me around the interconnected small plots of land she and other women use to farm and collaborate. Asma, who is featured more prominently in Chapter 6, explains that the initiative began despite "the harsh drought conditions" and the gendered systemic and structural exclusions that women face in farming (Interview, farmer, Amerzgane, March 14,

2023).[17] The poem was her response to my question about how she sees what is termed as an 'arid' and 'unproductive desert'.

The poem describes a desert whose worth is 'gold' and whose sands hold treasure that cures the mind and soul. It warns that the desert's ecology yearns for human interaction that is fleeting, fast and immediate, but not slow and intentional. The poem ends by speaking back to the pitying eye that seeks to transform it. Rather, through the gaze of the poet, who calls the desert home, the souls yearning for it reflect the imaginaries of a desert otherwise. Here, the desert is a site of pluralities for small-scale farmers like Asma, her poet friend and the ecologies that thrive despite its fragility. It is a site of abundance and provisioning, or in other words, home.

For the small-scale farmers in the very localities from which techno-political imaginaries are made and remade, the desert is what 'raised' them and from which they can satisfy not only their provisioning needs but also an eco-spiritual ethos of responsibility to land, water and each other.

Asma tells me:

> "All the women work together and help each other, from planting the seed to grinding the grain to making traditional Amazigh carpets together" (Interview, farmer, Amerzgane, March 14, 2023).

Asma's narration challenges the techno-political desert imaginaries of sustainability governance actors by emphasizing forms of relational knowledge that go beyond techno-scientific optimization. For Asma, the desert is a regenerative site that sustains all life-forms through embodied knowledge-practices and gendered cooperation and care.

Similarly in Tamegroute, a former oasis village just outside of Zagora, Sadiya, an elderly woman, whose own age she does not recount, and her daughter, Kathloum, approximately 35 years old, sit in the humble dimly lit living area, where just a few feet away their palm trees once stood tall and they were able to grow, eat and make from what the land provided. Kalthoum tells me of the labour she used to do and how this labour was passed down from her mother:

[17] This will further be emphasized in the subsequent chapter.

> "We were raised in the *jnān (*small farmland). I would gather the crops, make grains out of wheat and barley plants, get the alfalfa for the animals and feed them". (Interview, farmer, Tamegroute, May 25, 2023).

Her mother, Sadiya, adds that during her parents' time and as a young child, they were able to grow "everything", including:

> "I would go into the *jnān* with my mother. The water used to come to us, *Alhamdulilah* (thank God). We had everything. Onions, herbs, dates, wheat and barley, fava beans, *Allah* gave us everything because there was water in the *saqqiya* (traditional water channel)". *(Interview, farmer, Tamegroute, May 25, 2023).*

In addition to the above, I go on to ask her what else they grew/cared for: "Livestock?", "Yes"; "fruits?", "Yes… figs, pomegranate and dates and apricots" (Interview, farmer, Tamegroute, May 25, 2023). These recollections by Sadiya and Kalthoum of going to the *jnān* with their mothers, of what they witnessed and helped to grow there and how that sustained them, provide a different reading of the desert. Their embodied connection to it challenges the taken-for-granted singular desert conceptualized by GEG–sustainable development actors and demonstrates how the *jnān* is seen as a site of multi-species farming and intergenerational knowledge sharing. Their mention of the *saqqiya* highlights that water was present and managed collectively through ancestral irrigation systems. What development reports describe as arid land with little potential was, in practice, a biodiverse system that provided resources to support and care for families across generations.

I go on to inquire what they purchased that they were unable to cultivate. Using her hands to count, Sadiya tells me:

> "Egyptian spinach (*molokhia*), watermelon and honey melon". (Interview, farmer, Tamegroute, May 25, 2023).

Here, Sadiya challenges the widely disseminated narrative of scarcity, whereby her, her family's and her community's market dependence was selective. This points to how small-scale farmers

were largely autonomous from external markets and supply chains and challenges the assumption that economic development is required to render such landscapes viable.

The ways in which the desert provisioned for the needs of those who called it home were further articulated by Muna from Amazraou, also an oasis commune not far from Zagora. Muna tells me what they grew:

> "Everything. Alfalfa, vegetables, fava beans, onions, date and fig trees. We had everything. We had apple trees. We had lemon trees. Everything our ancestors grew here in Amazraou… the *jnānat (*small farmlands) grew/raised us". (Interview, farmer, Amazraou, May 25, 2023).

This everything is the traditional Amazigh rugs and coats made from the wool of sheep that keep the *dār* (house) and one's body warm on cold winter desert nights. It is the butter, milk, eggs and meat that come from the cows, goats, chickens and other livestock. It's the fruits that the trees give birth to and crops that spring from the soil used to nourish and heal those that care for it, their families, their livestock and their neighbours.

Women's stories of the desert describe their experiences in the *jnān* that do not emerge outside the Orientalist-capitalist logics, state interventions and development projects of sustainability governance analyzed throughout this chapter. Rather, they are forged and sustained in relation to these forces and in tension with the binaries of a lifeless, encroaching desert in need of techno-economic transformation.

Rather, as I will show in the following chapters and particularly in Chapter 6, women's embodied and relational accounts tell the story of an abundant desert through which its provisioning is experienced through *baraka* (blessing) and whose natural ecologies are recognized and approached through *amana* (sacred responsibility) to protect what sustains life. Even as they reflect on the slow erosion of the desert's abundance over time, their place-based eco-spiritual practices defatalize this loss by refusing to accept its normalization and continuing to care for the land, sustain it and place faith in the return of its abundance (Agathangelou & Killian, 2011; 2016; Davidson, 2016).

Conclusion

To the naked and unknowing eye, Tamegroute today appears to reflect technopolitical desert imaginaries of GEG–sustainable development institutions and actors that have co-created a singular desert that is increasingly becoming emptied of life. As I make my way through the once-thriving oasis commune, the *saqqiya* that once fed the *jnān* of Sadiya and Kalthoum, their families, and their livestock is now a dry, cracked and dirt path that encircles the commune and the ancestral farmlands of those who call it home. Fallen and frail-looking palm trees that once stood tall cut through the *saqqiya*. The *jnān* that once grew all that was needed and filled the commune with the colour of crops and trees was now a monochrome brown, grimly depicting a photo filter, stripped of life.

In this chapter, I demonstrated the rise of the technopolitical desert imaginaries of renewable energy endeavours by actors far removed from the desert who use technoscientific visual and textual discourses to (re)imagine the desert through a singular Orientalist lens. These erasures are enacted through maps, feasibility studies, sovereign performances and policy rhetoric, which materialize unevenly across bodies and ecologies. It is in these spaces where the consequences of representational harm become lived loss.

Chapter 4 turns to these lived techno-political landscapes by shifting from the representational work of desert imaginaries to the material and administrative practices that govern intervention. Drawing on women's testimonies, the chapter delineates how everyday relations to land and water are restructured once the desert's optimization has been legitimized. These testimonies highlight how large-scale technocratic interventions, most notably the NoorO complex and earlier dam-building projects such as the El Mansour Eddahbi Dam, turn technocratic decision-making masked through measurements and eligibility criteria into lived dispossession and loss.

Water emerges here as the most consequential register of this transformation. By linking the NoorO complex to Morocco's longer history of hydraulic governance, from colonial dam-building projects rooted in the 'Granary of Rome' fantasy to contemporary agri-energy infrastructures, the chapter shows how techno-political imaginaries are operationalized through the control of water allocation. It is through these hydraulic practices that land and livelihood labour practices are differentiated, ranked and subordinated to the state's priorities of agricultural modernization and renewable energy expansion. I conceptualize this process as *calculative loss*, which I define as a governing logic by which loss is made administratively justified through water

metrics and eligibility thresholds for state support, with impacts most acutely felt along gendered lines.

Chapter 4: Entanglements of Enduring Calculative Loss in Morocco's Agri-Energy Hydraulic Nexus

Kalthoum grew up not seeing the *saqqiya* water run through the oases of Tamegroute. She witnessed her family address the water scarcity and the drying of their oasis farm and subsistence farming practices by building a traditional well. The only constant in Kalthoum's life has been drought. From a young age, she observed the makeshift well her father dug, becoming progressively deeper as groundwater became increasingly difficult to extract.

Her mother's memory of water is folklore to Kalthoum, one she has heard time and time again, a longing recollection of a past she was not privy to. Kalthoum's mother, Sadiya, describes her youth in Tamegroute as characterized by abundant water and life in the desert where they were able to grow "everything", a time when "... all the blessings and good were in the *jnān*…[because] there was always water" (Interview, farmer, Tamegroute, May 25, 2023).

The cycle of water dispossession has not ended with Kalthoum. Now her four daughters and son hear their mother's story of a well that held water, and, like their mother, they hear the stories of a *saqqiya* filled with water that gushed through the smaller *suwaqi* that their grandmother tells; yet the mere sight and sound of the water that often visited the commune and gave life to the oasis' ecosystem is far from their lived experience.

Kalthoum, like many of the women, uses years and harvest production to calculate the steady loss of livelihood. She tells me how in 2022 she was able to grow only alfalfa, wheat, herbs and onions and how one year later she produced nothing. Her six date trees are frail and depleted because the groundwater aquifer has dried up, and she is unable to dig deeper in her traditional well or find an adequate water supply due to her lack of access to state-run modern wells. Kalthoum attributes water scarcity directly to the state's enduring control over water resources, beginning with the construction of the El Mansour Eddahbi Dam.

> "When the dam was built, the water stopped coming freely… this was made worse by the droughts in the 1980s and 1990s" (Interview, farmer, Tamegroute, May 25, 2023).

This chapter examines how socio-ecological loss is administratively produced and unevenly distributed throughout Morocco's longstanding agri-energy hydraulic governance. Through the

analytic of *calculative loss,* this chapter exemplifies the ways in which expert water metrics, project appraisal and hydrological planning frameworks, and agricultural eligibility criteria justify the layered erosion of small-scale farming and make it secondary to broader GEG–sustainable development's technocratic claims to environmental protection. Calculative loss is produced through a cumulative, ongoing process of technoscientific measurement of water scarcity, which allows institutions to frame unequal access as a technical problem of scarcity management rather than a political decision, where loss becomes a normalized aspect of 'sustainability'. Additionally, it is produced through bureaucratic calculations that sort farmers through the governance of lands and waterways into hierarchical categories of eligibility. The chapter does this by mapping the ways in which multilateral development banks, national institutions and regional bureaucracies perform distinct but mutually reinforcing forms of legitimizing work. These processes are experienced by small-scale farmers, particularly women, through reduced water flows, dry wells, land fragmentation and exclusion from agricultural support.

It draws on a genealogical reading of colonial and postcolonial water governance, land reform and contemporary sustainability governance using thirty-seven farmer interviews conducted in the southern Drâa-Tafilalet region, including two with large-scale male farmers and twenty-eight with small-scale female farmers from the southeastern Drâa-Tafilalet region and institutional actors involved in Morocco's agricultural, energy and water governance. These interviews are analyzed together with policy reports and funding documents to examine how scarcity is calculated institutionally and experienced by farmers through reduced water flows and technocratic eligibility barriers that have contributed to the cumulative erosion of their subsistence livelihoods.

I begin with the El Mansour Eddahbi Dam because it is the infrastructure through which these historical, institutional and everyday processes intersect and become entangled. The Dam is located approximately ten kilometres from Ouarzazate and was constructed in 1972 on the Drâa River as part of King Hassan II's postcolonial development agenda to transform Morocco's rural landscape through hydraulic governance. Its construction has transformed communally operated water flows, vis-à-vis the *suwaqi* (plural of *saqqiya*) channels, which flowed freely from the High Atlas to the Atlantic, into a state-managed water system (Kaczmarek et al., 2025). The aim of Morocco's hydraulic interventions was to support the irrigation of farmland and, specifically, to increase Morocco's agricultural production and generate hydroelectricity. Since 2016, the dam has

now linked rural life to global energy circuits through its essential role in cooling and partly powering the Noor Ouarzazate (NoorO) solar power plant. Thus, the dam becomes a key site for Morocco's agri-energy hydraulic governance of the southern Drâa-Tafilalet region, where colonial hydraulic regimes meet contemporary 'sustainable development' governance, through Morocco's largest agricultural strategy, the Green Morocco Plan (GMP) and its largest renewable energy project, the NoorO.

Whereas the previous chapter showed how techno-political desert imaginaries operate through technoscientific visual regimes and technocratic policy frameworks to make the desert appear available for large-scale intervention, this chapter turns to Morocco's agri-energy hydraulic governance as the material entry point for examining how the (re)organization of land, water and rural livelihoods is deemed permissible through selective decision-making guided by institutional mandates and done in the name of drought mitigation. *Calculative loss* operates as a sovereign and technocratic mode of agri-energy hydraulic governance that mobilizes water metrics, bureaucratic criteria and development metrics to legitimize the institutional role of invested sustainability governance actors. By employing depoliticized tools to measure water and worthiness, these institutions can justify their selective provision of water access. Calculative loss is gendered in the ways it builds on colonial and postcolonial land-tenure regimes, inheritance laws and agrarian institutions that structurally position rural women as the most vulnerable to water loss, land fragmentation and exclusion from state provisioning.[18]

In what follows, I trace calculative loss across three interconnected registers. First, I analyze how GEG–sustainable development institutions enact distinct legitimizing political work through technoscientific rationalities, such as contradictory water metrics, behavioural framings and administrative classifications, that reaffirm their authority to manage scarcity, even when their accounts diverge. Second, I examine how these institutional framings materialize through agri-hydraulic infrastructures and water governance practices, including redirected flows, reduced dam releases and groundwater depletion. Third, I demonstrate how calculative loss operates through

[18] It's important to note that I am not introducing *calculative loss* as a comprehensive theory of environmental governance, but as an analytical tool to trace how specific marginalized populations, particularly rural women farmers, and their experiences of exclusion through their cumulative and intensifying limited access to water resources.

bureaucratic eligibility and agricultural recognition, where land ownership, registration barriers, farming licences, subsidies and access to so-called 'sustainable irrigation' technologies determine which farmers are recognized as legitimate agricultural subjects. These mechanisms, when examined together and over time, produce a governance regime in which water, land, technology and recognition are selectively and hierarchically allocated and through which socio-ecological loss becomes normalized, especially along gendered lines.

This chapter directly addresses the dissertation's second research question by elucidating the ways in which the GEG–sustainable development nexus is both legitimized and operationalized through expert metrics, institutional practices and bureaucratic classification. Connectedly, it speaks to the third question by showing how these frameworks marginalize subsistence farmers' place-based knowledge-practices through uneven access to water, land, technology and agricultural recognition.

Calculative Loss

Instead of treating dispossession as an unintended outcome of scarcity or policy failure, calculative loss elucidates the technical and administrative process by which land, water and agricultural eligibility are converted into water-allocation calculations, impact assessments and eligibility thresholds that obscure the political dimensions of selective allocation. These forms of intervention are visible both in institutional accounts and in women farmers' own narratives of the state as a builder of dams and connected energy infrastructure, controller of water release schedules, gatekeeper of modern wells and the absent provider of support.

Sacrifice Zones and the Spatialization of Harm

Critical scholarship on sacrifice zones allows for a nuanced understanding of how environmental harm is spatially concentrated and how sacrifice zones are not an accidental by-product of development. Rather, this scholarship argues that contamination, extraction and dispossession are political decisions that work to advance global capitalist interests by designating particular places as acceptable sites of harm (Bullard, 1990; de Souza, 2021; Lerner, 2010; Wallace et al., 2025). Ross Wallace et al. (2025, p. 1293) note that these sacrifice zones are now being created through large-scale renewable energy infrastructure and their intersection with neoliberal

policies, thus creating new sacrifice zones that bring "significant negative socio-ecological consequences and environmental injustices" to marginal localities.

While the sacrifice zones literature exemplifies the spatial concentration of harm, it often leaves under-theorized the administrative and technocratic processes through which socio-ecological loss becomes normalized and defended. This chapter builds on this work by examining how, in the Moroccan agri-energy context, specifically the southeastern Drâa-Tafilalet region, calculative loss emerges as a governing practice through water accounting, efficiency benchmarks, land registration and institutional narratives of mismanagement, which together are used to depoliticize institutional mandates and justify provisioning selectivity.

Gendered Exposure to Loss

Feminist political ecology provides a foundational lens for understanding how environmental governance is inseparable from gendered relations of power (Elmhirst, 2011; Shiva & Mies, 1993; Nightingale, 2011; Rocheleau et al., 1996). This body of literature demonstrates that environmental degradation, infrastructural (re)ordering and resource withdrawal disproportionately burden women, particularly in rural agriculture-dependent areas, who often absorb the most material consequences of water scarcity through gendered, unpaid labour and expanded responsibilities for household provisioning and care (Fico, 2022; Shiva & Mies, 1993; Nightingale, 2011).

This is especially the case for Moroccan rural Amazigh women. As noted in Chapter 2, feminist research on the gendered dimensions of land access in Morocco's rural setting demonstrates how gendered land tenure systems and inheritance norms, along with language and education barriers, systematically restrict rural Amazigh women's access to land, water and state provisioning (Bossenbroek, 2016; Bossenbroek & Ftouhi, 2024; Charrad, 2001; Fico, 2022; Ou-Salah et al., 2023; Salime, 2016). From a feminist lens, I conceptualize calculative loss not only as administratively produced and spatially distributed but also as embodied.

Calculating Scarcity in Technocratic Sustainability Governance

Critical studies of technocratic governance, highlighted in the previous chapter, show how social and ecological losses are constructed as administratively rationalized and depoliticized

outcomes that rely on expert knowledge, metrics and managerial frameworks (Li, 2007; Mitchell, 2002; Scott, 1998).

Scholarship critical of the technocratic management of Moroccan agriculture and rural development further shows how, on the one hand, technocratic policy frameworks privilege export-oriented production and formalized efficiency, while, on the other hand, marginalizing subsistence practices and rural livelihoods that fall outside state-recognized categories of productivity (Faysse, 2015; Mathez & Loftus, 2023; Akesbi, 2019). Moreover, scholars examining Morocco's renewable energy transition echo these critiques by demonstrating how large-scale renewable infrastructure reproduces similar technocratic logics of optimization and the acceptable loss of water and land (Belghazi & Sammouni, 2020; Haddad et al., 2022; Hamouchene, 2016, 2019; Hanger et al., 2016).

Calculative loss synthesizes these respective literatures to elucidate how environmental harm and social loss are both justified and disproportionately distributed by administrative frameworks that are formed through expert knowledge, technoscientific metrics and entrenched hierarchies of value.

Institutional Hydraulic Governance and the Technoscientific Legitimation of Scarcity

Quantifying Water Scarcity: Competing Metrics and Complementary Logics

Drought conditions have long existed in Morocco but have intensified in recent years, in part due to climate change and the longue durée of colonial and state-sanctioned agri-energy hydraulic interventions that have sought to transform Morocco's desert through hierarchical water-allocation governance (Swearingen, 1987; Moore, 2019). However, institutional actors mobilize distinct but mutually reinforcing techno-scientific narratives to justify water scarcity and overexploitation. The purpose of these narratives is largely to insulate institutional legitimacy and sovereign decision-making.

As I demonstrate in the sections that follow, through water consumption figures, dam-level reporting, basin-deficit projections and behavioural framing, state institutions convert the material effects of water diversion into problems of scarcity management. These competing yet mutually reinforcing techniques and narratives are central to calculative loss because they enable the quantification and legitimation of uneven allocation by projecting certain losses as if they were inevitable and acceptable within Morocco's sustainable development agenda. Institutional data on

the NoorO's water consumption and dam levels produced by MASEN, the African Development Bank (AfDB) and ACWA Power, the Saudi developer and operator of NoorO, make this evident.

Early environmental studies estimated NoorO's total water consumption at 2.5–3 million m³ per year, covering one wet-cooled CSP plant (Noor I) and two dry-cooled CSP plants (Noor II and III). In 2021, Noor I alone extracted 1.63 million m³ from the El Mansour Eddahbi Dam (KfW, 2022, p.7). That same year, the Office Régional de Mise en Valeur Agricole (ORMVA), the regional agricultural authority, released data indicating that dam levels had fallen by 73 percent, with the deficit deepening to 88 percent in 2022 (Field document, ORMVA, March 13, 2023).[19]

In the case of ORMVA, these figures represent its institutional mandate as a regional agricultural authority responsible for implementing Morocco's agri-hydraulic development plans. Unlike the data published by MASEN, the AfDB and ACWA Power and their institutional allegiance to the NoorO, ORMVA's data tells the story of declining dam levels. By contrast, MASEN and international development banks consistently minimized the impact by providing fixed and overgeneralized calculations. The African Development Bank's (AfDB) "Phase III Project Completion Report" (2021, p. 21) asserted that "Noor I's water use represents only 0.7 percent of the water volume in the dam", and proposed dry cooling as a sustainable solution for arid regions. ACWA Power, in its Specific ESIA for Noor III, echoed this by claiming that implementing dry cooling in subsequent phases had enabled Noor I to meet Morocco's sustainable development goals (ACWA Power, 2015, pp. 98, 100). However, it is important to note, and as I illustrate in more detail in Chapter 5, the wet cooling used in Noor I demonstrates how anticipated water stress was channelled through technical and financial decision-making rather than treated as a political question of allocation. A former senior ONEE official who led the early stages of the NoorO I planning revealed that while dry cooling for NoorO I was considered, MASEN chose wet cooling, thus indicating the ways in which water scarcity, while anticipated, was deprioritized (Interview with former senior ONEE official, Rabat, February 17th, 2023).

A later KfW report released in 2022 titled "Ex Post Evaluation of Noor I" tells the story of water shortages affecting the El Mansour Eddahbi Dam and characterizes it as impeding on the

[19] ORMVA is the regional agricultural authority created on the advice of the World Bank and modelled on the colonial Office de l'Irrigation du Tadla, and now tasked with operationalizing Morocco's agri-hydraulic GMP and its successor, the Green Generation Strategy (GGS) (Swearingen, 1987).

project's sustainability (KfW, 2022). However, this acknowledgement does not contradict earlier estimates of water use and safeguarding measures. The report goes on to state that " …the water study had not foreseen this [decline] at the project appraisal" and that "the reasons for this [decline] are still unclear and beyond Nooro I's control" (KfW, 2022, p. 1; p. 7). The KfW's narrow framing allows water declines to be registered only through infrastructural precarity and a deferral of institutional responsibility.

The 'solution' proposed by KfW is for the project to tap into the Sultan Moulay Ali Cherif dam, used for drinking water. The Sultan Moulay Ali Cherif dam, which was created in response to water shortages in the region and the aging El Mansour Eddahbi's inability to secure clean drinking water, was named by the KfW report as a potential cause for the decline in El Mansour Eddahbi's water reserves (Interview, official from the Hydraulic Basin Agency of Drâa–Oued Noun, Ouarzazate, March 9, 2023; KfW, 2022). Here, calculative loss operates through KfW's recognition of water scarcity as a technical problem requiring a technical solution, vis-à-vis new hydraulic infrastructure to extract water. In doing so, the KfW protects the NoorO's legitimacy by proposing the continuation of technocratic interventions that, in part, contributed to the decline of El Mansour Eddahbi's reservoir. As I show subsequently, the KfW's calculative narrative differs from the accounts provided by farmers, who link water scarcity to decades of dam-mediated technocratic governance.

The Hydraulic Basin Agency of the Drâa–Oued provides another institutional framing of scarcity. As a regional office established in 1995 and tasked with addressing and managing Morocco's drought by issuing well permits, monitoring water usage and overseeing basin-wide planning in each region, it offers an assessment that echoes that of renewable energy institutions:

> "At the time [the El Mansour Eddahbi] was built, it had 625 million cubic metres of water, and now it's at 428 million cubic metres" (Interview, Basin Agency Official, Ouarzazate, March 9, 2023).

The metrics presented by the Hydraulic Basin Agency of Drâa–Oued Noun indicate a total loss of 31 percent over a 50-year period, which conflicts with the ORMVA's official narrative of 88 percent in 2022.

These assessments should not be seen as just different measurements, but as representative of institutional efforts to legitimize their respective mandates. Whereas ORMVA's figures speak

to declining dam levels in relation to its agri-hydraulic development mandate, the Basin Agency's longer-term dam-volume framing situates scarcity within basin-wide hydrological management. By framing the NoorO's water consumption as a negligible percentage, MASEN, AfDB and ACWA Power depoliticize scarcity and uphold the project's sustainability credentials. Moreover, KfW's evaluation reporting acknowledges scarcity through the language of deferred responsibility and technocratic adjustments that centre the NoorO over the region's inhabitants and ecologies. These institutional maneuvers and trade-offs are not competing interpretive claims; they should be interpreted as differentiated by mutually reinforcing and complementary logics of scarcity. They do so by collectively mobilizing their bureaucratic mandates and technoscientific discourses to make water diversion appear to be an administratively excusable trade-off.

This technocratic framing becomes even more evident at the basin-planning level, where water scarcity is expressed as numerical supply-demand deficits that can be modelled and forecast within long-term planning frameworks. In contrast, the Hydraulic Basin Agency of Drâa–Oued Noun defines scarcity through basin-level modelling and long-term deficit forecasts. In the agency's 2022 "Master Plan for the Integrated Development of Water Resources in the Drâa–Oued Noun Basin", total renewable water resources are estimated at 819.8 million m^3 per year, while total water requirements reach 985.7 million m^3, which amounts to a basin-wide deficit of 165.9 million m^3 annually (Hydraulic Basin Agency of Drâa–Oued Noun, 2022, obtained during fieldwork).

At the same time, the agency's emphasis on long-term or absolute declines in dam volume indicates a broader hydrological crisis. For instance, when speaking to a high-ranking official employed at the agency about how he explains the water scarcity plaguing Zagora and its surrounding communities' oases and the drought conditions being felt by Ouarzazate and its surrounding communes, his answer was vague and technocratic:

> "Yes, there is a water crisis, but it is being handled". (Interview, Hydraulic Basin Agency of Drâa–Oued Noun Official, Ouarzazate, March 9, 2023).

When asked how it is being handled, he responds by showing me where new dams have been built, such as the Sultan Moulay Ali Cherif Dam in Ouarzazate, which provides the region with drinking water, the same dam that the KfW proposed MASEN tap into due to the declining water levels of the El Mansour Eddahbi Dam (Interview, Hydraulic Basin Agency of Drâa–Oued Noun,

official, Ouarzazate, March 9, 2023). He refers to the National Water Plan (NWP) 2020-2050 as a current guide to the agency's work. This is significant because both my inquiry and farmers' complaints about water, as Mina's account later shows, are funnelled into long-term planning frameworks of technical monitoring and future infrastructural solutions.

Bureaucratic Blame: Administrative Constructs of Water Scarcity and its Perpetrators

The NWP uses a three-pronged 'Results Area' (RA) approach to address water scarcity in the region. For the purposes of this project, the first two are of particular importance. The first aims to strengthen water governance at the "national and river basin level" by further entrenching technoscientific mechanisms of water management. For instance, the World Bank appraisal document emphasizes long-term climate uncertainty, water valuation, aquifer-management contracts, smart meters, groundwater monitoring, information systems and performance benchmarking (World Bank, 2023b, pp. 6–7).

The World Bank document also refers to the King's 2022 parliamentary speech, whereby the King emphasized "leveraging modern technology" and underscored the need for "…rational exploitation and preservation of groundwater resources, in particular by curtailing illegal pumping and well digging…" as among the measures of the NWP's strategy used to curb water deficit.

These technocratic, sovereign-directed measures address scarcity by further entrenching data capture and technoscientific infrastructural monitoring vis-a-vis smart meters, Geographic Information Systems (GIS), hydrological models, benchmarking frameworks and performance standards. As the story of water governance in Morocco has been, and continues to be, told, the colonial-capitalist logics that underlie these strategies make certain water users increasingly visible to administrative oversight and simultaneously label their socio-ecological losses as behavioural.

The funnelling and rearticulation of these logics can be seen in the high-ranking Hydraulic Basin Agency of Drâa–Oued Noun official's suggestion that modern wells require land assessments, agricultural licensing and authorization from the state as solutions to the drought felt by oasis communities (Interview, official from the Hydraulic Basin Agency of Drâa–Oued Noun, Ouarzazate, March 9, 2023). Due to the bureaucratic checklist and financial capital required to access modern wells, none of the farmers I interviewed in the Southeastern Drâa-Tafilalet region had one in their *jnānat*, with the exception of the two male large-scale farmers. Ultimately, the solutions proposed by the NWP, which, as I will examine below, draw on thresholds articulated by

the GMP and its predecessor, the GGS, where scarcity is treated as a problem requiring more 'efficient' monitoring and oversight, as well as the expansion of authorized infrastructure. This, in turn, diminishes the political questions of uneven allocation and infrastructural extraction by deeming the aforementioned technocratic management mechanisms as rational and universally accessible responses to scarcity. [20]

Other institutions, such as the Ministry of Agriculture and its regional subsidiary, the Office Régional de Mise en Valeur Agricole (ORMVA), acknowledge increasing water depletion in the region but place the blame on small-scale farmers. This can be seen in internal agency documents co-produced in 2022 by the Ministry of Agriculture and ORMVA, which describe the increasing year-by-year rainfall deficit in the region and its impacts on dams, rivers and hydraulic irrigation perimeters (ORMVA Ouarzazate, 2023, document obtained during fieldwork). The documents note the impact this has had on the date palm sector (downstream oasis communities), with date palm production falling by 40 percent in the 2021-2022 season (ORMVA Ouarzazate, 2023, document obtained during fieldwork). With that being said, the document implicitly shifts the blame to both climate change, via the shortage of rain, and to the very communities being most impacted by the water shortages. The document states that "dry climatic conditions combined with overgrazing and excessive exploitation of pastoral resources" (ORMVA Ouarzazate, 2023, p.3, documents obtained during fieldwork).

By framing scarcity as the combined result of climatic drought and local resource misuse, agricultural institutions, such as ORMVA, construct farmers, without differentiation, as the primary site of intervention.[21] In doing so and as this chapter will subsequently show, their role becomes one of advocating for water management through expanded governance mechanisms vis-à-vis permits, crop planning and the adoption of irrigation technologies that benefit large-scale farmers and further marginalize small-scale farmers' access to water.

[20] The GGS will be covered in more detail in Chapter 5 on the temporal (re)making of sustainability governance in Morocco agri-energy nexus.

[21] It's important to note that farming has intensified the region's water shortage; however, as I outline in the subsequent subsection titled "The GMP's Pillar II and the Technocratic Discipline of 'Solidarity Farming'", this has been connected to large-scale farming practices and the GMP's strategies in the Southeastern Drâa-Tafilalet region.

This is evident in both ORMVA and the Chamber of Agriculture's bureaucratic discourses on scarcity.[22]

As a high-ranking Chamber of Agriculture official in Ouarzazate put it:

> "Since 2015, there has been an increasing drought in the area. We do training on different plants, trees, etc., so that the farmer can protect the water and not misuse it" (Interview, high-ranking representative Chamber of Agriculture, Ouarzazate, May 18, 2023).

Similarly, an ORMVA agricultural engineer in Ouarzazate explained their role as:

> "To protect water usage because farming is a large consumer of this water source" (Interview, ORMVA agricultural engineer, Ouarzazate, March 13, 2023).

Among the strategies they employ to manage water usage is to:

> "… to transform the traditional *saqqiya* system into a modern irrigation system" (Interview, ORMVA agricultural engineer, Ouarzazate, March 13, 2023).

These excerpts from ORMVA and the Chamber of Agriculture personnel demonstrate how scarcity is constructed as a problem of agricultural consumption and farmer behaviour rather than as a structural issue. By describing farming in generalizing terms that include both small- and large-scale farmers, bureaucratic actors deem scarcity as a demand-side inefficiency to be corrected through monitoring, training, crop substitution and irrigation reform. As such, agricultural institutions assume the role of technical managers tasked with protecting water from misuse. This binary of selfish misuse and technical fixes disassociates scarcity from the political decisions it is embedded in by treating it as a manageable administrative condition that needs further discipline. These bureaucratic accounts provide a glaring contrast to the lived realities of scarcity that Kalthoum, Sadiya and other farmers experience, particularly women, as I will show throughout this chapter. Moreover, such institutional narratives converge on a familiar solution

[22] The Chamber of Agriculture acts as an intermediary between farmers, especially those with licenses, and the state.

that promotes techno-capitalist GEG–sustainable development logics by further expanding 'modern' hydraulic infrastructure. This is evident in the state's insistence on 'modern' hydraulic mechanisms to 'preserve' water and in their embeddedness across regional agri-energy agencies.

Through selective metrics, permitting regimes and infrastructures as 'solutions', GEG–sustainable development actors sustain their institutional legitimacy through distinctive but mutually reinforcing technoscientific claims to assessing scarcity. Actors invested in the NoorO protect and promote the project's sustainability; basin agencies emphasize hydrological planning; and agricultural institutions frame farmers as subjects requiring behavioural correction and modernization. However, these institutional practices converge to administratively rationalize basin-level allocation models, modernization schemes and environmental assessments that quantify water flows and legitimize technocratic intervention. In this process, responsibility is displaced onto those deemed insufficiently modern and unintelligible to technocratic sustainability governance. This logic of technocratic management, however, is not a contemporary invention of environmental sustainability governance. As the next section demonstrates, it draws directly from colonial hydraulic imaginaries that sought to govern Morocco's desert through its water resources.

From "Granary of Rome" to Hydraulic Nationalism

Materializing the Granary of Rome through Agri-Energy Hydraulic Control

As discussed in Chapter 1, Morocco's contemporary agri-energy hydraulic regime is rooted in a longer colonial history in which water control functioned as a central technology of territorial authority. The colonial desert imaginary of bringing to life the once-flourishing 'Granary of Rome' was both a representational and materially constituted project that depended on the control and reorganization of Morocco's waterscapes. This vision became materialized through colonial hydraulic expertise and engineering schemes. For instance, the hydraulic engineer Paul Penet, recruited by the French in 1917 to advise them on the large-scale transformation of Moroccan irrigation, coined the widely disseminated motto, "not a single drop of fresh water should flow into the sea" (Swearingen, 1987, p. 55). This motto became a cornerstone of Morocco's colonial agri-energy hydraulic policy and led to the material restructuring of Morocco's agri-energy nexus through the introduction of exclusive concessions to semi-private companies, such as *Énergie Électrique du Maroc*, financed by the Banque de Paris et des Pays-Bas, to oversee both irrigation and hydroelectric power generation. Experts within Énergie Électrique du Maroc were tasked with

"…rationally develop[ing] hydroelectricity and [advanced] irrigation" simultaneously (Moore, 2019: 144; Saul, 2002).

Developing Morocco's hydroelectric power, in particular, was funded by the powerful Bank de Paris to industrialize Morocco through mineral exploitation for the benefit of the French administration and to serve the interests of the motherland (Houston, 1954). In utilizing a techno-scientific rationale imposed by expert rule and funded by colonial banks, the colonial administration began fusing state authority with resource privatization and, consequently, restructuring rural life around export-led, extractive water management (Daoud & Engler, 1981; Swearingen, 1987). Overall, Morocco's postcolonial moment served as a temporal handover, in which colonial techniques of water control were (re)deployed as instruments of postcolonial sovereign legitimacy.

Claiming Sovereign Security: Postcolonial Governance of Land and Water

Upon Morocco's independence, its new sovereign monarchy relied on the continuation of large-scale rural interventions through hydraulic infrastructure to gain loyalty and usher Morocco into an era of global capitalist accumulation. Central to this was the newly independent monarchy's reliance on the World Bank. Morocco was one of the earliest nations to obtain a loan from the World Bank in 1964, and as Davis (2006, p. 90) highlights, "…were provided…to expand irrigated agriculture according to plans originally made during the colonial period". A year prior, King Hassan II invited the Bank to conduct a scientific study similar to those previously conducted by French colonists to "help find a path to 'sustained development'" (Davis, 2006; Swearingen, 1987, p. 159). For the purposes of this study, I focus on three interrelated recommendations that are particularly consequential for understanding the longue durée of colonial-capitalist rearticulations of land and water governance.

One such recommendation, which became a cornerstone of King Hassan II's reign, was the introduction of Morocco's large-scale agri-energy hydraulic policy, *la politique des barrages,* in 1968. This policy called for the irrigation of one million plots of land and the integration of agricultural and energy policies through hydraulic infrastructure (Moore, 2019). The plan inherited the Penet's colonial maxim of "not a single drop of fresh water into the sea", and sought to build one dam per year and irrigate one million hectares of land (Rignall, 2016, p. 36). The World Bank supported this endeavour by allocating much of the 2.7 billion dollars' worth of loans to Morocco

from 1968 to 1985 towards irrigation projects, which allowed the King to secure his dam-making legacy through the construction of over 60 large-scale (hydro)dams during his reign (Akesbi, 2006; Swearingen, 1987).

Another interlinked World Bank recommendation mirrored that of the Protectorate and was concerned with and reform intended to serve the King's ambitious sovereign-securing policy goal of irrigating one million acres (Swearingen, 1987). This was done through the monarchy's creation of an Agricultural Code in 1969, which has defined much of the agricultural strategies that preceded it, including the GMP and the GGS, by creating the surveillance and control mechanisms around division of collective land into private landholders, inheritance laws that prescribed a single heir so as to maintain large plots of land intact and irrigation plans and perimeters that prioritized water allocation to landholdings of no less than 5 hectares, which the government had permission to intervene in (Rignall, 2016; Swearingen, 1987).

The World Bank also recommended the creation of "…regional administration at the level of irrigation perimeter or province" (Swearingen, 1987, p. 159). This led to the formation of the ORMVA in 1966, which comprised seven regions. The ORMVAs' role within Morocco's agri-hydraulic apparatus replicates that of the colonial Office de l'irrigation du Tadla (Swearingen 1987). Through the ORMVAs, the state exercised granular control over land preparation, crop selection, rotation cycles, agricultural techniques and water use. Land titles produced under the Protectorate, overwhelmingly held by male heads of family or male tribal elites, were now repurposed as mechanisms of state control and provisioning. Those who sought irrigation benefits from the state were required to prove ownership and land 'potential', assessed primarily through plot-size thresholds, thereby excluding smallholders and most rural women from state-supported access to water (Charrad, 2001).

The World Bank report did not hide the plan's economic motives. Increasing Morocco's agricultural production for export was an explicit objective, as was the consolidation of sovereign stability in the countryside, where rural unrest was treated as a risk to be managed not through provisioning or equitable redistribution, but through hierarchical technocratic governance (Houdret, 2012; Moore, 2019; Swearingen, 1987). In adopting the Bank's recommendations, the monarchy constructed a hierarchical hydraulic regime in which access to irrigation was planned, mapped and strategically made to prioritize large-scale landholdings within designated perimeters. As Will D. Swearingen (1987) notes, only one-fifth of the policy's beneficiaries were smallholders,

mostly men, due to land allocation laws. Sovereign security, pursued through the containment of rural unrest, thus relied on selective inclusion and managed exclusion, with water allocation serving as a tool of political discipline.

King Hassan II's hydraulic governance, supported by multilateral development banks, such as the World Bank, through financing and expertise, restructured land relations and differential eligibility for state-recognized forms of farming across Morocco. As such, the growth-oriented logics of modernizing Morocco's agricultural and energy infrastructure were consolidated through technoscientific irrigation planning and economic rationalization that created a hierarchy of provisioning that, on the one hand, privileged large landholdings and capital-intensive production, while, on the other hand, dismissed and excluded the farming practices that fell outside state legibility and resource allocation.

This concentration of water infrastructure and technical support is aligned with the state's (sustainable) development priorities and has increased the precarity of small-scale farmers. Thus, calculative loss emerges through the language of nation-building development goals and is implemented and justified through eligibility criteria, technocratic mapping and the provisioning of water access. In the subsequent section, I demonstrate the ways in which calculative loss manifests across intersecting scales within Morocco's agri-energy hydraulic governance. I begin with the El Mansour Eddahbi Dam, which, as Sadiya and Kalthoum's sentiments show, is central infrastructure through which irrigation, the GMP and the NoorO become materially connected. Through El Mansour Eddahbi, I show how, for small-scale farmers, the dam, and its longstanding diversion of water to support Morocco's agri-economy and its linkages to the NoorO, has led to a decline in water access and the depletion of their subsistence livelihoods.

Everyday Geographies of Scarcity: Hydraulic Provisioning and Livelihoods Lost



(Photo of mural taken by author, Zagora, May 23, 2023)

Across from the nearly empty, dimmed café I frequented during my time in Zagora, a colourful mural adorns the tan-brown wall. The wall's tones seem deliberately chosen to blend with the desert dust that inevitably settles over everything it touches. In the mural, a hand rises from the water, cradling a flourishing palm tree whose leaves fan outward like a peacock's display. Behind it, the desert is far from 'barren', but filled with equally vibrant palms.

It was in that same café, facing the mural, that I interviewed Mustafa, a local environmental activist and oasis farmer. When I asked what his activism entails, he replied,

> "I am working on reviving the ecological ways of our ancestors and the sustainable ways they did farming". (Interview, farmer and environmental activist, Zagora, May 23, 2023).

Pressed on the reasons this work is important, he paused, lowered his gaze to his nearly empty coffee cup, then looked up again and, with steady resolve, replied: "I feel a responsibility to my oasis community" (Interview, farmer and environmental activist, Zagora, May 23, 2023).

Mustafa explained that preserving land and water requires returning to ancestral teachings:

> "…when you water the palm tree, you are watering a whole ecosystem of plants and crops. This is because, under the palm tree, we plant other plants and those plants benefit from the water we provide to the trees. At the same time, the palm trees retain water on hot days and prevent it from evaporating as quickly as when these crops are exposed directly to the sun. Currently, the way in which people are encouraged to farm consumes substantial water, and the results are not as productive. Even when examining the methods of watering (*saqqiya*), the traditional method is innovative, whereas modern methods, such as drip irrigation systems, are not. The traditional way depends on you to take care of the water because it is a cyclical process". (Interview, farmer and environmental activist, Zagora, May 23, 2023).

The place-based knowledge-practices of oasis communities, as shown by Mustafa, are cyclical, with the palm tree sheltering other crops and water governed communally and with care. When analyzed through a feminist lens that is attentive to relationality and care, Mustafa's deep-

seated responsibility to his oasis community has been cultivated over generations of intimate relations with land and water, including human and more-than-human life. It is a responsibility to his land and water and a commitment to his ancestors, kin and future generations. This care and responsibility, as I demonstrate in Chapter 6, are rooted in place-based stewardship guided by an eco-spiritual relational ethic of *baraka* (blessing) (Von Denffer, 1976; Nigst, 2025), *amana* (sacred trust and responsibility) (Gada, 2014; Ou-Salah et al., 2023), and *twizi* (collective solidarity/mutual aid) (Mimouni, 2003). This ethos has been steadily disrupted by the afterlives of colonial governance. Mustafa notes this change by providing a layered and historical analysis of state-led agri-energy hydraulic policies that sought to 'fix' technoscientific intervention and the persistent problem of drought and desertification by restructuring Morocco's rural landscapes:

> "The traditional way we accessed water was that it would come down from the Atlas Mountains and provide water for all the oases here through the traditional *saqqiya* channels and then would trickle down to the Atlantic Ocean. However, under King Hassan II, there was considerable focus on the construction of dams to prevent water from seeping downstream. In Ouarzazate, this was done through the El Mansour Eddahbi Dam to stop flooding, sanitize the water and produce hydropower. However, due to the dam's creation, oases are largely affected, as water is released infrequently under state control. This has affected the *fursha el ma'eeya* [the subterranean water-bearing layer of the soil], which has started to decrease significantly. Whereas before, we learnt to swim in the *suwaqi* [plural of *saqqiya*]. Then came GMP, which privileged large farmers and agro-business farming, and this also affected the small-farmer" (Interview, farmer and environmental activist, Zagora, May 23, 2023).

The shift from cyclical *saqqiya* flows to dam-regulated releases and from collective stewardship to technocratic management that Mustafa narrates provides an important intervention into the intricately intertwined but distinctive legitimizing political work performed by the various institutional actors entangled in Morocco's agri-energy hydraulic governance. Importantly, Mustafa shows how agri-energy hydraulic infrastructures, over time and through different mechanisms, have institutionalized access to land and water and, consequently, reordered and

marginalized the communal water-sharing practices of small-scale farmers by privileging capital-intensive agricultural endeavours.

As mentioned, a central component of Morocco's hierarchical agri-energy hydraulics regime is the El Mansour Eddahbi Dam in Ouarzazate. The dam is positioned as a multipurpose infrastructure for irrigation regulation, flood control, water and sanitation, as well as hydroelectric production, and, as such, serves as a reflection of Morocco's broader agri-energy aims to transform the desert into sites of agricultural and energy production through the governance of water (Swearingen, 1987; Moore, 2019). The dam's material formation followed the postcolonial state's irrigation schemes and the World Bank's technocratic forms of governance, which sought to prioritize the irrigation of large plots of land. It was further expanded and consolidated under King Mohammed's sovereign energy plans, where the dam now serves as a lifeline for the NoorO solar complex.

As will be demonstrated below, through these technocratic framings of scarcity, small-scale farmers are deemed marginal to the accounts of (sustainable) development and environmental protection. This is especially felt by women, who articulate their gendered loss through the language of longing and nostalgia for what was, what is and their future and for their long-held knowledge-practices. Moreover, they situate loss in a wider history of land and water infrastructures that have redirected, regulated and denied them access to water.

The El Mansour Eddahbi Dam and the Gendered Geography of Water Loss

In much of rural Morocco, women are caretakers of the land, the retrievers of water and the main users of water within the household (Bossenbroek & Ftouhi, 2024; Fico, 2022; Montanari & Bergh, 2019). Women's stewardship role in small-scale farming has increased due to exacerbated drought conditions, both driven by climate change and by Morocco's agri-energy hydraulic governance, where men are progressively leaving the rural setting to work in Morocco's metropoles (de Haas & Van Rooij, 2010; Sadiqi & Ennaji, 2004). However, due to compounding factors rooted in the persistence of patriarchal social norms in rural communities as well as structural gendered exclusions, many women's rural labour is seen as an extension of their household labour.

Most of the women interviewed, such as Kalthoum and Sadiya, have no formal education because, as Kawthar, an elderly woman from Amazraou who does not know her exact age, puts it,

"They [the village elders] said that girls don't study" (Interview, farmer, Amazraou, May 25, 2023). They also lack social capital and, with the exception of a few, were largely excluded from or denied access to familial inheritance and communal land schemes. What many of them have inherited is the practice of small-scale farming, which they tell me they learned by watching their mothers on the land. Their relational connection to the land, as both knowledge and practice, is important to keep in mind as it is the means by which they measure socio-ecological loss. For instance, Rawiya, a farmer from Zagora, who did not receive formal schooling, does not know her age and grew up tending her family's *jnān*, recalls the years before the El Mansour Eddahbi dam when the *saqqiya* carried water in steady and predictable flows:

> "We grew everything. That's the only way we ate. We would just get sugar, tea and oil from the store. We lived off the land only. At that time, you could live off the land, but now you can't. [This is] because at the time you could grow everything in your garden, but the water shortage now doesn't allow that" (Interview, farmer, Zagora, May 24, 2023).

In the excerpt above, Rawiya's contrast between past abundance and present scarcity highlights how predictable *saqqiya* flows enabled the interdependent cultivation practices that Mustafa highlighted and sustained household and community life. Rawiya's recollection provides two important interventions. Like Kalthoum, Fatima, and Sadiya in the previous chapter, Rawiya sees the desert as already a site of abundance and, in doing so, traces the trajectory of water loss. She does so by noting that water shortages first became evident in the 1980s, with each year becoming progressively worse (Interview, farmer, Zagora, May 23rd, 2023). Rawiya is cognisant of the increasing dry weather and lack of rain, as well as the fact that climate alone is not the only explanation for water shortages.

> "Since the *sedd* (dam) came, the water went. [Before] there was no barrier to accessing water. Since the construction of the *sedd*, access to water has been limited… The government is responsible for this drought, and the government does not adequately distribute water to its citizens. Now the water of the region is going to the [NoorO] energy project" (Interview, farmer, Zagora, May 24, 2023).

When I ask Rawiya whether she has noticed a further decrease in water released from the dam following the construction of the NoorO, Rawiya makes explicit how the project enters farmers' everyday understanding of water scarcity. Rawiya, like Mustafa, views the NoorO as an additional part of the historically sedimented state-control of the region's hydraulic system, one that diverts already scarce water away from downstream oasis communities. In her words, she tells me:

> "Yes, it has decreased. The water from the *sedd* now is released once a year. But if we had no *sedd*, then we wouldn't have this drought" (Interview, farmer, Zagora, May 24, 2023).

By linking water scarcity to dam construction and state-controlled releases, Rawiya draws on the ways in which drought is, in part, a politically produced outcome of hydraulic governance. For Rawiya, her interaction with the NoorO cannot be understood without her experience with water infrastructure. By referencing times before and after the dam's construction and its ongoing disruption of downstream flows, Rawiya narrates the entanglements between centralized water control and infrastructural provisioning. For her, the timeline from before infrastructure, through the dam's construction, and its convergence with the NoorO has restructured the conditions under which small-scale farmers retain and sustain access to water, thereby exacerbating their socio-ecological loss.

Additionally, Rawiya's ability to trace these embodied timelines of entanglements of infrastructure and loss allows her to pinpoint causal actors, which for her is the Moroccan government. Through her account of the dam's hierarchical governance, she elucidates how water is managed technocratically to selectively support large-scale agricultural and energy infrastructure that serves national and broader capitalist visions of sustainability governance. Thus, calculative loss for Rawiya is experienced through routine, long-term management of flows, whereby the decline of rural livelihoods is made secondary to the state's continued interventions in water and energy development.

Gendered Narrations of 'Sustainable' Infrastructures and Calculative Loss

Rawiya's sentiments are shared by women farmers across the southern Drâa-Tafilalet region, who describe similar disruptions to water access and livelihood security through their embodied

and relational experiences of declining water access. A glaring example of the loss of desert ecological life and livelihoods is in Amazraou, an oasis commune close to Tamegroute and Zagora. Na'imah, an elderly subsistence farmer in Tamegroute, shares sentiments similar to those of Kalthoum, Sadiya and Rawiya. She tells me she does not know her exact age, though she suspects she may be around 75-years old. Like many women in Amazraou, Na'imah grew up farming and learned to tend the *jnān* by watching and later helping her mother and father. She could not attend school and was married at age 13. Her father owned land that her brothers took and sold, for which she received no compensation. Na'imah has witnessed the effects of Morocco's intensified agri-energy hydraulic governance on her livelihood. She narrates how the dam's construction disrupted her family's water source by transforming the *saqqiya'*s regular flow into periodic, dam-mediated releases and how this was further intensified by the NoorO's reliance on the same hydraulic system:

> "When they created the dam, the water began to decline and the drought has exacerbated this. Previously, the *saqqiya* did not prevent the water from running, but with the dam, the flow decreased. Then came the construction of the energy project. There was farming here. There is farming here. But the water is gone. May *Allah* give us and give you" (Interview, farmer, Amazraou, May 24, 2023).

Na'imah does not concede to the possibility that the land has become arid beyond repair and that the intergenerational practice of oasis farming is no longer viable. She implicitly defers responsibility to the technocratic infrastructures that serve broader (sustainable) development goals. Her description of the layered technocratic management of the southeastern Drâa-Tafilalet region's hydraulic regime echoes Rawiya's, whereby both women trace their loss of livelihood to ongoing conditions of infrastructural interventions.

Moreover, like Rawiya, Na'imah situates the NoorO within a broader dam-mediated reorganization of water in the Drâa-Tafilalet region, where downstream communities like theirs experience scarcity that is both climatic and infrastructural. This understanding challenges KfW's deferral of causality and agri-energy institutions' narrow framing of responsibility, mentioned earlier. Rather, both Rawiya and Na'imah identify and understand water decline through their liv(ed)(ing) proximity to the ecologies that surround them. Through their lived experience of water

loss, the women provide accounts that are more encompassing and historically accountable than those of agri-energy institutions and their narrow, self-serving, calculative measurements.

N'aimah's mother owned a small plot of farmland in Tamegroute, which, as mentioned previously, is a rare occurrence in Morocco's Drâa-Tafilalet region, where women's land ownership is uncommon. Na'imah did not inherit any of her mother's small plot of land and explains that when plots are already small, dividing them would still leave her with a significantly smaller share than her brothers. As such, Na'imah has faced a double exclusion from land access. She tells me that since her marriage began, she has been taking care of her husband's family land, which she notes also produced a diverse and abundant harvest at one point. However, Na'imah explains that the dam's construction limited their access to water and, consequently, the crops they could cultivate. With increasing water scarcity, her husband has had to find work in construction and other labour-intensive domains to compensate for harvest losses. She states:

> "Apples, figs, pomegranate, apricot, dates and when the people from the chamber came, everything dried up" (Interview, farmer, Amazraou, May 24, 2023).

Although Na'imah's socio-ecological loss is not told through water metrics and other technocratic assessment tools, it is reflected through the effects of culminating and historically situated calculative decisions through what has been lost from her *jnān*, including her "apples, figs, apricots and dates". In a similar way to Rawiya's ability to link governance to loss, Na'imah calls into question decisions made by the "people from the chamber" and adjacent agri-energy institutions, such as the regional Chamber of Agriculture, as well as ORMVA and the Hydraulic Basin Agency of Drâa–Oued Noun. The creation of the southern Drâa's irrigation infrastructure, governed, monitored and provisioned through these regional bodies, together ceased control and management of the Drâa River and aquifers through dams such as El Mansour Eddahbi, which regulate downstream irrigation (Bossenbroek & Ftouhi, 2024). While these institutions do not share identical mandates, their overarching technocratic-capitalist logics converge in practice through the assessment and regulation of the dam and its linkages to the NoorO and agricultural governance. This has significantly affected small-scale oasis villages, like Na'imah's, where the ramifications of dam-mediated releases, vis-à-vis institutional decisions and bureaucratic regulation and the (re)engineering of everyday access to water, are increasingly felt through socio-ecological loss of water, land and livelihood.

Na'imah's story provides a pertinent entry point into how many of the women I interviewed narrate gendered socio-ecological loss. Her early marriage, lack of schooling and exclusion from inheritance are told in a matter-of-fact manner. Her detached demeanour and apathetic tone demonstrate how gendered violence is often absorbed into the language of social and familial expectations and women's survival within patriarchal rural settings. This is in contrast to how she speaks of the gendered loss of livelihood, where these factors converge with the 'Chamber people' and their technocratic imposition on her farming practices as a disruption that has made farming increasingly untenable. This distinction does not make marriage, inheritance or educational exclusion any less violent. Rather, it shows how the technocratic management of water compounds already existing gendered exclusions and becomes a site through which women articulate critique and loss. Na'imah's acknowledgement of gender's weight and its enmeshment in all aspects of life is most clearly voiced at the end of our interview when reflecting on her hardship providing for her two daughters and son; she tells me with a sigh, "The one who has daughters has it hard" (Interview, farmer, Amazraou, May 24, 2023). Na'imah, like other small-scale farmers, does not recount socio-ecological loss as a single moment and time but as a concurrent, cumulative and layered experience of calculative decisions and dam-mediated interventions that selectively provide water access to some while marginalizing already vulnerable communities.

Cumulative socio-ecological loss is not limited to downstream oasis communities like Na'imah's. As the next section shows, upstream communities are also experiencing the effects of technocratic hydraulic control, though in different ways and to varying degrees. By showcasing Mina's account in Amerzgane, I demonstrate the ways in which small-scale farmers engage the state's own techno-hydraulic language by advocating for dams, permits and infrastructural promises even as these same governance frameworks continue to arrange water governance hierarchically and deepen water insecurity, especially for women engaging in small-scale farming.

Speaking the State's Technocratic Language: Farmers' Appeals for State-Managed Access

Though not all the women I spoke with in the southeastern Drâa region made direct reference to NoorO's entanglements with the El Mansour Eddahbi Dam and the technocratic management of water, they showed and spoke about it through the language of gradual water decline, using landmarks, timeframes and enactments of water levels and flows. This can be seen in Sadiya and

Kalthoum's intergenerational observations of water decline and the loss of livelihoods in the downstream oasis commune of Tamegroute, as well as reflections shared by women in upstream communities like Amerzgane.

Mina, an elderly woman from the upstream community of Amerzgane, is one of the few women I interviewed who owns a small plot of land. Mina uses landmarks and time periods, specifically years, to tell the story of water decline. When showing me the *saqqiya* and the stoppers they once used solely to manage water flows within the community, she tells me that this was all they needed to feed the land. When showing me the traditional well she built, she tells me about how water scarcity began to take shape in the region. When introducing me to the river basin that runs behind her *jnān,* she uses her body as a physical marker to exhibit how the water levels were before 2014 (Interview, farmer, Amerzgane, March 14, 2023).

As mentioned in Chapter 2's methodology section, although Amerzgane is located slightly upstream, it remains connected to the same hydrological system through which basin water flows are redirected to the El Mansour Eddahbi Dam, which is the NoorO's main water source (Kaczmarek et al., 2025). While Mina does not explicitly name the NoorO, her reference to 2014, which is when Noor I was being constructed, situates her account of water decline within the period when the solar complex became materially connected to the dam-mediated water regime.

However, for Mina, her contention with Morocco's agri-hydraulic institutions is not about their interference with water systems, but rather about their unfulfilled promise to build yet another dam further up that would cater to the water needs of small farmers in its vicinity. She states that when she complained to the basin agency, they referred her and other farmers to the NWP, which advances the logic of more dams to address water scarcity, but she tells me they have "…yet to see anything materialize" (Interview, farmer, Amerzgane, March 14, 2023; International Trade Administrator, 2025).

Mina's frustration adds nuance to the story of unequal distribution and calculative loss by both critiquing the state's control over water and turning to the state as the authority expected to address scarcity. This nuance is not necessarily read as a contradiction but as a means by which small-scale farmers negotiate survival amid constrained conditions through the state's techno-hydraulic language. However, despite Mina's ownership of her small *jnān* and appeals to the state through its own technocratic mechanisms, she is still not able to secure water for her *jnān*. Rather, her ability to cultivate, like many small-scale farmers, is increasingly predicated on the decline of

traditional wells, redirected water flows and state support routed towards imagined future technocratic solutions.[23]

Through the accounts provided by Na'imah, Rawiya, Sadiya, Kalthoum, Mustafa and Mina, dam water allocation emerges as a sovereign technocratic technique of governance. Na'imah speaks of water being "prevented from flowing"; Rawiya links drought to the dam and the NoorO; Mustafa recalls communal *saqqiya* channels that once "provided water for all the oases"; and Mina traces water decline through the disappearance of older community-managed flows. While they do not narrate water loss or the role of state institutions in identical ways, their reflections merge into a broader story of how calculative loss is experienced and lived through layered technoscientific calculations of water that together mediated interventions in water flows, and how it is becoming increasingly difficult to survive from their *jnān*.

However, dam-mediated scarcity is only one layer in a cumulative, cascading process of loss. Once *saqqiya* flows, traditional wells and community-managed water systems become unreliable due to dam interventions and the control of water direction and flow; farmers are forced to seek access to alternative water sources and state support. It is here that agricultural institutions, including regional agricultural offices and the Chambers of Agriculture, become a central component of the entangled story of calculative loss.

Through the GMP, Morocco's hierarchical allocation of water was extended and further entrenched through bureaucratic eligibility mechanisms of recognition and exclusion. In what follows, I focus on Pillar II of the GMP to demonstrate how calculative loss is produced and managed not only through the diversion and regulation of water but also through the bureaucratic management of agricultural access, specifically sustainable irrigation technologies. Land, wells, subsidies, irrigation technologies and farming licences are granted to large-scale and licensed farmers, while small-scale farmers, particularly women, are excluded from so-called 'solidarity' support and water 'conservation' technologies. Through these hierarchical technocratic mechanisms of the GMP, I show how calculative loss ensues through the administrative sorting of deserving and undeserving farmers.

[23] Deferrals to future technocratic solutions to past and ongoing failures is explored in further details in Chapter 5 through the analytic of temporal (sustainable) development amnesia.

From Dam-Mediated Scarcity to Agricultural Modernization and its Technocratic Management

The GMP's Pillar II and the Technocratic Discipline of 'Solidarity' Farming

Envisioned by foreign consultancies, large-scale farmers, policymakers and economists, the GMP employs earlier colonial and postcolonial agricultural technocratic logics, including King Hassan II's Agricultural Code and irrigation strategies rooted in the Protectorate's vision of Morocco as the "Granary of Rome" (Akesbi, 2012; 2019; Faysse, 2015; Mathez & Loftus, 2023). The GMP, Morocco's largest-ever agricultural strategy and framed in the language of "good agricultural governance", sought to expand agricultural exports and address drought through the "conservation of irrigation water" simultaneously (African Development Bank, 2015, p. 9). As mentioned in the introduction, the goals of the agri-irrigation strategy were strongly endorsed and funded by multilateral development banks (African Development Bank, 2015; World Bank, 2018a).

The GMP has two main pillars, with Pillar II, framed as "solidarity-based support," applying to less 'favourable' agricultural regions and specifically to small and medium-sized farming (Akesbi, 2012). The pillar functions more as a disciplinary apparatus than as a form of redistribution (Belarbi, 2025). This can be seen in the significant disparity in resource allocation between Pillar I, aimed at large, modern and high productivity farming and Pillar II, which, according to Najib Akesbi (2012), is up to nine times higher per beneficiary than Pillar I. Akesbi (2012, p. 17) further notes that the productivist and technical model of agricultural development that the GMP adopts is one that was adopted over "…fifty years ago by developed countries, heavily reliant on fertilizers, pesticides, and water with significant environmental consequences". While Global North states have since abandoned this form of agricultural development, Morocco, through the GMP and its successor, the GGS, has repackaged it through the language of sustainability and modernization.

Through subsidies and technical assistance, Pillar II privileges practices organized around productivity, scale and market integration, while leaving subsistence farmers, particularly women, outside the bureaucratic thresholds through which access to land, water and state assistance is granted. The GMP's Pillar II and its hierarchical allocation of resources, specifically under so-called 'sustainable irrigation' technologies, become clearer when read through the contrasting

experiences of farmers. Below, I narrate the stories of Omar and Youssef, two large-scale farmers, to show how the GMP's promise of agricultural modernization intersects with gendered exclusions and structural hierarchies. I show how the provisioning of water and land becomes accessible to farmers who already have tribal access, capital and the bureaucratic know-how required to appear viable within the state's agricultural vision. I then juxtapose these narratives with those of women and their limited access to both land and water resources.

Contrasting Lived Experiences of Water Provisioning Under the GMP

Though Omar, originally from Marrakech, was neither born into farming nor connected to Ouarzazate, his status as a male lineage member of a tribe in Ouarzazate allowed him to access 5.5 hectares of communal land through his male-run tribal council. Omar used these gendered land regimes to begin his latest business venture, a large-scale agribusiness. Omar confessed that he found state-governed schemes for land acquisition for agri-business endeavours and subsidies for water technologies to be an offer he, a businessman, could not pass up. In addition to the subsidies he was able to receive, including a water basin, drip irrigation system and an electric pump that connects the basin to the drip irrigation system, Omar tells me that he was easily able to acquire a modern well permit, which allowed him to dig a well that runs 101 meters and uses two heavy-duty pumps – one electric and one solar – that work around the clock to continuously pump water that he feeds into his water-intensive crops.

The experiences of Omar and other large-scale farmers, like Youssef from Zagora, who similarly was able to obtain tribal land for water-intensive watermelon farming stand in stark contrast to the lived experiences of small-scale women farmers in the Ouarzazate and Zagora regions, whose access to water and state support is systematically constrained by land tenure precarity, licensing regimes and technocratic definitions of agricultural viability (Interview, farmers, Ouarzazate and Zagora, March, 2023). What both Omar's and Youssef's trajectories of land and water access show is that agricultural support is oriented toward those already deemed viable subjects under the terms of agricultural modernization. Those who are able to access land and have the capital, tribal connections and bureaucratic know-how can benefit from Morocco's large-scale agricultural endeavours, such as the GMP and its provisioning.

After speaking to Omar, I spent the rest of my day helping his farmhands set up Omar's drip irrigation distribution tubes, row by row across his large farmland. Among them is Aisha, a

47-year-old divorcee. She tells me that she moved to Ouarzazate with her husband, but stayed even after leaving the abusive marriage because there is no work for her in the Zagora region. She shares that her communal lands in the Feija area are now being used for watermelon farming, similar to the kind of expansion Omar himself was pursuing. However, when I asked whether she could go back and farm there if she wished, she shared with me:

> "No, women cannot", adding that even if she wanted to, "there is no more water to do that anyway" (Interview, farmer, Ouarzazate, March 19, 2023).

Aisha's sentiments reflect what Moroccan feminist scholars interested in how land tenure is gendered in Morocco have noted, which is that communal land is often mediated by the gendered constraints of tribal authority, capital and social hierarchies within the tribe (Salime, 2016; Berriane, 2016; Kahlaoui, 2022). As such, women like Aisha are left out of communal land decision-making and provisioning. Whereas Aisha is unable to access tribal land as her male counterparts can, Mina, as shown previously, demonstrates that land ownership alone does not guarantee water security, even when appealing to the technocratic language of the state.

Na'imah's reflection makes gendered (in)access even more evident, especially when put against the narratives of Omar and Youssef. She tells me that her traditional well, built with her husband and used as a communal site of gathering and sharing, has now run dry and sits between her *dār* and *jnān* untouched and exhibiting obvious signs of abandonment, with thick, blackened rust around the pulley and a worn, dusty rope hanging lifeless around.

Now, she tells me, there is nothing to share, not in the *saqqiya* channel nor the *bir*:

> "It is not only those who live farther down south from the dam that are affected by water shortages, though they are the most affected. It is also those in close proximity, especially those who have no access to modern wells and generators because the fursha [the subterranean water-bearing layer of the soil] is depleting" (Interview, farmer, May 24, 2023).

When brought into conversation with Mina's earlier account, Na'imah shows that loss is widely felt across the small-scale farmers I interviewed. However, because agri-energy hydraulic governance operates unevenly, socio-ecological loss is felt disproportionately as well. For

instance, downstream communities such as Tamegroute and Amazraou have experienced severe water scarcity due to reduced *saqqiya* flows and the resulting loss of livelihoods. On the other hand, upstream or dam-proximate communities, such as Amerzgane, may still retain some water flow yet continue to experience declining levels, which has altered community management practices and led to a growing dependence on state promises of further infrastructure.

Underlyingly, for small farmers, these uneven geographies of water loss are compounded by further calculative decisions that limit their access to state provisioning. Proximity to the dam or upstream location does not guarantee water security when dependable access is increasingly concentrated among those with authorized wells, capital and agricultural licences. Thus, the convergence of dam and agricultural governance and longer histories of gendered structural exclusions, makes water access reliable for farmers already recognized as useful to and viable within Morocco's agricultural modernization agenda and its underlying techno-capitalist logics. These entanglements are shaped by colonial and postcolonial histories of hydraulic governance, land reform and technocratic development that are carried forward and rearticulated under sustainability governance.

The Cascading Implications of Uneven Access to Water on Small-Scale Farmers

Uneven access to water through provisioning mechanisms adds another hidden layer to water misuse by exemplifying how calculative loss takes shape, through not only scarcity, but also the selective authorization of extraction by the Hydraulic Basin Agency of Drâa–Oued Noun, ORMVA and related agricultural bureaucracies. For instance, through wells authorized by the Hydraulic Basin Agency of Drâa–Oued Noun, large-scale farmers pump groundwater into private reservoirs or basins, a practice administered and normalized by agencies such as ORMVA under the GMP (Akesbi, 2013; Faysse, 2015). These processes are justified as drought-preparedness and efficiency measures, but they have left farmers like Na'imah, who rely on shallow traditional wells and intermittent *saqqiya* flows, with little to no remaining groundwater due to over-extraction by large-scale agricultural operations (Fico, 2022). Access to so-called 'sustainable irrigation technologies' such as drip irrigation, likewise, is dependent on licensed wells, which have overwhelmingly been allocated to large-scale farmers.

By 2011, the GMP's Agricultural Development Fund had distributed subsidies totalling approximately 2.35 billion Moroccan dirhams (around 210 million euros), the majority of which accrued to large-scale agricultural producers (Akesbi, 2013; Faysse, 2015, p. 628). As multiple studies demonstrate, drip irrigation in large-scale farming has often failed to reduce overall water consumption (Benouniche et al., 2014; Faysse, 2015). Rather, they have led to the expansion of cultivated land and the intensification of production (Benouniche et al., 2014; Faysse, 2015). As such, far from conserving water, these technologies have served as instruments to maximize agribusiness output.

As noted earlier in the chapter, regional agricultural agencies, such as ORMVA, often frame scarcity through generalized claims of local misuse, minimizing the differentiated roles that large-scale farmers, cash-crop production and state-supported agricultural policies play in intensifying water extraction. However, Mustafa, the oasis farmer and local environmental activist from Zagora, challenges this framing by naming the policy mechanism that both Aisha and Na'imah allude to: the GMP's encouragement of cash-crop production on communal lands in Feija, an arid area near Zagora. He notes:

> "The GMP, unfortunately, prioritizes farmers who are producing cash crops over oasis farmers; they encourage farmers from outside to take large plots of land, including communal lands in Feija, so that they can produce cash crops. This requires the use of a lot more water, and at the same time, this affects those who live in the oasis because it limits our access to water and dries up our land and affects our ability to survive off it".

Here, Mustafa's environmental critique speaks directly to ORMVA's internal framing of scarcity. Whereas ORMVA attributes degradation to "dry climatic conditions combined with overgrazing and excessive exploitation of pastoral resources," this explanation folds different rural practices into a generalized narrative of local misuse (ORMVA Ouarzazate, 2023, p.3, document obtained during fieldwork). Mustafa, on the other hand, emphasizes the political work behind the depletion of the groundwater aquifer, namely the GMP-supported expansion of water-intensive cash-crop production on communal lands in Feija.

Mustafa's crucial intervention calls into question the institutional commentary that attempts to remedy data on water loss. His ability to describe how hierarchical structural

provisioning produces loss echoes the testimonies of small farmers like Mina, Na'imah, Rawiya Kalthoum and Sadiya and provides context for Omar and Youssef's agribusiness visions and Morocco's broader agri-energy hydraulic governance. The over-extraction of water by large-scale agribusinesses using so-called 'sustainable irrigation' technologies is increasingly part of the broader water-scarcity story in the Drâa-Tafilalet region (Fico, 2022; 2024). When read alongside Omar's around-the-clock extraction of groundwater to fill his basins and irrigate his large plot, Na'imah and Mustafa's description of the depletion of the soil's subterranean water-bearing layer shows how water shortages extend beyond downstream oasis communities (Fico, 2022; 2024).

Both Na'imah and Mustafa point to the overlapping and cascading effects of hierarchical water allocation on Morocco's water resources. Within this causal nexus, large-scale farmers, predominantly men, are more likely to obtain state-recognized farming licenses through bureaucratic know-how, financial capital and access to sizable landholdings, and thus are positioned as water-deserving subjects. In turn, this recognition grants them access to state-supported irrigation technologies, including drip irrigation, modern wells and individual water basins. However, in practice, these technologies enable large-scale farmers to over-extract water resources to both save for future dry periods and to continuously water their large plots of land. This culminates in intensified groundwater depletion and contributes to the decline of groundwater reserves, making traditional wells increasingly obsolete as the state redirects and reduces dam water releases.

The compounding loss of water and livelihood is therefore produced through overlapping mechanisms of declining *saqqiya* flows produced through redirected and dwindling dam releases, as well as the uneven distribution of so-called 'sustainable irrigation' technologies used by large-scale farmers to hoard water during dry spells, which have made it increasingly difficult for small-scale farmers to maintain their subsistence livelihoods. Through these intertwined processes of hierarchical exclusions, calculative loss becomes not only technocratically organized and bureaucratically enforced trade-offs but also gendered in its effects on small-scale women farmers. As men use their social mobility to work in the metropoles or abroad, women are increasingly expected to bear the everyday consequences of water decline by maintaining the *jnān* and provisioning for their households, all while being the least able to access water resources.

Calculating Provisions: Eligibility Thresholds and the Bureaucratic Production of Loss

Eligibility for drip irrigation systems and private water reservoirs is contingent on formal land registration and documentary proof of ownership (Agency for Agricultural Development, 2023; Fico, 2022; Mathez & Loftus, 2023). These requirements produce calculative loss through calculations of eligibility, where access to state provisioning is funnelled through administrative measures of land size, ownership and documented proof. These requirements act as hierarchical thresholds that selectively determine who receives access and to whom access is granted. As I demonstrate below, these calculative thresholds systematically exclude small-scale farmers, particularly women, from state provisioning. Thus, these so-called 'sustainable irrigation' technologies, promoted as 'water-saving solutions' and subsidized through the state, become part of the very governance apparatus through which water access is made reliable for some and increasingly precarious for others.

This hierarchy of eligibility was made explicit by a high-ranking representative of the Chamber of Agriculture in Midelt, who emphasized that access to agricultural subsidies depends on technoscientific evaluation and formal land ownership:

> "Farming licensing is based on a survey study that you give to the state, and the state evaluates it, and once it evaluates and registers you as a farmer, it gives you the benefits. The important thing is that he owns his land. You must show that you own the land" (Interview, High-ranking representative of the Midelt Region's Chamber of Agriculture, Midelt, June 2, 2023).

This is further articulated by a high-ranking representative of Agriculture in Ouarzazate, who tells me:

> "They need to have proof that they are a farmer. Any farmer can. He takes the paperwork and the Chamber of Agriculture confirms that they are a farmer and they get their farmland" (Interview, High-ranking representative of Chamber of Agriculture, Ouarzazate, May 18, 2023).

Apart from both the Chamber's high-ranking representatives using "he" to refer to farmers, which reflects the societal and institutional imaginary of who is deemed a legitimate agricultural

subject, they also demonstrate how agricultural recognition is calculated through technocratic state surveillance mechanisms that require registration and 'proof' in order to gain provisioning. Moreover, and importantly, while they attempt to describe the bureaucratic process as straightforward and procedural, this is far from the reality experienced and expressed by farmers. According to their own admission, obtaining a license is conditional on a land survey, proof of ownership and petitions to the Chamber. Their own admission illustrates the layered threshold through which careful and calculative logics of access to licenses and subsidies are reconciled.

What is missing from this already lengthy process, requiring capital, bureaucratic know-how, and basic formal education, is the five hectares of land needed to obtain a farming license, which most farmers do not have. This is further exemplified through Mustafa's account. After relaying what the high-ranking representative of the Ouarzazate region's Chamber of Agriculture told me about the process to obtain a farming license, Mustafa laughed before responding:

> "The politician will tell you everything is all good. One of the preconditions of the GMP is making it difficult for small farmers to obtain a farmer's license, and making administrative issues difficult for farmers because of all the conditions that are required to obtain a farmer's license. It is not a democratic process and disadvantages the small farmer" (Interview, farmer, Zagora, May 24, 2023).

By using the language of "not a democratic process", Mustafa is demonstrating the hierarchical, murky and selective process by which licensing is carried out under the GMP and by the Chamber of Agriculture. This is echoed by most unlicensed small-scale farmers I encountered, who shared their experiences of bureaucratic barriers posed by land-size thresholds, the 'headache' of dealing with the Chamber of Agriculture and the need to know someone personally to ensure your inquiries are answered and your paperwork goes through.

Both the eligibility and bureaucratic processes required to access a farming license illustrate how the Chamber of Agriculture completes the institutional circuit of calculative loss by interpreting agricultural modernization, water-saving discourse and state provisioning into concrete eligibility thresholds and lengthy administrative processes that prevent small-scale farmers from accessing them. As I demonstrate subsequently, for small-scale women farmers, these thresholds are experienced as everyday encounters of abiding and cumulative processes of exclusion that have led to their compounding socio-ecological loss.

Women Farmers and the Everyday Experience of Bureaucratic Exclusions

Fatima, a 40-year-old from Tarmigt, a commune just outside of Ouarzazate, responds to my question on state provisioning for small-scale farmers like herself by stating:

> "No, no, small-scale farmers do not… Those who have large machines, extensive land and numerous animals help. I have just the *saqqiya...* There are people, such as large-scale farmers, who use solar power, drip irrigation, and water basins. We have to figure out how to do [things] ourselves. There are many people in Morocco who use [that equipment]. You can go down the street and see that *fram,* and you'll see they have installed solar panels and everything…[24] You go to them (local government offices) and they say, 'You are only a small farmer, why should we help you?' Those who have the big machines and a lot of land and a lot of animals, they help. All I have are goats. Why would they help me? They don't help me" (Interview, farmer, Tarmigt, May 18, 2023).

In this excerpt, Fatima's encounter with bureaucracy is expressed with a sharper dismissal than that of Mina's. While officials referred Mina to the NWP and future infrastructure projects, Fatima experienced bureaucracy in the form of dismissal and devaluation. By pre-empting the state's response as, "You are only a small farmer, why should we help you?", Fatima speaks to the ways in which calculative decisions about water allocations, licensing and irrigation subsidies take material shape in how small-scale farmers come to understand their position within the hierarchical allocation of water resources. Her statement shows how calculative loss takes shape through bureaucratic decisions about who is deemed a farmer and 'worthy' of access. On the one hand, those with access and capital are rendered worthy of support. On the other hand, those, like her, with little capital and social and economic access, are left to 'figure out' their own survival.

Both Mina's and Fatima's interactions with regional bureaucracy show that there is little distinction between the state's logic of exclusion and the systemic sedimentation of calculative decision-making, only in the ways in which that logic is communicated. They show how small-

[24] *Fram* is a term used commonly in Morocco to describe big agricultural farmlands.

scale farmers are not only denied support but also repeatedly made to understand that their land, labour and water practices are devalued within Morocco's technocratic visions for modernization.

Similarly, Fatima, a 67-year-old widow from Ouarzazate, speaks to how broader access is mediated through nepotism, social relations and capital. For Fatima, she is only able to maintain the small plot of land her husband left behind because the "inheritors have not divided it yet" (Interview, farmer, Ouarzazate, May 16, 2023). Moreover, due to the water shortage, she is only able to grow wheat, barley and alfalfa. When asked if the government provides water, she states:

> "No, we are dependent on the release of the barrage and then they close it. They don't release it except for a bit these days because there is a drought" (Interview, farmer, Ouarzazate, May 16, 2023).

Unlike Rawiya and Na'imah, who more explicitly link water loss to the dam's construction, its connection to the NoorO and state control, Fatima frames the absence of releases through the simplified relation between drought, dam shortages and closures. However, she explains the absence of support in terms of large hydraulic infrastructures.

Her choice to do so becomes clearer as we continue to speak. Fatima shows me her well, which is no longer functional because she does not have the means to purchase the generator and fuel needed to extract water during extreme shortages. She knows that larger farmers are able to install solar panels, pumps and water basins, and she has heard that NGOs sometimes help small-scale farmers access solar pumps. I ask her if she has tried to access one through an NGO, to which she responded:

> "No, because I am a woman. I don't know people and don't go anywhere. I don't ask around. People who know me and my situation come to me at home but I don't go out. There was one woman who came from the Chamber of Agriculture and was asking about the farmers, but not us, the big farmers. I know this because she asked me for my national ID and I gave it to her and since then there has been nothing. I haven't seen or heard anything. The one who has will benefit, but I have nothing" (Interview, farmer, Ouarzazate, May 16, 2023).

In the excerpt above, Fatima begins by recognizing her gendered limitations as a rural woman in accessing support from both NGOs and the state. These gendered structural restrictions accumulate through limited mobility, capital, licensing and social/bureaucratic know-how, which provide entry points to calculative access. Even when the state comes to her, it is not followed by access. Fatima's mistrust of the state, particularly its Chamber of Agriculture, is confirmed when she hears nothing back. As such, for Fatima, the only access she has is the state's uneven distribution of water through large-scale hydraulic infrastructure such as the El Mansour Eddahbi Dam. However, under conditions of intensified drought, large-scale agribusiness expansion and the NoorO's dam-mediated water needs, this access becomes increasingly precarious and insufficient to sustain the *jnānat* of small-scale farmers.

The lived realities of women in the southeastern region of the Drâa-Tafilalet elucidate the ways in which they experience water and livelihood loss through intricate and cascading exclusions and intensifying enclosures of water access. These exclusions are gendered in the ways they are compounded by limited land ownership, restricted mobility, lack of capital, bureaucratic invisibility and the devaluation of subsistence farming as a legitimate agricultural practice. Through these layered and abiding gendered exclusions, calculative loss is seen as a cumulative process through which water, land, technology and recognition are selectively allocated in ways that make some livelihoods viable while rendering others increasingly difficult to sustain.

Conclusion

In this chapter I have traced how calculative loss materializes within Morocco's agri-energy hydraulic nexus as a historically layered, technocratic and gendered mode of governance. Building on Chapter 3's analysis of techno-political desert imaginaries, I examine how the desert, once imagined as empty and thus optimizable, is materially governed through technocratic water-allocation mechanisms within Morocco's rural agri-energy nexus. In other words, where the previous chapter examined how techno-political desert imaginaries make intervention appear necessary, this chapter has shown how intervention is sustained through hydraulic control, institutional calculation and selective bureaucratic provisioning.

Water is the central register through which this transformation becomes visible. Through the El Mansour Eddahbi Dam, the chapter begins by investigating how GEG–sustainable

development actors involved in Morocco's agri-energy governance produce different, and at times contradictory, accounts of water scarcity. I demonstrate how institutional disagreement does not necessarily destabilize Morocco's GEG–sustainable development nexus. Rather, these divergent accounts perform complementary forms of legitimizing work by protecting institutional authority while making uneven allocation appear administratively defensible. Here, calculative loss operates through distinct yet mutually reinforcing institutional practices that render unequal allocation rational in the name of sustainable development.

In situating these contemporary practices within a longer genealogy of hydraulic governance, the chapter goes on to show how Morocco's present-day agri-energy hydraulic regime is rooted in colonial and postcolonial projects that treated water control as a technology of territorial authority, agricultural productivity and sovereign legitimacy. Importantly, it elucidates how contemporary institutions such as ORMVA and the Chamber of Agriculture inherit and repurpose colonial-capitalist power structures using Morocco's 'green' turn and the language of sustainability.

Women farmers' testimonies make visible the tangible effects of loss, which these institutions often justify or consider less significant compared to capital interests and technocratic (sustainable) development goals. While their stories are not identical, nor do the women share uniform perspectives regarding blame, solutions and agricultural futures in the Drâa, their collective ongoing experience of loss shows that water loss is lived and measured through memory, labour, care and their everyday insistence on keeping their land alive under increasingly constrained drought conditions. In introducing the GMP and the bureaucratic mechanisms of access and exclusion associated with it, specifically Pillar II and the selective distribution of so-called 'sustainable irrigation' technologies, the chapter goes on to demonstrate the cumulative and gendered dimensions of Morocco's agri-energy hydraulic nexus.

Overall, the chapter delineates the ways in which calculative loss is neither singular in moment nor mechanism, but a cumulative process through which water, land, technology and recognition are selectively allocated in ways that allow some livelihoods permission to grow and expand in the name of national (sustainable) development, often at the neglect of and the expense of others. In this way, calculative loss is a governance mechanism that names a governance process through which ongoing and culminating losses experienced by small-scale farmers, particularly women, are measured, justified and made administratively justifiable.

The next chapter builds on this analysis by turning to the temporal governance dimensions of the normalization of socio-ecological loss. Whereas Chapter 4 has shown how socio-ecological loss is made administratively legible and materially distributed through water allocation, agricultural eligibility and bureaucratic recognition, Chapter 5 analyzes a different but related issue of how failures produced by technocratic governance decisions are prevented from becoming matters of historical and political accountability. Through the analytical lens of temporal (sustainable) development amnesia, the chapter demonstrates how the failures and harms produced by sustainable development are selectively remembered rather than resolved and instead displaced into future promises of modernizing redesign and repair.

Chapter 5: Temporal (Sustainable) Development Amnesia: Selective Remembering and Deferred Responsibility in Morocco's Agri-Energy Nexus

"And what do you have?" I hesitantly turn to ask Samia after hearing Khalida's story. Our gazes lock for mere seconds that felt unmeasurable by time. Heavy with grief, her eyes glistened with tears forming, momentarily blocking the tired gaze she wears. She tells me, "My daughter, I only have this soul of mine" (Interview, farmers, Aït Ben Yacoub, June 6, 2023).

Samia's harrowing "I only have this soul of mine" speaks to the socio-ecological loss of livelihood when land can no longer support life. It points to the layered condition in which livelihoods have been stripped away and unsettles the forward-looking optimism of sustainable development governance. Her unexpectedly direct statement emphasizes how progress narratives displace the technopolitical and calculative normalization of dispossession and the quiet forgetting of self-sufficient pasts.

I sit down near Khalida and Samia on the stark, unwelcoming red-orange dirt hills of Aït Ben Yacoub. Khalida and Samia are crouched and huddled together, a position not unfamiliar to them and their years dedicated to crop gathering. Their bodies angled toward the land they have lived on for decades, now undoubtedly unrecognizable to their younger selves. This village is among the communes affected by the Noor Midelt project, one of five tribal territories whose lands have been acquired for the construction of Morocco's newest hybrid solar power plant.[25] Framed as a technological leap beyond the NoorO, the Noor Midelt promises greater capacity and efficiency through a concentrated solar power (CSP)–photovoltaic (PV) hybrid model (World Bank, 2018c).

However, the surrounding landscape offers little to suggest a different outcome. The unpaved road leading into the village and the quiet withdrawal of water and livelihoods signify the continuity of dispossession. When I ask Khalida what compensation the community has received

[25] According to the "Project Summary of the Noor Midelt" power plant produced by the African Development Bank (2018) there are 5 identified ethnic groups that make claim to the over 4,000 hectare of land that the Noor Midelt will reside on – they are Aït Masoud Ouali Enjil, Aït Rahou Ouali, Aït Massoud Ouali with the communes most impacted being in the areas of Mbladen, Zaida and Ben Yacoub, which are all part of the Midelt region as well as the Enjil Commune, part of the Boulemane region.

for the acquisition of their land, the answer is already evident in the material conditions surrounding us. What little compensation did arrive was largely absorbed through male tribal leaders and the permeating colonial legacy that remains – the Ministry of the Interior, leaving women excluded from both formal recognition and material redress. Khalida notes:

> "*Haram*, [we have received] nothing. The youth are *misakeen*; they are merely sitting idle and have no opportunities.[26] And now ONEP [the National Office of Electricity and Drinking Water] has cut our drinking water too…The drinking water was provided by NGOs and now ONEP has come and said we have to join the national drinking grid for 7000 dirhams" (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

Khalida's use of *'haram'*, meaning morally forbidden or unjust, speaks to failed promises and state neglect. Her statement that "we have received nothing" speaks to the lack of redress and restitution for the tribes whose lands were acquired, where even basic necessities that should be provisioned to all, are privatized and monetized by the state. This contradicts official claims of orderly acquisition and equitable compensation, which I will delve into in more detail later in the chapter.

Moreover, her reference to the youth specifically speaks to the magnitude of loss of livelihood that has engulfed the commune. Whereas subsistence farming once functioned as an intergenerational inheritance that secured food, knowledge and livelihoods for future generations, its dispossession through continuous agricultural and hydraulic interventions narrows the possibility of self-sufficiency and continuity.

Khalida's narratives are part of the intersecting lens this chapter uses to examine the Noor Midelt as more than infrastructure, but as a way of understanding how new projects are made to appear technologically renewed while continuing to extract land and water and (re)produce socio-ecological loss and dispossession.

The Noor Midelt was introduced in 2019, and like its predecessor, the NoorO, it was draped in the language of green innovation and national progress. However, its emergence depends on a

[26] *Misakeen* here it translates as 'poor them' and is said as a colloquially to emphasize the despair and disadvantage that rural youth face.

selective remembering of the very failures that preceded it, as well as of the longstanding, colonially permeated and capitalist-structured institutional arrangements that govern land and water. Rather than confronting these continuities, the past is narratively resolved through the promise that a redesigned system will finally deliver a transformed desert landscape, which will, in turn, bring economic prosperity and sustainability. For instance, under the Noor Midelt acquisition framework, mirroring the approach used for the NoorO, approximately 4,141 hectares of tribal land were purchased across five communes, with compensation distributed through tribal intermediaries rather than directly to affected households (AfDB, 2018; World Bank, 2018c). As a result, those who rely on the land for subsistence but lack formal recognition are rendered largely invisible within compensation mechanisms.

Seen through the lens of Khalida, Samia, and the Aït Ben Yacoub tribe, this is a pattern of the postcolonial state's interference in their land and water governance. This chapter explicates how sustainability governance sustains legitimacy by governing through time, whereby loss and harm are narrated as part of the past and temporally contained, technical fault lines are deemed as learnings and reckoning is deferred into an anticipated future.

I develop the analytic of temporal (sustainable) development amnesia to name this temporal work. By amnesia, I do not mean that institutions 'forget' that failures occurred, but that they are selectively remembered in order to create the conditions for reproducing technocratic sustainability governance frameworks. Through this selective remembering, temporal (sustainable) development amnesia refers to a governance technology through which institutions manage failure by sequencing it and quarantining it as historical remnants, solvable technical glitches and displacing responsibility forward through promises of redesigned interventions. In this temporal structure, which seeks to further entrench institutional legitimacy, accountability is continually deferred while intervention is continually renewed. It's important to stipulate here that I do not argue that the state takes explicit responsibility for failure, but rather that responsibility is often minimized, if at all acknowledged, and deferred into future-oriented technological redesign and new infrastructures.

With this in mind, the dissertation addresses its second research question primarily by showing how the GEG–sustainable development nexus is legitimized and operationalized through temporal governance. It demonstrates how unresolved and ongoing socio-ecological loss, due to enduring calculative exclusions and institutional shortcomings, is reframed as technical lessons,

reassigned to future redesign and used to authorize renewed intervention. It also addresses the third research question by illustrating the ways in which these temporal strategies continue to marginalize small-scale farmers' land, water and place-based livelihoods. A crucial caveat to keep in mind is that this framework does not revisit how desert landscapes become legitimized as sites of techno-political imaginaries (Chapter 3) nor how socio-ecological loss is made governable through water metrics, eligibility thresholds and institutional classifications (Chapter 4). Instead, it isolates temporality as a governing technology through which sustainability discourse authorizes repetition and renewal without reckoning.

I draw on critiques of duress, depoliticization, time and postcolonial state-making to demonstrate how temporal (sustainable) development amnesia performs three interrelated functions that secure institutional authority through the continual relaunching of intervention. First, it quarantines failure by removing land dispossession, water depletion and project shortcomings from the ongoing political and structural conditions that engulf them, situating failures in the past. Second, it transforms technical failures into future-oriented justifications for redress, marked by redesigning interventions through new technologies and continued investment. Third, it displaces responsibility forward in time by locating repair in an anticipated future, while material and gendered harms are absorbed in the present.

I develop this analytic through fieldwork conducted in the Midelt region, specifically the Ait Izdeg, Boulaajoul, Ait Ben Yacoub and Zaida. These sites were selected because of their centrality to both Morocco's agricultural modernization agenda and the Noor Midelt solar project. These communities were selected not only because of their centrality to Morocco's renewable energy ambitions but also because the province produces about 53 percent of Morocco's apples, with the province seeing an orchard area expansion from 8,645 hectares in 2008 to 17, 501 hectares in 2020 and production rising from 121,384 to 370,000 tons (AgriMaroc, 2020). This boom, fueled by irrigation infrastructure and subsidies under the GMP's Pillar I, positioned Midelt as a key site for interrogating how agricultural modernization and renewable energy projects intersect to produce new geographies of dispossession vis-à-vis the discourse of amnesia and selective remembering. The analysis draws on interviews with twelve small-scale farmers, six of whom were women, as well as interviews with representatives from MASEN, ONEE, the World Bank and a Moroccan renewable energy scholar. These interviews are read alongside a critical discourse analysis of project and policy documents related to Noor Midelt, including environmental and

social impact assessments, development bank reports and project communications. By reading institutional narratives and farmers' experiences in conjunction, I elucidate how sustainability governance manages socio-ecological loss through temporal processes of selectively remembering failures and shortcomings, and reproducing their logics through promises of future innovation.

In what follows, I trace how temporal (sustainable) development amnesia operates across finance, technological redesign and land–water relations. I first build the conceptual framework for thinking time as a governing technology, then I proceed to show how the NoorO's breakdowns are both forgotten and reengineered as solvable glitches to legitimate Noor Midelt and successive agricultural strategies, which in turn defer accountability to the future, before turning to how this temporal work is stabilized materially through land dispossession, water scarcity and gendered socio-ecological loss.[27]

Temporal (Sustainable) Development Amnesia

Temporal (sustainable) development amnesia refers to the set of practices through which unresolved dispossession, ecological degradation and institutional breakdowns are acknowledged only insofar as they can be rendered past, technical and/or already addressed. Governing through time allows responsibility to be postponed while interventions, using similar technocratic and capitalist logics, appear as perpetually necessary. To theorize this temporal work, this chapter draws on four strands of critique, amnesia and duress, the depoliticization of development, universal and linear temporal regimes and postcolonial state-making, to show how temporal amnesia operates as a calibrated technology of rule.

Duress and Amnesia

To theorize how temporal amnesia operates as a governing practice, this chapter turns to scholarship that treats colonial histories as active and ongoing conditions of rule. I draw here on Ann Laura Stoler's (2016) conceptualization of "imperial duress" to refer to the enduring pressures of colonial histories as ongoing constraining conditions that shape the present and how it is

[27] It's important to note that the analytical concern here is not how harm is produced, but how it is narratively contained and re-authorized over time.

governed. Through "imperial duress", Stoler sees colonial governance not as a past consignment but as a persistent force in the present in forms that "wrap around contemporary problems; adhere in the logics of governance; [and] are plaited through racialized distinctions" (2016, pp. 4-5).

Duress in temporal (sustainable) development amnesia operates as a governance tool by allowing institutions to acknowledge breakdown only insofar as it can be temporally displaced by rendering it historical, exceptional and/or already endured. Central to this is the depoliticization of governance and the translation of historical violence into technicalities. This temporal displacement of accountability is evident in how the failures of the NoorO and the transition to the Noor Midelt are contained and selectively addressed through technological redesign and improved planning, while maintaining technocratic and capitalist forms of governance.

Depoliticization

Scholars critical of development have noted development logics' employ scientific universalism and its depoliticization as new sites of accumulation.[28] James Ferguson (1994) describes development as "…an anti-politics machine, depoliticizing everything it touches, whisking political realities out of sight, all the while performing its own pre-eminently political operation of expanding bureaucratic state power" (1994, p. xv). Arturo Escobar (2011) offers a scholarly critique of depoliticized development paradigms, noting that this longue durée 'problem' is continually reproduced through 'new' discourses on women, peasants and nature, and the need to repeatedly intervene in and develop them.

Within this chapter, depoliticization is central to temporal (sustainable) development amnesia because of the ways it reduces historically produced harm, vis-à-vis land dispossession, uneven allocation of water, bureaucratic and gendered exclusions, and public loss absorption, etc., into technical problems, thereby dissolving political responsibility through deferral. By reading the Noor Midelt through this literature, we see how, by invisibilizing the colonial and neoliberal failures embedded in Morocco's earlier projects, the Noor Midelt becomes seen as a novel

[28] The theme of depoliticization within global development paradigms, specifically GEG–sustainable development has been explored in Chapter 3 and Chapter 4 through the techno-scientific obscuration of the political and the normalization of loss. Here, I expand this by looking at its temporality as a political technology of governance that allow for its reproductions.

experiment in renewable energy endeavours. However, the success of this deferral is directly linked to universal and linear time, which makes Western repetitive interventions, regardless of their harms, appear to be progress.

Universal/Linear Time

Scholars of post/decolonial development and international relations scholars situate universalism and the ahistoricization of development in colonial histories of extraction and knowledge production rooted in hierarchies of race, gender and class (Agathangelou & Killian, 2011; Chakrabarty, 2000; Escobar, 1995, 2011; Lugones, 2010; Shiva & Mies, 1993; Mitchell, 2011). Such depoliticized hierarchies create binaries of modernity that situate some societies as already modern while casting others as stuck in an earlier historical stage.

International relations scholars, such as Anna M. Agathangelou and Kyle D. Killian (2011; 2016), note that temporal ordering is central to sustaining global hierarchies. This, according to Agathangelou & Killian (2016; p. 14), is a form of violence enacted by temporal regimes that classify peoples and histories as contemporaneous and thus are relegated to the past through the mapping of the "cultural isolates" of Western universalism into an "eternal present".

Decolonial eco-feminist critiques by Maria Mies and Vandana Shiva (1993) of the "myth of catching-up development" show how colonized peoples, particularly women and peasants, are positioned as temporally 'behind' and in need of 'catching up". They note how such colonially permeating logics are internalized and accepted by the elites of the Global South despite the failures of the 'myth of catching up' where, "nowhere has it led to the desired goal" of modern utopia, it continues to drive the (re)making of the Global South's political-economy (1993, p. 55).

As such, linear developmental time governs by positioning each successive intervention as inherently more advanced than the last, thereby converting repetition into progress and sheltering institutions from having to reckon with cumulative harm. Temporal (sustainable) development amnesia builds on this by showing how these linear and universal temporal regimes are institutionalized and mobilized by postcolonial states and GEG actors as tools of authority and legitimacy.

The Postcolonial State, Elites and Depoliticized (Sustainable) Development

In the postcolonial context, Sara Salem (2020) and Omnia El Shakry (2007) both demonstrate the continuities and afterlives of colonial hierarchies instilled by nationalist state elites. They note that the postcolonial state mobilizes development to consolidate elite power while reproducing class inequalities. Salem (2020), for example, demonstrates how in Egypt, postcolonial development reproduced many of the authoritarian and class-exploitative features of colonial governance. She highlights how, "Egypt has become increasingly entangled within global capitalism in ways that have diminished its people and its potential… This unites linear narratives of progress and European imperialism; imperialism progresses as time moves forward – its colonies regress" (Salem, 2020, p. 277).

In Morocco's agri-energy hydraulic governance, state agencies – often in coordination with multilateral development banks – deploy depoliticized planning frameworks that do not take into account the contestations around land and resource use (Bergeaud-Blackler, 2012; Berriane, 2016). Tribal councils and the Interior Ministry further entrench hierarchical and patriarchal control that sidelines ordinary tribal members, particularly women, who, because of the codification of the protectorate treaty, are excluded from the tribal council's decision-making process (Sater, 2002; Rignall, 2016; Ryser, 2019).

Building on the literature on postcolonial governance, temporal (sustainable) development amnesia enables postcolonial state authority, specifically elites, to renew claims to sovereign competence through future-oriented projects while structurally preserving the institutional configurations that produced prior failures. The NoorO, Noor Midelt and the hydraulic infrastructure that sustains them exemplify how GEG–sustainable development projects consolidate elite authority not despite repeated failure, but through it.

When read concurrently, the aforementioned literature demonstrates how temporal (sustainable) development amnesia operates as a governing technology of selective remembering through which failures are either unacknowledged and obscured or converted into technical lessons that justify future interventions that mobilize similar logics.

Quarantining Failure: Technocratic Certainty and the Mirage of 'Progress'

Technical Infallibility, Spectacle and the Temporal Isolation of the 'Past'

> On rubbled soil scraped to pancake flatness, row upon row of curved mirrors reflect the cloudless sky and the blazing coin of the sun. There is something about the gleam of this vista, a trick of the light perhaps, which brings to mind the classic desert mirage of unattainable water, and with it the long-vanished Therys Sea.
> "It will shine like the sun," says Tarik Bourquouquou.
> I want to know what might go wrong. "Cyber collapse?"
> "It won't affect us," he says. "It's a closed system."
> "A plague of locusts?"
> "Same issue as sandstorms. The glass is very tough. There's a washing system at Noor One, using water pumped from a nearby dam."
> "So how could it fail?"
> He laughs. "The sun might not rise in the morning". (Rees, 2018).

This performance of invincibility by Tarik Bourquouquou, a Senior Business Development Manager for MASEN, exemplifies the ways in which temporal (sustainable) development amnesia operates through their articulation of technocratic certainty, thus diminishing potential failures. Here, the NoorO is presented as an infallible object of techno-scientific precision, whereby the only thing that would impact the system is the seemingly unfathomable thing that would lead to the demise of all planetary life –the sun not rising. This technocratic certainty is an extension of the myth of objectivity imparted on the world by dominant Western techno-science and its claims to 'truth' and infallibility.[29] This infallibility is produced and sustained through specific spatial, temporal and discursive renewals of intervention as both necessary and inevitable.

[29] I demonstrate this infallibility throughout my previous chapters. In Chapter 3, this infallibility is sustained through *techno-political desert imaginaries* which are the imaginary and narrative constructs of Morocco's deserts as export-oriented and sovereign legitimizing. In Chapter 4, I showed how this logic materialized and legitimized through the technoscientific governance of water.

Building on the techno-political desert imaginaries established in Chapter 3, the GEG-sustainable development's transition from the NoorO to the Noor Midelt reproduces these technocratic framings as temporal assurances of progress and development. These temporal loops operate through techno-political desert imaginaries that render past failures as irrelevant background noise by reproducing the desert as spectacle and a frontier of gleaming techno-optimism. Such configurations depoliticize cycles of incompetence, universalize time toward an imagined renewable future and erase the socio-ecological knowledges that resist this narrative. In this way, the desert becomes a temporal stage on which selective remembering takes place, allowing development amnesia to be continually renewed in the name of progress and potential. The (re)emergence of sustainable development paradigms through GEG institutions and actors is thereby separated from earlier failed interventions. This becomes evident with the emergence of discourses around the Noor Midelt power plant that legitimize the project on technological and economic grounds and conceal the socio-environmental impacts that NGOs, critical news media and Moroccan and international scholars have brought to the forefront.

For instance, multilateral development banks, such as the World Bank, European Investment Bank, the African Development Bank, the German Development Bank, the French Development Agency and the Climate Investment Fund, have consistently framed the NoorO Midelt as a "trailblazing climate project" and a testament to successful international cooperation (World Bank, 2018c). An example of this can be seen in a World Bank press release (June 18th, 2018) where Marie Francoise Marie-Nelly, the World Bank Country Director for the Maghreb, stated about the Noor Midelt plant: "This is yet another step toward a promising clean energy future for Morocco" and that the plant would "…seal Morocco's position as the region's pioneer in renewable energy" (World Bank, 2018c). The World Bank Lead Energy Economist for the Maghreb, Moez Cherif, reiterated this by focusing on the technology aspects of the project, noting "…the design of Noor-Midelt relies on proven technologies that will be operated in a pioneering way to take advantage of the benefits of both CSP and PV technologies on a single site" (World Bank, 2018c).

The technical is also supported by the corporations involved in the plant's construction and ownership. For instance, Mohamed Jameel Al Ramah, the CEO of MASDAR, the UAE company that won the original bid to build the plant, boasted in various media interviews:

> "Masdar is honoured to leverage its global expertise and experience in CSP and PV technologies as part of the consortium chosen to develop the Noor Midelt Phase 1 multi-technologies solar power plant…We applaud Morocco's bold renewable energy vision and its commitment to the large-scale development of a groundbreaking technology combining solar power with storage, which will achieve new levels of cost and operational efficiency" (Kraemer, 2019).

Here, the CEO of MASDAR, as well as the World Bank Lead Energy Economist for the Maghreb and the World Bank Country Director for the Maghreb, all employ similar temporal logics that separate past projects from 'new' innovative technological potentials and future infrastructures. Particularly, the use of technoscientific vocabulary, such as "groundbreaking technology", "pioneering application of technology," and "global expertise", functions as a temporal governance practice that seeks to quarantine the NoorO and obscure its failures by introducing the Noor Midelt as the next stage of technological advancement. This, thus, makes renewed intervention seem both necessary and unavoidable.

However, as I will demonstrate, the NoorO project's technological vulnerabilities were tied to a broader political-economic mechanisms in which public institutions absorbed the risks and costs of making large-scale renewable energy attractive to private capital. I show how the temporal quarantining of technological and economic vulnerabilities is co-constituted, in which technological shortcomings are narrated as solvable design problems, while the financial burdens produced by those shortcomings are displaced onto public institutions and moved to future development phases.

Economic Duress: Privatizing Profits and Socializing Losses

Within the temporal logic of sustainable development, private-public partnerships (PPPs) in the renewable energy sector often impose fiscal burdens on the public while de-risking capital flows for private and foreign investors (Carroll, 2012; Hamouchene, 2022; Viterna & Engeman,

2022).[30] Such models are "anti-political" tools that depoliticize and obscure the redistribution of public wealth into private hands under the guise of development (Bracking, 2016).

This becomes evident when looking at the PPP model that has funded Morocco's renewable energy transition. The PPP framework, agreed upon by the Moroccan state and multilateral development banks, has generated a persistent fiscal deficit, whereby, since the inception of NoorO in 2016, Morocco has incurred annual losses of approximately €80 million, costs that have been repeatedly "covered by the public purse" (Hamouchene, 2022). A 2021 piece written by a Moroccan news agency further illustrates this by noting that from the start of the project, ACWA Power sold every kilowatt-hour (kWh) of energy at 1.62 Moroccan Dirhams (MDH), which meant that the cost of solar power exceeded that of coal and wind power (Gharbaoui, 2021). According to the news agency, electricity generated under the first three phases of NoorO was purchased from ACWA Power at prices ranging from 1.38 to 1.62 Moroccan dirhams (MDH) per kWh, and sold onward to the National Office of Electricity and Drinking Water (ONEE) at approximately 0.85 MDH per kWh. MASEN absorbed the resulting gap between purchase and sale prices, effectively transferring financial losses to the public sector (Gharbaoui, 2021; Bengezi, 2023).

This public loss absorption was intentionally structurally embedded within the project's design. According to the World Bank's Independent Evaluation Group (IEG) (2025, p. 2), Component 2 of the Project established a formal "Cost Mitigation Mechanism" to support MASEN in covering "the initial gap between the purchase price and the selling price" of electricity sold to ONEE. The report further notes that MASEN acted as an intermediary "absorbing market risks and thus securing revenue for developers", and that this mechanism constituted a "critical element in the risk mitigation strategy, attracting private investors" (World Bank, 2025, p. 2). In addition, the Moroccan government provided sovereign guarantees to lenders, securing MASEN's debt and enabling access to concessional financing (World Bank, 2025). These measures institutionalized the transfer of commercial risk from private developers to the Moroccan state.

In this arrangement, the Moroccan state, through MASEN, absorbs the financial losses incurred by selling high-cost CSP electricity to the national utility at below-market rates, while ACWA Power benefits from long-term power purchase agreements, concessional loans and World

[30] See Chapter 3 for a detailed analysis of how the NoorO was framed as an export-oriented energy infrastructure embedded in Euro-Mediterranean decarbonization imaginaries.

Bank-backed risk guarantees. According to the World Bank, this was a "critical element in the risk mitigation strategy, attracting private investors" (World Bank, 2025). With the NoorO, the Moroccan state acted as a mediator of transnational capital flows, while bearing the economic and political costs of transferring risk. These losses are displaced forward in time through renewed development objectives vis-à-vis the Noor Midelt. For example, this can be seen in the ways the IEG report frames the cost mitigation mechanism as essential to the project's "financial sustainability" and highlights the importance of integrating "lessons learned" from the NoorO into subsequent phases, such as the Noor Midelt project (World Bank, 2025, p. 11). Through this framing, cost overruns and fiscal strain are thus described as elements of the project's adaptive evolution, not as resulting from structural risk-allocation asymmetries.

This reinforcement of neoliberal governance logics involves many of the same transnational actors and top-down development institutions that have long shaped and destabilized the political economies of the Global South. As one senior World Bank official involved in structuring the PPP financing of the NoorO explained in an interview, the project was conceived as a pilot where the Bank initially turned toward PPPs in Morocco vis-à-vis the NoorO to test a 'new' financing model that would later be scaled across the country's renewable energy sector:

> "Because the bank really focuses on public finance [and] because [the] structure and approach for the Ouarzazate plant was something that the bank hadn't done before which is basically using public financing in a project finance structure where then the government borrows concessional money and then lends it through MASEN to the project company, the privately own project company, [which then] become the sole creditor of that project company" (Interview with senior World Bank official, Zoom, March 15, 2023).

In the interview, the senior World Bank official described the NoorO as a 'pilot project' whereby the Bank tested a new hybrid public–private financing model. Under this structure, concessional public loans, such as low-interest and government-backed financing, were extended to the Moroccan state, channelled through MASEN and then lent to a privately owned project company. Therefore, public capital underwrote what resembled a private project-finance setup, thus making the Moroccan state the sole creditor in a structure usually used for private investments.

In other words, what was introduced as a new model of green banking and development was, in fact, a financial structure that redistributed risk downwards and onto the public. The Moroccan state remains responsible for absorbing the project's financial obligations, making the public sector the intermediary through which climate finance, under a PPP framework, is made attractive to private investors.

This admission by the senior World Bank official points to the World Bank's role in reconstituting predatory financial models through new discourses, such as PPPs, that depoliticize them as 'public funding' and remove them from the longue durée of development policies and financing structures imposed on the Global South by international institutions. This temporal amnesia is enacted through selective remembering, where past predatory financing is quarantined and new articulations of them, like the PPP structure, are deemed a "first" or a "pilot. This political work depoliticizes fiscal responsibility as a learning milestone toward technical improvement rather than a political question over whether public debt should support privatized infrastructure. Through this ordering, persistent fiscal deficits and public loss absorption are treated as transitional costs of innovation rather than structural features of development finance. As a result, PPPs operate as temporal governance tools that enable the repetition of extractive development under the sign of sustainability while simultaneously sustaining the appearance of continual renewal.

In this section, I showed how the NoorO's financing, through PPP structures, displaces economic risk onto Moroccan public institutions. Similarly, below, I discuss the technological and economic dimensions of the same arrangement where the commercialization of CSP meant creating and institutionalizing the economic conditions under which that technology could become viable and scalable for new frontiers. In the Moroccan case, this involved encouraging the state to take on the financial and technical risks associated with CSP technologies through concessional lending.

Technological Duress and Technical Failures

Noor III's repeated shutdowns have been widely portrayed as temporary disruptions within a linear story of maturation despite multiple long-term shutdowns. For instance, in the summer of 2021, Noor III, which houses the thermal storage power, experienced technical failures that led to the shutdown of the 150 MW plant (Eljechtimi, 2024). More recently, in January 2024, Noor III

experienced a 14-month shutdown following a leak in its hot molten-salt reservoir (Tachfine, 2023).

Rather than prompting reflection on the structural limits of CSP, these failures have been absorbed into a developmental narrative in which breakdown is framed as an expected phase of ongoing innovation. Despite very recent failures of the NoorO and the employment of a very similar techno-financial framework, the NoorO has received renewed promotion. Such unrelenting practices of renewal show how failure is temporally managed, where the technical failures of CSP are constructed as temporary disruptions within a linear narrative of techno-progress, in which each new iteration is presented as an improvement.

These technical failures were predictable to those with academic and industry expertise on solar energy, many of whom questioned the choice of CSP early on. For instance, a professor of renewable energy at a university approximately one hour from Rabat, notes that the choice of CSP was largely promoted by European states and institutions involved in the making of the NoorO:

> "European countries and institutions encouraged us to take on this technology. And we bought it, 'the first country in Africa' and all that…. [they] really pushed for us to adopt it with their expertise, as at the time…" (Interview, Renewable Energy Expert and Professor, Rabat, February 10, 2023).

This quote from the interview with the renewable energy expert provides two key insights. Firstly, it reiterates the top-down, external and Western influences on technological choices and localities in renewable energy export visions, as highlighted in Chapter 3. Secondly, it clarifies Morocco's willingness to accept external expertise, which would elevate the country's profile in renewable energy on the international stage and support the King's objective of (sustainable) development and sovereign security vis-à-vis renewable energy endeavours.

In another interview, a retired renewable energy professor, who taught for over four decades at a leading Moroccan university and advised both public and private energy actors, argued that the technology was a poor choice and that the King had been misled by advisors, policymakers and international experts:

> "Our King was dealt badly twice... I won't speak about social issues or economic issues. I will only speak about energy. The first time was when he was a young King

> and with the search for petroleum. We were supposed to be oil-rich like Algeria and Libya, and the King came out and made a special talk about this some 20 years ago. Where is the petroleum today? This was the first time Our Majesty was driven the wrong way…. The second time involved some people who advised the King to go with CSP. This was even before MASEN. The King had a speech in Ouarzazate where he launched the Moroccan solar power initiative, particularly the NoorO. The choice of the technology was already there" (Interview, Renewable Energy Expert, Rabat, February 12, 2023).

Here, the retired energy professor reiterates what the senior World Bank official noted in Chapter 3, that climate policy is not the goal but rather energy security (Interview, Zoom, March 15, 2023). While the object of development shifts from oil exploration to renewables and green growth, the underlying technocratic logics of extractive ambitions and the resulting patterns of failure continue to permeate.

Additionally, it is important to note that in both moments the retired professor recounts, sovereign authority is simultaneously invoked and shielded, whereby the King is positioned as the decisive actor, yet responsibility for failure is displaced onto advisers, experts and international policy paradigms.[31] Here, the locus of sovereign power is protected from critique because the monarchy's (sustainable) development vision is deemed good for national progress. Failure here is acknowledged but prescribed and attributed to misguided expertise that led to technical miscalculations, as opposed to overarching political choices. In this way, temporal (sustainable) development amnesia operates as a 'renewal' without reckoning by shielding both techno-scientific solutionism and the political-economic choices of (sustainable) development.

Without absolving the King and state elites of responsibility for the choice of CSP, which, as noted in Chapter 3, was crucial to the construction of Morocco's renewable energy imaginaries and solidifying the King's sovereign rule, international actors, particularly multilateral

[31] As discussed in Chapters 3 and 4, the Moroccan monarchy's legitimacy has been historically bound to its capacity to remake nation-building imaginaries through large-scale infrastructural and agri-energy projects. These projects function not only materially, as development interventions, but as symbolic and material claims to sovereign authority. The present chapter builds on the previous two chapters by examining how sovereignty is temporally insulated from accountability through the narration of failure as expert miscalculation and not political decision-making.

development banks like the World Bank, who are committed to the continued flow of global capital, did have sway in the choice of technology. According to a World Bank senior official, the World Bank was interested in 'diversifying' renewable energy technologies and, specifically, in commercializing CSP, even though it was a newer and more expensive technology than PV. He notes that:

> "PV was less expensive than CSP… it still is the same today. CSP was a new technology; PV had been growing for 10 years earlier. CSP was quite a lot more expensive at the time and because it was a relatively new technology and that was the reason why the bank got into it because we knew that for solar and renewable energy to proliferate, you need to have many different types of technologies…not just one source. And we [the Bank] knew that if development financial institutions don't step up and support the commercialization of this technology, very few people will" (Interview, senior World Bank official, Zoom, March 15, 2023).

Additionally, according to the former top-ranking ONEE official and international investment banker referenced in Chapter 3, the World Bank was instrumental in the technology selection for the NoorO. He notes that while the decision to adopt CSP technology was formally made by Moroccan institutions and backed by the King, in practice:

> "Usually with MASEN and ONEE, they cater their projects to the financial backers' liking and suggestions. They try to accommodate the financial backers" (Interview, former ONEE official, Rabat, February 13, 2023).

In reflecting on the financial and technological rationale, the former ONEE official notes:

> "There was a time when CSP was interesting and this is no longer the case. MASEN's argument is that with CSP, storage can be combined, which is not true. This argument doesn't stand. It is bad economics. I would even go further than [just a critique of] CSP and say that we should not centralize these projects" (Interview, former ONEE official, Rabat, February 13, 2023).

Here, the former top-ranking ONEE official points to the limits of the World Bank official's logics of commercialization. Whereas the senior Bank official frames CSP as a necessary step toward

diversifying and scaling renewable energy technologies, the former ONEE official views this choice as a technological and economic miscalculation.

This misalignment between CSP's projected promise and its operational realities was not unknown to policymakers and renewable energy actors. The renewable energy expert and professor teaching at a university near Rabat shared that he had tried to alert both MASEN and the government about the choice of technology:

> "I contacted MASEN and talked to them about the choice, but they could not stop because [of] the cost, they had already got the funding for the CSP and could not just stop…[and] when you criticize something that the government is doing, they don't want to hear it" (Interview, Renewable Energy Expert and Professor, Rabat, February 10, 2023).

Here, the expert speaks to the foreclosure of debate and the limited consideration of alternative pathways to large-scale development projects once financial commitments and sovereign prestige become attached to them. Even when technical critiques emerge, the convergence of international financing, institutional inertia and state authority makes reversal politically difficult and, as such, narrows and locks in technological pathways. All this while subsequent shortcomings are selectively remembered and reinterpreted through narratives of experimentation and progress rather than as the outcome of political and financial choices.

The comparison between the NoorO and the Noor Midelt demonstrates this clearly. Instead of asking about and learning from political and distributional shortcomings, GEG–sustainable development actors employ the language of technical corrections that isolate failure and absolve them of accountability. Accordingly, this action preserves the existing financial structures, expert authority and sovereign-development ambitions that contributed to their failures in the first place.

According to the World Bank senior official, the technological limitations of CSP have been a known fact within the renewable energy sector, due to the known technological, financial and social drawbacks of the technology in the publicized Solar Energy Generating Systems (SEGS), the first CSP power plant built in the Mojave Desert in California (Moore, 2019). Moreover, a 2013 report from the United States National Renewable Energy Laboratory (NREL) notes both environmental and cost limitations of CSP technologies (National Renewable Energy Laboratory, 2013). Such issues pertained to land acquisition, water use, greenhouse gas emissions and

economic cost (International Energy Agency, 2010; National Renewable Energy Laboratory, 2013).

However, these known setbacks were not identified in the 2013 and 2014 NoorO ESIA reports of the funding institutions discussed in Chapter 3. As noted previously, the discourse surrounding the Midelt project, particularly in press releases, framed it as a transformational initiative that would benefit Morocco and showcase the viability of large-scale renewable plants. These narratives emphasized innovation and progress and downplayed the risks and concerns related to environmental costs and community impacts. At the same time, and as I will demonstrate subsequently, they left unaddressed the technical and ecological failures that had already emerged with the NoorO project. In this way, technological duress operates as a temporal governance strategy in which known shortcomings are selectively remembered by isolating them as solvable technical issues, which allows them to be depoliticized and deferred into the future. This, in turn, allows technocratic authority and large-scale interventions to be continually renewed without structural or political reckoning.

From Failure to Authorized Renewal: Depoliticizing the Noor Midelt Delays

In 2024, a Reuters article titled "Moroccan Solar Plans Hampered by Dispute Over Technology" was published, accompanied by a picture depicting the now familiar desert/technology juxtaposition of Orientalist-capitalist narratives of techno-political interventions (Eljechtimi, 2024). The article notes that the "construction has not even started on the planned $2 billion 800 MW Noor Midelt I plant, which was meant to start operating this year, after the Energy Ministry and grid operator ONEE rejected the proposed CSP technology…" (Eljechtimi, 2024). This delay is linked to the failures of the NoorO and to the purported differences among the Energy Ministry, ONEE and MASEN.

However, it is notable to mention that the blame for the failures of the NoorO and the consequential delays of the Noor Midelt power plant was largely placed on a single person, the then president of MASEN, Mustapha Bakkoury, who was framed as having made bad technological and financial decisions when it came to the NoorO project (Foulahi, 2023). The scapegoating of Bakkoury is another example of how the 'anti-politics machine' of the global capital order seeks to depoliticize GEG-sustainable energy paradigms and thus erase questions of

power, dispossession and expertise (Ferguson, 1994). By narrowing accountability onto Bakkoury, responsibility for failure is displaced from the systemic entanglements of the state, multilateral development banks and corporate actors that constitute the GEG–sustainable development nexus and onto a single technocrat. This narrowing not only diminishes the structural conditions that produced the NoorO's failures but also clears the way for the solar project to be reasserted as a symbol of national progress, and consequently, the chain logic of accumulation and sovereign security to persist.

It is in this context that King Mohammed VI's November 22nd meeting on renewable energy must be situated not as a rupture with the NoorO's troubled legacy, but as its realignment of this temporal regime. This meeting took place following another year of delays to the Midelt Solar Power project due to tensions between MASEN and ONEE over technology selection and costs (Bengezi, 2023; El Karmouni, 2022). King Mohammed VI urged the government and stakeholders to accelerate the development of renewable energy and attract more domestic and foreign investments in the sector to secure and strengthen its "…energy sovereignty, reduce energy costs and position itself in the decarbonized economy for decades to come…" (North Africa Post, 2022; Royume du Maroc, 2022). Moroccan media sources, such as *Yabiladi,* reported that the King was particularly eager and exerted pressure on stakeholders to complete the Noor Midelt plant following delays (Jaabouk, 2022).

The King's insistence on the realization of the Noor Midelt plant underscores his role and vested interest in Morocco's renewable energy expansion, and how another mega-solar power project in the desert can bring him closer to etching the legacy he began to forge with the NoorO project. The economic and technological failures of the NoorO were not explicitly identified as the cause of the project's delays; rather, the discourse focused on disagreements over the price point and the optimal technology for the Noor Midelt power plant. The ESIAs highlighted in previous chapters were not considered legitimate concerns for such large-scale renewable energy projects. As such, the silencing of the NoorO's structural failures serves to present the Noor Midelt as a remade and untainted frontier of renewable energy progress.

Despite these delays, there have been no changes to the technology choices of the Noor Midelt and the project has continued to receive financial support and technical backing from both international funding institutions and private energy corporations (Reuters, 2024; World Bank, 2025). Moreover, in the summer of 2025, Noor Midelt II and III were awarded to ACWA Power,

the Saudi company responsible for NoorO, which, as with NoorO, will design, finance and operate the new phases under a PPP model (Zouiten, 2025; Jowett, 2025). This most recent move by the Moroccan state institutions, international funders and corporate investors illustrates how delays are dismissed as temporary obstacles, even as new projects are heralded as symbolic of Morocco's continued leadership in renewable energy.

What makes this cycle reproducible is not solely deployment of temporal amnesia, through silence and the selective remembering of past failures through questions of technology and cost, but, and most importantly, the persistent minimizing of the social and economic dimensions of these projects, which determine who bears the brunt of land and water dispossession and who benefits. In Morocco's agri-energy nexus, large-scale projects consolidate royal authority by enhancing the King's international climate leadership profile, strengthening claims to energy sovereignty and reinforcing elite networks tied to transnational green capital. By erasing these realities from official discourse, Noor Midelt II and III can be seen as a technically and economically novel project, even as they replicate the same techno-economic structure, institutional collaborations and patterns of exclusion that have marked Morocco's agri-energy hydraulic trajectories.

While temporal (sustainable) development amnesia is enacted through discourses of financial and technological redesign, it ultimately requires material sites through which failure can be displaced and absorbed. Land and water become the primary sites for this temporal work because they bear the ecological, social and gendered costs that institutions and elites refuse to reckon with. In Morocco's agri-energy hydraulic nexus, the ability to frame each new project as a renewal rather than a repetition depends on the continued availability of land for appropriation and water for extraction, even as scarcity worsens. The appropriation and extraction of land and water, as I will demonstrate below, is tied to the ESIA's that legitimize their intervention in the name of sustainability. In the subsequent section, I delineate how socio-ecological losses of land, water and livelihood are temporally reorganized so that they appear already addressed or resolvable through the next project.

The Temporal Work of ESIAs: Resolving Socio-Ecological Harms for the (Re)Making of Renewable Energy Imaginaries

Land Dispossession through Environmental Social Impact Assessment Frameworks

As I make my way through the scattered, rubble-strewn and seemingly abandoned homes of Aït Ben Yacoub, I find myself having to remember that this was once a commune that was home to people, tradition, passed-down knowledge, histories and all forms of life. I try to imagine *life* here in the now nearly abandoned village. However, the eerie stillness that hangs over the deserted commune, and the heavy silence that lingers against the dry and water-deprived landscape make this imagining exercise difficult. The quiet stillness of the space is infiltrating, where even time seems to pause in this stillness. It is only when my research assistant, Hassan, speaks to me, having seen me glancing towards a figure in the distance, a herder and his sheep, that I realize how engulfed I was in my imagination, trying hard to visualize an Aït Ben Yacoub in another time and space. Brought back to the stillness of the now, I turn to Hassan, who repeats the question I missed while daydreaming: "Shall we go and speak to him?"

Mohammed, an elderly herder and a member of the Aït Ben Yacoub tribe, is another statistic in the imaginaries of the GEG-development nexus and the governance of temporal (sustainable) development amnesia. His socio-ecological losses, like those of his counterparts in the southern Drâa-Tafilalet region, are made necessary for the making of Morocco's renewable energy legacy. The ESIA for Noor Midelt I, which was first conducted as a Framework ESIA in 2015 and later as a 258-page Specific ESIA in 2019, mirrors the Orientalist-capitalist logics, cloaked in techno-scientific language, used to greenlight the NoorO project.

For instance, in the "Land Use" and "Site Selection" portions of the report, the land from which the Noor Midelt is to be constructed on was deemed as ecologically "degraded rangeland" and described the Noor Midelt I site as being "located on a bare ground"…and where "there are no residential, agricultural, industrial, archaeological or biological sites of particular interest in or near the project area" (MASEN, 2019, p.18). Moreover, the ESIA reports that by the time of land acquisition (which began in 2014), "no nomadism activity has been observed since 2014" on that land. While presented as a carefully conducted ESIA, this statement reflects the haste of the ESIA's consultation and evaluation process, in which a long-term evaluation of pastoral and nomadic activity was not considered necessary and was therefore treated as administratively insignificant.

Additionally, as mentioned in the introduction of this chapter, this land, deemed as 'degraded' and of 'no particular interest', is the ancestral and tribal lands of Mohammed, the Aït Ben Yacoub, as well as the Aït Oueflla and the Aït Rahou Ouali tribes. Now, pastoralists will not only have to find new herding pathways, but in a déjà vu of the NoorO land acquisition process, the majority of the tribes' members did not receive any compensation (Rignall 2016; Hamouchene, 2016). Mohammed notes that there were beneficiaries; however, they were the same beneficiaries who benefited from the NoorO (Rignall, 2016) :

> "The *jama'a* [tribal council] of the communal lands benefited, but the actual tribal people did not" (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

This is further articulated by Abdallah, a 64-year-old former farmer who became a herder because of the water crisis, who shares a similar view when asked about the consultation and decision-making process for the Noor Midelt.

> "The *nawab* [tribal representative] of the communal lands does what he wants. The *jam'a* [tribal council] of the communal lands and the Interior Ministry are the ones who control the communal lands. They do not consult the tribe members" (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

Abdalla and Mohammed's matter-of-fact response speaks to the normalization of tribal hierarchical structures in Morocco, in which a select few men (*nuwab*) make decisions on behalf of the collective. This representative system, rooted in French colonial land governance, has since shaped how collectively held land is understood, shared, used and inherited through hierarchical and specifically gendered ways that privileged a small number of tribal men (Berriane, 2016; Kahlaoui, 2022; Salime, 2016; Rignall, 2021).

However, these lived realities and the institutionalized hierarchical structure of tribal affairs, which have allowed for the seamless negotiation of land acquisition for Morocco's development projects, were not included in the 258-page specific ESIA. Instead, the ESIA notes that, "Landowners...have been compensated in compliance with Moroccan regulations and IFIs (International Financial Institutions) requirements" (MASEN, 2019, p. 222*).* This generalized and misleading statement does not reflect the experiences of Mohammed, Abdallah, Samia, Khalida

and their fellow tribe members, who are formally seen as outside of formal tribal representation and thus not accounted for in decision-making and compensation processes. The ESIA thus does the double work of making land acquisition appear procedurally complete, while simultaneously mobilizing technopolitical desert imaginaries to paint a picture of a degraded, nominal desertland in need of rescue. This double work allows the ESIA to certify compliance and, at the same time, recentre the Noor Midelt as a necessary development intervention.

Hussein, a farmer from Zaida, one of the areas deemed affected by the construction of the Noor Midelt, further complicates the ESIA's linguistically ambiguous notion of consent and benefit by showing how affected communities actively contested, vis-à-vis protest and bureaucratic confrontations, their exclusion from compensation for land acquisition. He addresses my question of compensation by stating:

> "The sons/children [of the community] don't [benefit]. When you go and inquire about work, they say there is nothing and to go talk to the top. But who is the top? We did protests, we did marches that we have no work and [still] nothing" (Interview, farmer, Zaida, June 7, 2023).

In using the gendered language of the "sons of the community", Hussein emphasizes the exclusion of the broader tribe and community, particularly male small-scale farmers, from the employment and provisioning promised by the project. Hussein also highlights the different tactics community members have used to make claims on the state. One tactic appeals to the ESIA's promises of jobs and local benefits, while the other rejects these processes through protest and marches. In both cases, Hussein notes, the community was ignored by the state.

What's important to clarify here is how the ESIA (re)organizes dispossession over time. By describing the land as 'degraded', 'bare', and "without observed nomadic activity in 2014", the ESIA enacts the temporal logic of selective remembering by narrowing the land's history to its own administrative timeframe, thus diminishing longer histories of pastoral and seasonal mobility. Similarly, by documenting in the report that land acquisition and compensation met Morocco's regulations and multilateral bank requirements, the ESIA places dispossession in the administrative past. As a result, the temporal work of ESIAs becomes the certification of the past as 'resolved', which accordingly serves to protect the project's present legitimacy and clear the

way for the Noor Midelt's development. Water, as I subsequently demonstrate, extends this temporal logic through narrow institutional acknowledgements of water scarcity.

The Mischaracterization of Water Use in Official Noor Midelt Documents

In addition to the framing of land, the ESIAs also mischaracterize the water requirements of the Noor Midelt project, thus repeating many of the same silences that accompanied the NoorO project. These assessments minimize the project's dependence on dam-mediated water and overlook how, in conjunction with the Green Morocco Plan (GMP) and its successor, the Green Generation Strategy (GGS), the expansion of commercial apple farming has deepened water scarcity. Combined, these large-scale agricultural strategies have accelerated the decline of small-scale farming in the Midelt region and exacerbated the precarity of households already dispossessed of their land.

The Hassan II dam, named after King Hassan II, was commissioned in 2000 and inaugurated in 2009 (International Union for Conservation of Nature [IUCN], 2010). The dam has three main functions, which include producing hydropower, providing drinking water to nearby towns and irrigating agricultural land in the Midelt plain (IUCN, 2010). At the time of its construction, the dam's original capacity was approximately 400 million cubic meters (IUCN, 2010). However, in March of 2025, Hespress English, a Moroccan online news site, used data from the regional Mellouya Water Basin Agency to draw attention to the massive water shortages the region is facing by citing that the current volume of the Hassan II Dam in 2025 is approximately 60 million cubic meters, which is approximately 17 percent of its filling capacity (Hespress English, 2025).

This approximately 85 percent decrease in the dam's capacity over 16 years has not deterred the construction of the Noor Midelt power plant. Rather, according to the World Bank's Environmental and Social Review Summary (2018) and the European Investment Bank's Environmental and Social Data Sheet (2019), like the NoorO, the Midelt power plant was strategically placed 11 kilometres from the dam to ensure a reliable water supply for the construction, cooling and cleaning of the power plant. Here again, the GEG–sustainable development nexus' temporal amnesia (re)legitimizes repetition and consequential socio-ecological loss by using the same infrastructures of scarcity that devastated the southeastern Drâa

and redeploying them in Midelt.

In official documents, like the World Bank's "Additional Financing" Report (2018) and the "Specific Environmental Assessment for Noor Midelt I" (2019), the water used, which is predicted to be approximately 220,000 cubic meters of water per plant, is met with mediative language that points to how the technological choices selected are purposefully not water-intensive. For instance, the consolidated specific ESIA signed by the consortium for the project states that the project will use "dry cooling, which will reduce water needs strongly" and a "dry brushes system [that] will clean PV panels without water" (MASEN, 2019, p. 9). The issue here is not the ESIA's lack of acknowledgement of water scarcity. Rather, in a déjà vu fashion to the NoorO's ESIAs, completion reports, national agri-hydraulic strategies and regional institutional narratives, scarcity appears as behavioural on the part of the farmers and institutionally deemed a technical constraint and not an enduring political condition that, in part, is a product of prior hydraulic governance, uneven water allocation and the expansion of water-intensive agricultural development in the region.

The Noor Midelt project attributes the decline to drought conditions and increased agricultural use by using subdued language that echoes the language of the NoorO appraisal and ESIA documents, in which technology is presented as a solution to the water question. This framing demonstrates the temporal work of (sustainable) development amnesia, whereby past harms are acknowledged only insofar as they can be deferred into future-oriented promises of technical correction. As such, the ESIA's mischaracterization of land and water demonstrates how temporal (sustainable) development amnesia operates across sectors by rendering dispossession and scarcity as technical, contained and already addressed, while enabling the continual expansion of extractive agri-energy infrastructures and the normalization of exacerbated socio-ecological loss.

As I will demonstrate in the next section, these intersecting regimes of energy and agricultural governance, along with their temporal logics, have created increasing ecological and livelihood pressures, leaving many small-scale farmers with no option but to abandon traditional farming practices.

Deferring Accountability and Through Time: Policy Succession and Cascading Socio-Ecological Loss

Reproducing the Pillars of Exclusion: From the Green Morocco Plan to the Green Generation Strategy

Building on the analysis of Pillar II in Chapter 4, this section situates the GMP and its successor, the GGS, within the cumulative policy landscape that has shaped small-scale farming in Midelt. While Pillar II was framed as a mechanism of support for small-scale farmers, its implementation unfolded alongside parallel agricultural strategies that prioritized capital-intensive, export-oriented production and irrigation expansion (TelQuel, 2024; GreenTimes, 2025). In Midelt, these large-scale agrarian transformations materialized through the promotion of apple monocropping and increased dependence on dam releases and groundwater extraction (TelQuel, 2024; GreenTimes, 2025). Introduced as a corrective, the 2030 GGS rearticulates this trajectory through new discourses of inclusion, youth employment and climate-smart agriculture (Agricultural Development Agency, 2026). Moreover, in a press release promoting the large-scale agricultural strategy, World Bank Maghreb Country Director Jesko Hentschel framed it as a "landmark" strategy that "…introduces a paradigm shift in the way Morocco envisions agricultural development…" (World Bank, 2020). However, when looking closely at the 'two pillars' of the project, they closely mirror those of the GMP, with Pillar I focusing "…on the development of modern agriculture with high added value in irrigated areas" and Pillar II aimed at "develop[ing] solidarity farming implementing projects that are technically feasible, economically viable and socially appropriate in fragile areas" (World Bank, 2020).

Through its continued reliance on location-specific "pillars", "solidarity farming" versus "high-value production", as well as its privileging of "technical feasibility" and "economic viability", the GGS does not provide the 'paradigm shift', Hentschel claims. Rather, it renews much of the GMP's governing logics by using more inclusive, future-oriented vocabulary. Thus, the uneven distribution of water becomes a site from which temporal (sustainable) development amnesia is made visible. By portraying itself as renewed, inclusive and climate-smart, the GGS absorbs the shortcomings of the GMP without engaging with the distributive issues that originally caused those failures, such as who gets water, who qualifies for support, which farming practices are recognized as productive and whose losses are treated as the cost of modernization.

When examining the uneven distribution of water, water-intensive export monocropping remains central to Pillar I and thus, by extension, to the Midelt Region-targeted strategy, whereby priority and technical incentives continue to be concentrated among large-scale farms (World Bank, 2020; Goodwin, 2023).[32] This takes a particularly heavy toll on small-scale farmers, whose traditional water channels have been disrupted by state hydraulic interventions, such as dams, and who are left out of state provisioning of hydraulic technologies. Consequently, many have lost their farmlands and youth have left farming and their ancestral homelands altogether, a repercussion of ongoing cycles of temporal (sustainable) development amnesia. Within this governing framework, agricultural "modernization" unfolds unevenly across land, water and lives.

Living Through Temporal Amnesia: Morocco's Agri-Energy Nexus and the Consequences of Development Renewal

An example of the lived consequential realities of the persistent logics and lures of agricultural growth through modernization can be seen with Asim. Asim, a 70-year-old farmer in the small village of Fleelo, holds gently between his fingers the frail leaves of one of his last remaining apple trees. He tells me they are *meritha* (sick) and insists that I look closely. Insects cling to the sparse leaves. He is not able to bear the cost of pesticides needed to ward off the little critters, nor is he able to afford a well to ward off the drought.

Behind the clustered plots where Asim and his neighbours farm on less than a hectare of land lies a large orchard stretching toward the horizon. It is equipped with drip irrigation, a modern well connected to a solar pump and protective mesh draped over healthy trees. When I ask who owns this land, Asim tells me simply, "A Frenchman". He proceeds to tell me that the owner is Moroccan, but he *mla nefsou* (filled himself) with French. His family having accumulated wealth through collaboration with the colonial administration (interview, farmer, Fleelo, June 4, 2023).

I ask Asim whether he holds a farming license. He laughs softly and tells me licenses are reserved for those with large plots. For farmers like him, with fifty or seventy trees, "everything is

[32] The World Bank's appraisal document which proposes a loan of 250,000 million dollars USD, highlights that the GGS goal is to double exports and mobilize large tracts of land for capital intensive agribusiness (World Bank, 2020).

on me". Without a license, he explains, access to state support is closed off. Those who cannot keep their trees alive take on debt, and some are eventually forced to sell their land to repay it.

As we sit together in his *jnān*, sharing a pot of mint tea prepared by his daughter-in-law, I ask whether small-scale farmers have value in Moroccan society. Asim does not hesitate to respond:

> [The farmer who is able to bring] 100 million or more MDH [from their produce]. That is who they help. But someone who cannot find what to eat, they don't get any assistance from anyone. They talk about the GMP. Why don't they look at the small farmer who has nothing and has 6-7 kids and brings in the bare minimum? Instead they go and assist the big farmers" (Interview, farmer, Fleelo, June 4, 2023).

Asim is echoing what others in the southeastern Drâa-Tafilalet region have also stated. Despite differences in agricultural policies across regions, it is clear that agricultural modernization strategies and policies are centred on efficiency and growth, rather than supporting the majority of farmers in Morocco, who are small in scale and with limited access. The 'they' he is referring to is the regional institutional offices discussed in the previous chapter that use the GMP and its successor, the GGS, through eligibility criteria, licensing regimes and technical support programs, to administratively sanction hierarchical provisioning. These agricultural strategies, with renewed completion dates and added technical and technological solutions, ultimately reproduce development promises that sustain the hierarchical allocation of water, subsidies and technical assistance.

The visual proximity of frail, diseased apple trees to flourishing, technologically fortified estates makes these longue-duree processes of loss spatially and temporally condensed, and the entangled contradictions of Morocco's agri-energy hydraulic nexus ever more glaring. Meanwhile, nearby orchards, equipped with solar pumps, deep wells and state-subsidized irrigation systems, visualize a form of 'green' modernization made possible by the same water and energy regimes that render small-scale farming increasingly untenable. Accordingly, temporal (sustainable) development amnesia folds previous failures into renewed promises of technical improvement that do not account for small-scale farmers and the fragile ecologies that bear the brunt of Morocco's

technocratic agricultural modernization strategies. This is further illustrated with the case of Abdallah, a 64-year-old farmer from Aït Ben Yacoub, one of the purported beneficiaries of the land acquisition for the Noor Midelt. When asked about his farm and means of living, he somberly explains that:

> "[All] the trees have dried. [All we have is] wheat, barley and some alfalfa. We bought and planted apple trees, but they have dried. The drought over the past 4 or 5 years has dried the trees….my father and grandfather were subsistence farmers…then people moved to apples, then the water crisis became so bad that the trees died" (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

Abdallah, in detailing the trajectory of the death of his *jnān,* shares what many farmers in the region have experienced by trading their subsistence farming practices for the technocratic visions of agricultural modernization. They understood these agricultural shifts as a means by which to gain some legitimacy within a state provisioning system organized around market-oriented cultivation. However, they were given little relief from the state and their shift led to increased costs as water scarcity intensified.

Khalifa, an elderly farmer from Borem, describes how the move from diverse subsistence crops to apple monocropping coincided with deepening water scarcity:

> "We grew *fusa* (alfalfa), *dura* (sorghum), *batates* (potatoes) and *lubiya* (cowbeans)… and there was abundance. But once the trees came, the water started to deplete" (Interview, farmer, Borem, June 2, 2023).

Khalifa speaks to the failures of the state's agricultural export strategies by noting the shift to monocropping and the intensification of water-cropping. He outlines a time of abundance, which Muslims see as a form of *baraka* (blessing) manifested through the ability to sustain ecologies and livelihoods (Nigst, 2025), and its stoppage with the introduction of large-scale monocropping.[33]

[33] In Chapter 6, I delve into *baraka* as an eco-spiritual aspect of small-scale farmers, particularly women's, place-based knowledge-practices that both "defatalizes" (Agathangelou & Killian, 2011; 2016; Davidson, 2016) their loss and grounds them in continuous care for land, water and each other, despite the encroaching fatalism of technocratic sustainability governance.

His powerful reflection, “Once the trees came, the water started to deplete”, is reminiscent of Na’imah’s reflection from the previous chapter of “when the people from the chamber came, everything dried up”. Though they are speaking from different localities and institutional encounters, both their sentiments reflect the ongoing technocratic logics of governance that have exacerbated the loss of their local ecologies and their livelihoods. The cumulative effects of technocratic agri-energy governance and its constant renewals are clearly articulated by Abdalla when I ask him the follow-up question of “what do you have now”? He responds with a simple:

> “Nothing” (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

He goes on to echo the words of Asim and the many other small-scale farmers in the Drâa-Tafilalet region:

> “The big farmer has a pedigree and is respected [whereas] the small farmer has nothing. The big farmer has status and respect, and benefits from the government’s assistance and the simple farmer is forgotten” (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

Abdallah’s testimony demonstrates how dispossession is cumulatively produced by the agri-energy hydraulic nexus. The drying of his apple trees is a direct result of the layered infrastructural and policy shifts that have reallocated water, land and support away from subsistence life-worlds. His realization of the hierarchical ordering of provisioning and access is a lesson learned by many farmers across the Drâa. Whether they succumb to and accept the technocratic lure of modernization and/or remain steadfast in sustaining their small-scale subsistence livelihood, they remain largely unaccounted for as beneficiaries.

These exclusions are even more pronounced when examined through a gendered lens. As shown through the testimonies of women from the southeastern Drâa-Tafilalet region, women farmers encounter dispossession through additional layers of exclusion produced through gendered inheritance, care responsibilities and dependence on shrinking household resources. Ghada, a woman in her mid-40s from Zaida, one of the areas impacted by the Noor Midelt and its entanglements with hydraulic infrastructure and agricultural development, recalls a time when water was more reliably available. However, when asked about the current state of her trees and livestock, she responds by telling me:

> None…now, we don't have anything. The water in our well is salty… We don't have anything to eat except what is bought" (Interview, farmer Zaida, June 7, 2023).

Married at 14 years of age and with no formal education, Ghada worked on her husband's land until drought and water withdrawal signalled that cultivation was no longer possible. The loss of subsistence crops, along with the failure of their apple trees, has left her dependent on what male family members can purchase.

Aisha, a woman in her late 60s from Fleelo, who, like Ghada, has no formal education and few livelihood options beyond agriculture, has been left to do physically demanding, precarious work cleaning homes for 20 dirhams ($2 USD) a day (Interview, farmer, Fleelo, June 4, 2023). Aisha, unlike most women, inherited land. However, like Mina in the previous chapter, her rare access to inheritance did not exempt her from structurally gendered inheritance practices, which left her with a smaller parcel of land, approximately 100 by 50 meters, and only able to hold 60 trees. Moreover, as outlined in Chapter 4, the combined effects of gendered inheritance, limited land size, drought and bureaucratic access make her less likely to receive state support. As a result, she is unable to sustain apple production as water scarcity increases.

The combined impacts of water scarcity, infrastructural exclusion and agricultural policy renewal have severed the intergenerational transmission of farming knowledge-practices. Abdallah's children, like Aisha's, have left the land because, as Khalida noted in the introduction of this chapter, the enclosures of farming for small-scale farmers have left youth with few prospects. For young farmers like Hussein, a 33-year-old from Zaida, like Ghada, the loss of his trees has meant the loss of his livelihood and provisioning autonomy. Like many others in his commune, he now engages in precarious work on the lands of large-scale farmers. He somberly explains:

> "The whole area used to be farming and now nothing…. people have gone to work in others' [big farmers'] lands because they have nothing. The water shortage doesn't let us farm here" (Interview, farmer, Zaida, June 7, 2023).

Hussein's reflection speaks to the ultimate loss of land, community, livelihood and future generations' ability to continue to provision from their ancestral lands. What was autonomous provisioning has become precarious labour. The culmination of dispossession and loss, brought on

by the logics of temporal (sustainable) development amnesia, has further entrenched the very hierarchies of access and provisioning that agricultural modernization claims to resolve.

The stories of Aisha, Abdallah, Ghada, Hussein and others who endure the slow death of small-scale farming and its inherited place-based knowledge practices reveal how temporal (sustainable) development amnesia operates through dispossession. Development discourse positions projects such as the Hassan II Dam, the GMP and its successor, the GGS and the Noor Midelt as 'new' and 'forward-looking', and in doing so, erases both the enduring legacies of past interventions and the other life-worlds they seek to dismantle. Through small-scale farmers' experiences, cycles of loss and dispossession produced through development amnesia aimed to bury the past through renewed discourses of future redemptive intervention.

Conclusion

On my first day in Ouarzazate, before beginning my field research in the Drâa-Tafilalet region, I met my now-friend Elham, whom I was introduced to via WhatsApp by my late friend Jamie. Elham, a native of Ouarzazate, graciously guided me through the narrow, descending storefronts of the artisan souq, the dark archways and uneven steps of the famous kasbahs, and into the city centre. At various points during the tour, a bright and glaring object is ever-present on the horizon, meeting your direct gaze or lingering in the corner of your eye. The presence of the NoorO CSP tower in many localities of Ouarzazate led me to prematurely share my inquiries about the project with Sarah. When I asked Sarah what her thoughts were on its construction, she shrugged and said, "It's just there".

Since then, and during my month in Ouarzazate, I have learnt that many locals share a similar perspective on the world's largest solar power plant. Sarah is not only apathetic but skeptical about the NoorO. She tells me that, "Many [in town] will say that it has made the town hotter and, to be honest, it has gotten hotter in the last 5-6 years, so I don't know".

In Midelt and its surrounding villages, where Noor Midelt is being constructed amid long-standing agricultural interventions and water scarcity, farmers expressed a similar skepticism about who these projects are for and who they leave behind. For instance, Kareem, a middle-aged farmer from the same village as Abdallah, pauses and lets out what sounded like a sarcastic laugh when asked about his general opinion of the Noor Midelt. He proceeds to respond by noting:

> *"*It's good, it's nice… it will help Morocco, especially the big cities" (Interview, farmer, Boulaajoul, June 6, 2023).

Similarly, Abdallah, the farmer who lost over 800 trees in the drought and the generational farming of his ancestors, echoes Kareem's remarks:

> "[The electricity from Noor Midelt] won't come to us, it will go to Fes" (Interview, farmer, Aït Ben Yacoub, June 6, 2023).

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Through an analysis of the agriculture-energy nexus in the Midelt region and its intersections with land and water, this chapter has argued that Morocco's agri-energy nexus operates through what I term temporal (sustainable) development amnesia. Rather than resolving failure, this governance logic reorganizes it in time, selectively curating memory so that unresolved dispossession, ecological degradation and policy breakdowns are rendered past, technical or already addressed, while renewed intervention is continually authorized to overshadow past shortcomings and maintain institutional legitimacy. In doing so, sustainability projects are severed from the long histories of colonial extraction and postcolonial development failures that structure their conditions of possibility. The testimonies of farmers in the Midelt region importantly intervene to show how this temporal governance materializes through lived experiences, loss of intergenerational farming practices and the collapse of subsistence livelihoods.

Moreover, gender is a constitutive dimension of temporal (sustainable) development amnesia. Women small-scale farmers experience compounded exclusions through gendered inheritance practices, limited or absent access to state subsidies and licenses, particularly under the second pillar of the GMP, and forced displacement into unpaid or low-waged labour as farming becomes untenable. These exclusions are central to how agricultural modernization and renewable energy projects reproduce patriarchal hierarchies with regimes of capitalist extraction.

Across the last three chapters, I have shown how the normalization of socio-ecological loss operates through interconnected technocratic governing logics. Chapter 3 traced how techno-political desert imaginaries determine and depict desert landscapes as available sites for large-scale renewable energy intervention. Chapter 4 then showed how this availability is materially organized through calculative loss, whereby water, land, technology and agricultural recognition are selectively allocated through hydraulic governance and bureaucratic thresholds. This chapter has

extended that analysis temporally by showing how pending and ongoing harms are addressed through temporal amnesia, where they are acknowledged only as past problems, technical lessons or future design challenges, rather than as ongoing conditions of the normalization of socio-ecological loss.

The next chapter turns to the farmers for whom these projects are not only questions of technology, finance or national development by following the socio-environmental effects of these infrastructures to the *dār* and the *jnān,* where women narrate environmental change, absorb the burdens of loss and continue to sustain land, animals, households and community through place-based practices of care.

Chapter 6: Place-Based Relational Knowledge-Practices: Caring for the "Land [that] Grew Us"

The timidness I felt before walking into Muna's small but filled home vanished as soon as I was ushered in by her daughter and those already sitting on the overfilled floor cushions began to shuffle in unison to make room for me to sit. The ways in which Muna's home is filled, from the furniture to the people, and their hospitable warmth, feels familiar. It is the familiarity of the homes I was repeatedly invited into after spending time in the *jnān.* It is the familiarity of my own grandmother's circular living room, furnished with floor cushions, modest but comfortable and practical in its ability to turn no one away from a cup of tea.

Next to Muna is the gas burner, which she immediately turns. She pours a distilled jug of water into a large steel teapot and sets it on the burner. She and the other women had just come back from the *jnān*, which, given the water scarcity that has engulfed the commune, they mostly take the trip there out of habit. Something Muna has done all her life, first with her mother and especially after her father's passing, and then with her mother-in-law, when she married her husband over 50 years ago. She tells me she got married at age 11. I tell her frankly, "You should have been playing in the streets", to which she laughs, before responding simply with:

> "You see", before continuing, "See you now are studying and not making babies, I was only in the *jnānat* [plural for *jnān*]" (Interview, farmer, Amazraou, May 24, 2023).

This was in contrast to what she had told me moments earlier, when I asked her whether women farmers are seen as equals to their male counterparts, and her response, filled with conviction, gave me no reason to doubt her words:

> "Yes, we are men! We do everything with them that has to do with farming" (Interview, farmer, Amazraou, May 24, 2023).

Muna's verbal conviction that women are the same as men is complicated by the uniquely gendered experiences she has lived through. She explains that her father's early death, which left her mother widowed, meant that, according to social norms, her mother needed to find her a husband to care for her much sooner. Moreover, like many rural women of Muna's generation,

she did not go to school. Poverty, lack of access to nearby schooling and the social understanding that if the family had the means, the sons would be educated first meant that many women had little access to education.[34] Her "you see" is of particular importance because it registers an awareness that her experiences are marked by gendered violence, but at the same time, the candid and matter-of-fact way she narrates them exemplifies how acutely these gendered forms of violence are normalized within rural life.

Having maybe sensed my facial expression change, she asks me if I have any kids. I say yes, one and tell them his name and age, but say no more for fear of breaking down in tears of longing and guilt. My pause and attempt to hold back tears were short-lived as Muna's elderly mother-in-law began to recite a *dua* (prayer) for my son's protection. When we return to our initial conversation, Muna and her mother-in-law tell me that the *jnān* no longer keeps them alive and pays the electricity bill like it once did. They, like farmers mentioned in Chapter 4, lost nearly all their crops and trees to the cumulative drought conditions that oasis farms have endured. Muna points to the construction of the El Mansour Eddahbi Dam as the moment everything began to change:

> "When they built the dams, the *saqqiya* began to dry up. Before the water came down and entered the gardens, it would reach up to here (pointing to her knee to indicate the height of the water travelling down the *saqqiya*)" (Interview, farmer, Amazraou, May 24, 2023).

Muna does not name the NoorO directly, and its absence from her statement is of analytical importance. As demonstrated in Chapter 4, for many women farmers, the NoorO is encountered primarily not as a renewable energy project or a broader policy objective by various GEG–sustainable development actors, but rather through dam-mediated water regimes that have limited and redirected water flows away from their *jnānat*. Additionally, by showing me, with her body as her measuring stick, how much water they had and identifying the dam as the moment the water

[34] It's important to note that this gendered access to education in rural communities continues today. According to a 2024 report by Morocco's Supreme Council for Education, rural households often prioritize boys' education over girls', citing the economic burden of educating multiple children (Chentoufi, 2024).

began to dwindle, Muna situates the loss of the *jnān* within a longer history of infrastructural intervention rather than climate-induced drought alone.

This chapter follows the women, like Muna, who have and continue to face the cumulative and enduring socio-ecological losses caused by Morocco's hydraulic technocratic governance that imagined the fruition of the NoorO, sustained it and made subsequent solar infrastructures, like the Noor Midelt, possible.[35] Many of the women in this chapter do not encounter the NoorO and Noor Midelt power plants through formal consultation, compensation, employment promises or direct land acquisition. What they do experience is the broader, interlinked and historically sedimented conditions, such as dam-mediated water allocation, infrastructure and large-scale farmers, along with shrinking *saqqiya* flows, declining wells and bureaucratic, calculative mechanisms. It is from these technocratic governance entanglements that women narrate the socio-ecological loss of the *jnān*, as shown in previous chapters. However, the place-based knowledge-practices of care, responsibility and collective stewardship that inform these narratives do not emerge from these encounters with agri-energy interventions. The knowledge-practices highlighted in this chapter are rooted in intergenerational and cyclic eco-spiritual lifeways that continue to sustain life within and despite their increasingly peripheral positioning within broader sustainable development agendas.

While Muna holds complicated feelings about the gendered violence that has marked her path to the *jnān* she now tends to her husband's family land, she does not understand the *jnān* only through the terms of this violence. She tells me:

> The *jnānat (*small farmlands) grew/raised us". (Interview, farmer, Amazraou, May 25, 2023).

For Muna, the land that 'grew' her also demands continued care and stewardship. It is for this reason that she, her husband and her mother-in-law have remained committed to sustaining their small-scale farming practices. With the help of their neighbours, Muna and her family gained access to the *jnān* of a neighbour who had relocated. Another neighbour also generously allowed

[35] The stories of some of the women featured in this chapter have been shared in Chapters 3, 4 and 5, while others are only featured in this chapter. Those who have previously been featured can be identified by their pseudonymous name, age and location.

them to use her well, even as water scarcity continued to affect the village. The assistance of her neighbours has allowed her to continue farming, though she cultivates very little. She recognizes that the alfalfa and limited herbs she grows will not sustain her large family nor provide the means to keep the lights on, by telling me:

> "We were living off our *jnān,* now we live off the *souq* (market)" (Interview, farmer, Amazraou, May 24, 2023).

As highlighted in Chapter 4, the shift from the *jnān* to the *souq* did not happen overnight but in gradual stages that have progressively reconfigured small-scale farmers' access to water resources, starting with the technocratic implementation of large hydraulic infrastructures like the El Mansour Eddahbi Dam and extending through the calculative privileging of large-scale agribusinesses and renewable energy infrastructure. For Muna, calculative socio-ecological loss is lived through the slow but enduring shift from subsistence autonomy to market dependence, driven by lingering technocratic interventions in Morocco's waterways.

When I ask her why she chooses to continue to farm, she responds:

> "I like [farming and I want it and Alhamdulillah [for it]. The only thing is that there is no water. [With farming] I move my body until I am tired/sleepy. If you are just sitting around, you will get sick and die…. [but] You saw the farms now, you saw their state. Poor them. But I give thanks to *Allah*" (Interview, farmer, Amazraou, May 24, 2023).

Though, as a woman, she was given little choice but to tend to the *jnān*, she sees the lack of water as the only hindrance to her ability to continue farming. Her and her husband's choice to cultivate a different plot near a still-active well demonstrates that her attachment to the *jnān* is more than a matter of gendered fate. Her care for the land gives her purpose, even when it can no longer fully provision for her family. Additionally, when she describes the farms as 'poor them', she speaks of them as living relations capable of suffering, and therefore as requiring continued stewardship and care.

The above reflection on time spent in Muna's *dār,* symbolized through shared tea, intergenerational care, prayer and the recounting of collective labour in the *jnān,* is a snapshot of

everyday life in rural Morocco and the ways it is governed by small-scale farmers. Governance through stewardship here does not operate vis-à-vis policy planning, infrastructural allocation, nor the selective distribution and withholding of resources according to capitalist valuation logics. Governance for these women is stewardship that is enacted through lived relationalities and grounded in proximity to land, water and a spiritual-ecological ethos that organizes care for human and more-than-human life.

I draw on feminist approaches that insist on rethinking governance through women's situated knowledges and practices (Harding, 2008; Haraway, 1988; Smith, 2012; Simpson, 2014).[36] Through these feminist insights, I define place-based knowledge-practices as situated, relational and intergenerational practices through which farmers learn to read, respond to and care for land, water, animals, families and community. These practices are grounded in *baraka* (blessing) (Von Denffer, 1978, p. 172; Nigst, 2025, p. 54), *amana* (sacred trust and responsibility) (Ou-Salah et al., 2024, p. 178) and *twizi* (collective labour/communal solidarity) (Mimouni, 2003), which are the ecological-spiritual principles that show up in women's daily movement between the *dār* and *jnān,* or what I call the *dār-jnān* continuum. Materially and temporally, these relations are sustained through the everyday proximity of the *dār* (home) and the *jnān* (farmland), where shared space and cyclical time organize care, labour and responsibility. Women repeatedly trace their situated knowledges from the ebb and flow between the *dār* and *jnān*, to their childhoods alongside their mothers, grandmothers and neighbours and to the present as mothers and grandmothers. The *dār–jnān* continuum is where the material losses exemplified in Chapter 4 and the temporal deferrals delineated in Chapter 5 are lived in daily routine. However, despite these losses and the increasing enclosure of small-scale farming in the Drâa, women across the region continue to insist on maintaining these daily, intergenerational and cyclical practices of rotating their labour between the *dār* and the *jnān.*

[36] This analysis is indebted to feminist social reproduction scholarship (e.g., Federici, 2004, 2011; Mies 1986), which has shown that the labour of sustaining life, including care, food provisioning, ecological maintenance, household survival and intergenerational knowledge transmission, is central to political economy. Although a fuller engagement with social reproduction theory exceeds the scope of this dissertation, the women's place-based knowledge-practices examined here can be read as forms of social reproductive knowledge and labour that women employ daily to sustain the conditions of life that Morocco's agri-energy development model simultaneously depends on and devalues. However, for the purposes of this dissertation, I am reading this labour through the lens of intergenerational knowledge transfer and spiritual-ecological place-based practices of care.

Thus, these relational temporalities "defatalize" loss and open possibilities for life-sustaining forms of world-making that refuse its normalization (Agathangelou & Killian, 2011; 2016). The methodological insights of this chapter centre on small-scale farmers', particularly women's, everyday knowledge-practices as sites through which governance is lived, negotiated and sustained. This chapter draws on feminist ethnographic methods and in-depth, semi-structured interviews with women farmers. The concepts developed in this chapter emerge inductively by following the women between the *dār* and the *jnān*, observing farming practices, and inquiring and listening to small-scale women farmers' stories and accounts. Through these methodological practices, a recurring understanding of responsibility, stewardship and collective survival is witnessed, learned and passed on across time and space.

This chapter addresses the dissertation's third research question by showing how women farmers'place-based knowledge-practices elucidate the limits of technocratic sustainability governance and offer a relational understanding of sustainability grounded in a socio-ecological ethos of responsibility, communal solidarity and socio-ecological stewardship. The chapter begins by examining the *dār–jnān* continuum to demonstrate the ways in which the spatial and temporal proximity of home and farmland organizes shared labour, redistributes risk and sustains subsistence through relational knowledge-practices that operate parallel with and often in compensation for formal governance structures. This closeness of *the dār–jnān* continuum serves as the foundation of this chapter and allows me to trace how cyclic temporalities are woven into daily routines and seasonal practices. It highlights how women's shifting between care and cultivation disrupts linear governance timelines that view environmental loss as standard and inevitable.

Building on this, the chapter turns to intergenerational knowledge transmission to show how responsibility for land, water, family and collective survival is learned and reproduced through embodied practice, as opposed to technocratic expertise. The latter sections build on the *dār–jnān* continuum to engage with the spiritual–ecological concepts of *baraka*, *amana* and *twizi*, by showing how responsibility, restraint, care and collective solidarity are practiced through cyclical labour and collective obligation. Altogether, these place-based practices challenge the extractive logics and the temporal amnesia associated with the GEG–sustainable development nexus, not because they exist apart from them and the conditions of socio-ecological loss they produce, but

because they continue to sustain cyclical and relational forms of stewardship within and against their calculative terms.

The *Dār–Jnān* Continuum: Relational Labour and Shared Cyclical Time

Cyclical Temporalities: The Ebb and Flow Between the Dār and the Jnān

The generative relationship between small farmers, particularly the women I spent time with, and the land they care for is exemplified by the blurring of the *jnān* (small farmland) and the *dār*. The short walk from the *jnān* to home is done at least twice daily. For most of the *jnānat* I visited, the *dār* was in close proximity and often served as an extension of the *jnān.*

Aisha, a 35-year-old generational farmer from Fleelo, a small village outside Midelt, demonstrates this endurance when explaining her daily morning routine despite no longer being able to engage in the same subsistence farming practices she saw growing up:

> "I feed the kids [breakfast], eat and go to the *jnān* to cut the alfalfa to feed the cow" (Interview, farmer, Fleelo, June 4, 2023).

Though her daily subsistence practices have shifted due to the imposition of apple farming in the Midelt region by state agricultural policies and false promises, Aisha's daily movement between the *dār* and the *jnān* continues.

Hundreds of kilometres away, Souad, a 60-year-old woman who lives on a farm in Zagora with her 7 children, three of whom are married and whose spouses and children also live with her, shares a routine similar to Aisha's (Interview, farmer, March 16, 2023). She wakes up at *fajr* (dawn), like most farmers and prepares food for her husband and children, using the wheat she grows to bake fresh bread and the cow's milk to make butter, which she later showed me. At around 8 AM, Souad makes her way to the *jnān* and starts to cut the alfalfa to feed the animals, gathers crops and subsequently goes back to the *dār* to make lunch. After lunch, she rests, then returns to gather alfalfa, feed the animals and make dinner for her family (Interview, farmer, March 16, 2023).

Aisha, a 50-year-old from Zagora, provides a near-identical account to Souad:

> "I wake up in the morning. I pray the Fajr (morning) prayer. I prepare breakfast and make the bread dough. I make the bread on the coal stove outside. I come to eat breakfast with my kids. [Then] I go to the *jnān* and gather the crops and animal feed. I go and feed my livestock and then I come back to my kitchen and make lunch and clean up. [Afterwards] I go back to *jnān* to gather more crops and animal feed. Then I feed my animals again and then I come back home and spend time with my husband and kids" (Interview, farmer, Zagora, May 24, 2023).

By describing their daily routines, the women also show their fluid, non-linear movement between the *dār* and the *jnān.* This cyclical movement is gendered because it encompasses both farming labour and provisioning labour, moving cultivation and care, as well as production and reproduction. As such, the *dār–jnān* continuum must be read as both a site produced through unequal social conditions and a space where women sustain forms of care, ecological memory and collective responsibility that exceed the terms through which state and market institutions recognize as agricultural 'value'. For rural women and their narratives, the cyclical movement between provisioning for the *dār* and the *jnān* is centred on the needs of the ecologies they care for, as they organize their day around crops, livestock, water, kin and household.

When reading the cyclical ebb and flow of women's labour and their attention to ecological time against the future-oriented timelines of the GEG–sustainable development nexus outlined throughout this project, these daily cycles of place-based stewardship provide a different reading of sustainability. From their place-based situatedness, women's cyclical practices interrupt *temporal (sustainable) development amnesia* by refusing the idea that loss can be contained in the past, resolved or technically deferred into the future.

In the following section, I delve into the ways in which the cyclical movement between the *dār* and the *jnān* positions farming within a longer temporal horizon, where knowledge of land, water and care is remembered and passed down.

Intergenerational knowledge sharing and farming practices

For these women, the short trips to the *jnān* were made with their mothers to gather crops and to feed their families, neighbours and their animals (Field Interviews, farmers, March – June

2023). It is all that they have known since being 'awakened' to the world. The proximity to the *jnān* meant that these women would often accompany their mothers from birth, carried on a makeshift cloth wrap on their backs, crawling through the long and widely scattered alfalfa vines, running after the baby chicks and rabbits and learning through practice and generational wisdom how to care for the land, water, their families and their communities. These intergenerational routines constitute a form of relational governance through which responsibility for land, water and collective survival is learned and reproduced beyond formal state and market institutions, even as farmers continue to navigate the exclusions those institutions produce.

The mother-daughter duo, Kalthoum and Sadiya, introduced in Chapter 4, succinctly capture intergenerational knowledge sharing. For instance, Kalthoum discusses her upbringing in the *jnān*:

> We were raised in the *jnān.* I would gather the crops, grind wheat and barley into flour, and gather alfalfa for the animals to feed (Interview, farmer, Tamegroute, May 25, 2023).

She still tries to care for her six palm trees, even though the drought has meant that they do not produce any dates, nor do they shield any crops beneath them from the sun, because there are no more crops to shield.

Kalthoum's mother, Sadiya, an elderly woman who does not know her age, shares that she grew up with a similar routine to that of Kalthoum, adding:

> "We did everything from beginning to end from scratch" (Interview, farmer, Tamegroute, May 25, 2023)

Kalthoum and Sadiya's narrations show that the *jnān* is a site where women learned the full cycle of subsistence, from gathering to grinding to feeding to preserving and caring. Sadiya's "everything from beginning to end" speaks to a cyclical knowledge grounded in the capacity to use and live off what the land provides.

This reliance on the land for 'everything' was also noted by Khadia, a 55-year-old widow from Zagora, as she described the work her mother did, watching and learning from her. When I

ask her about her relationship to the *jnān* and what her mother taught her. She explains that she watched her mother:

> "…Cultivate and gather the crops and plants to prepare food. She planted the seeds; she worked with the men. She did everything that they did. That was their provisioning in that hour. At that time, there was much, and now there is little and much poverty…At that time, we only lived on that. We didn't buy anything from the *souq*. Everything we grew ourselves and made use of for ourselves" (Interview, farmer, Zagora, May 24, 2023).

Khadija's narrative of her mother's work in the *jnān* is one she has watched, mimicked and carried on even after her mother's passing. In addition to the *jnān* labour that she has taken from her mom, the intergenerational and embodied labour is how rural women measure loss relationally and temporally. This is done through the contrast between a past of abundance and a present marked by "little" and "much poverty". Moreover, Khadija points to her mother's labour as both different from but connected to the labour undertaken by men. Her mother cultivated, gathered crops, planted seeds and "worked with the men", while also preparing food and sustaining the household from what the land provided.

She goes on to tell me that what she had learnt from her mother she has taught her own children, though under increasingly limited conditions of provisioning:

> "Farming is in our blood. You raise your child around farming and to love farming" (Interview, farmer, Zagora, May 24, 2023).

Here, Khadija speaks of farming as an embodied experience, one that runs through the veins of the farmer and lives within them generation after generation. Thus, socio-ecological loss for farmers like Khadija is more than the loss of livelihood but the loss of what it means to be a farmer and their relational attachment to land. With that said, farming is an embodied skill nurtured through proximity, repetition and attachment from an early age, even under the most precarious environmental conditions.

This temporal sensibility displayed by the women is why most of the women I interviewed could not provide a specific age when they began working in the *jnān*, but told time by their proximity to it or since the day they were "awakened to the world". The memories of their time in the *jnān* with their mothers serve as an ecological record from which they measure shifts in the *jnān* over time, including the introduction of new technologies and implementation of calculative technocratic policies.

Being awakened to the *jnān* is not only learning how to cultivate and use the land exclusively for provisioning, but also understanding the land's capacity to heal by learning about the healing properties of various plants. This knowledge becomes especially significant because formal healthcare is costly or inaccessible for many small-scale farmers. Women do not describe plants as cures for all ailments, but as part of an everyday repertoire of care used to respond to pain, minor wounds, colds and other common illnesses. For instance, Mina, an elderly divorced woman from Amerzgane and one of the very few women who inherited a small plot of land, tells me that in addition to doing what the women in the community do – take care of the animals and gather the crops – she is a natural healer just as her mother had been. When I ask her how she heals, she tells me she uses what the land provides:

> "The oils we grow here, the olives and almond plants, the henna plant and eggs from the chicken. This [knowledge] was passed down to me by my mother. My mother was also a healer. Anyone in the community who needed healing would come to my mother, and now they come to me" (Interview, farmer, Amerzgane, March 14, 2023).

Mina's inherited healing gifts exemplify how place-based knowledge-practices extend beyond food provisioning and animal care to include healing and communal care. What she and others demonstrate is that when cared for, the land is sufficient, not barren or awaiting technological transformation. In this way, Mina's reflection puts into question the techno-political desert imaginaries and the Orientalist impulse to continually reimagine the desert as a space in need of improvement.

It's also important to revisit this quote in light of Mina's appeal to the state to build another well, as outlined in Chapter 4, through the concept of calculative loss. This appeal is not a rejection of the *jnān*'s sufficiency but a petition, through the technocratic language of the state, to allow the

hydraulic conditions that would let the land continue sustaining her family, animals and community.

Overall, for the women mentioned here, as well as many others I encountered during my fieldwork, growing up in, with, and by the *jnān* meant learning, from early childhood, that the care of land, water and people was inseparable and continuous despite ongoing socio-ecological loss. Accompanying their mothers from birth, they learned through practice how to cultivate crops, feed animals and sustain households. These embodied knowledge-practices are not seen as a form of resource management but as a shared responsibility passed down generationally and rooted in everyday proximity to the land. For subsistence farmers, this is tangibly lived through the *jnān* and all that is sustained within it.

The next section demonstrates how small-scale farmers' knowledge-practices are grounded in a spiritual-ecological ethos of relational governance. It begins with the concept of *baraka* (blessing) to elucidate how farmers view the value of their surrounding ecologies and their small-scale farming communities beyond the calculative merits of technocratic expertise in top-down sustainability governance.

Spiritual-Ecological Stewardship: Setting the Baraka Stage

Scholarly work on *baraka* has primarily focused on conceptualizing it as a sacred force, a divine blessing bestowed upon a highly spiritual and/or prophetic person (Von Denffer, 1976; Nigst, 2025). According to Dietrich Von Denffer (1976), *baraka* is symbolized through material abundance, surplus and prosperity. Moreover, *baraka* is also tied to the natural world. In examining how *baraka* is conceptualized in the Quran, Von Denffer (1976) cites various verses in which *baraka* is expressed through the coming of rain and the tree's abundance as manifestations of *Allah'*s blessing. Lorenz Nigst (2025) notes how *baraka* can be seen as a practical mode of navigating illnesses, uncertainties and contingencies, attainable through *dua* (supplication) and by withstanding hardship.

In this chapter and through the women's narratives, *baraka* is seen as a divine blessing bestowed by *Allah* through the natural world, rather than exceptional religious figures. For rural women, the everyday relations with more-than-human life, such as water, land and the ecologies that depend on them and on their continued survival, constitute a form of abundance brought about by *baraka*. I then show that *baraka* is not only seen through the lens of surplus or prosperity but,

more fundamentally, through shared sufficiency, gratitude, care in continued stewardship and refusal to succumb to the ongoing losses they endure.

Shared Sufficiency and Relational Care

> "Farming is good. We aren't the only beneficiaries of farming. If an animal comes by, they can eat from the land. If a person comes by, they can pick and eat from the trees and plants. *Baraka* is in farming. This is our *baraka*. If I die, my history is in that farming. The *karmoos* (fig tree) that I have, everyone and everything eats from it" (Interview, farmer, Borem, June 2, 2023).

For small-scale farmers such as Rahma, a middle-aged woman from Borem, a small commune outside Midelt, the land is not privately owned and nor enclosed for the owner's benefit. For her, it is considered a shared blessing for both human and more-than-human life. Its abundance is abundance for all because it feeds animals, passersby and future generations. In this way, value is not measured through accumulation, spectacle and technological superiority, but measured in how and whom it benefits. It is shared even beyond her time on earth. Her care for the *karmoos* tree and the way the *karmoos'* abundance sustains those who come into relation with it becomes one way she understands her own value. This form of value challenges the techno-political desert imaginaries presented in Chapter 3, in which desert lands are deemed extractable by emptying them of their ecologies and histories to transform them into sites of technocratic output. Through Rahma's perspective and the situated values she articulates through her *karmoos* tree, we are presented with another story, one where fruit trees grow from the desert and act as a record of one's life lived and the values they held.

Baraka, as seen in Rahma's story and subsequently, is depicted by the women as a form of value that exceeds calculative merit and technocratic expertise. It defatalizes the technocratic and calculative certainty with which GEG–sustainable development actors operate. It does so by allowing farmers to acknowledge drought, dispossession and state neglect without succumbing to these conditions as final horizons of rural life. For Rahma from Borem, Muna from Amazraou and many of the farmers I spoke to, both male and female across my field sites in the Drâa-Tafilalet region, *baraka* remains a grounding force despite all that they have lost due to the state-sanctioned

imposition of technocratic fixes. As such, *baraka* serves as a spiritual compass for farmers that guides how they interpret loss, allocate care and sustain relations with land and water beyond state and market logics and despite persistent cumulative loss and dispossession.

This practice of *baraka* is significant on two main accounts. Firstly, *baraka* offers a different way of understanding uncertainty and provisioning that transcends the technoscientific precision and abstraction that are emblematic of technocratic forms of environmental sustainability governance. *Baraka* does not treat perceived 'uncertainty' as a risk to be tamed and managed; instead, what *baraka* does is display an embodied optimism that allows farmers to defatalize their disposability. Secondly, *baraka,* as defined by the women, demonstrates how sufficiency is both understood and practiced, whereby land, water and the sustenance derived from nature are recognized as blessings to be cared for and not extracted. As such, *baraka* serves as a sense of sufficiency rooted in gratitude.

Baraka as a Defatalizing Ethos

According to Anna M. Agathangelou and Kyle D. Killian (2011; 2016), defatalization challenges the notion of fatalism as a postcolonial phenomenon. For Agathangelou & Killian (2011; 2016), modern Western and colonial forms of power produce their own fatalistic understandings of history by presenting existing structural conditions as inevitable (2011; 2016, p. 16). In contrast, anti/decolonial struggles reveal the openness and contingency of the present by demonstrating that dominant relations of power are neither natural nor fixed. They challenge the notion of fatalism as a primarily postcolonial or Global South phenomenon. For Agathangelou and Killian (2011; 2016), anticolonial and decolonial struggles expose the openness and contingency of the present by challenging the temporal closures through which colonial, capitalist and technocratic forms of power make existing relations of domination appear inevitable. Through this lens, and as I subsequently demonstrate, farmers challenge the enclosures of intensifying loss they face under technocratic, calculative and temporal articulations of sustainability governance through continued practices of stewardship, care, restraint and collective responsibility that refuse to treat water scarcity as inevitable and their lives and livelihood losses as predetermined fate.

In this way, *baraka* operates as a defatalizing ethos that signifies the acknowledgement of ongoing and cumulative socio-ecological loss without accepting dispossession and hierarchical

infrastructural dominance as determinants of rural life and its future horizons (Agathangelou & Killian, 2011; 2016). This can be seen in the ways farmers situate the power of state actors, large landholders and colonial-capitalist inheritance within a larger spiritual order. For instance, Aisha, an elderly woman from Fleelo, tells me about her cousin, who was mentioned in Chapter 5 as the large farmer who inherited a large plot of agricultural land from his father, a close ally of the French colonial military. After telling me of his alliance with the colonial administration and the postcolonial state, she tells me:

> "He is big, but *Allah* is bigger. *Alhamdulillah* (Thank Allah)" *(*Interview, farmer, Fleelo, June 4, 2023).

By placing *Allah* above both colonial inheritances and contemporary state-aligned accumulation, Aisha reframes scale, power and legitimacy through a spiritual register that refuses the finality of techno-political dominance and the assumption that those who control land and water ultimately determine life chances.

Similarly, Muna, the 66-year-old from Amazraou, demonstrates *baraka* as a defatalizing ethos when responding to my question about government provisioning by stating:

> "Only *Allah* helps us, and we get our blessings from him. But no, the government doesn't give us anything. Even if they say they give, we don't get anything. We only have *Allah*, and we have everything we need. *Alhamdulilah*" (Interview, farmer, Amazraou, May 24, 2023).

An important caveat when reading Muna's above statement is that, while she does not succumb to the everyday socio-ecological losses she endures from state-sanctioned neglect because of her belief in a higher order, she also does not rely on that belief blindly. Farmers like Muna still appeal for government assistance, ask for access to water and recognize the failures of state provisioning. Her statement that "only Allah helps us" should therefore not be read as her succumbing to socio-ecological losses and the enclosures of top-down sustainability governance, but as a refusal to look only to the state for provisioning. Moreover, her understanding of the land as "everything we need" speaks to how she sustains her stewardship responsibilities to the land, which she continues to cultivate, advocate for and understand as "everything we need", despite the

technocratic, calculative and temporal enclosures that treat her marginal land and her subsistence practices as economically obsolete and calculatively dispensable.

Ruqaya and Fatima are both in their 50s, from Amerzgane, and rely solely on the rain and the *saqqiya* to feed their crops. When I project my internalized anxieties and ask them, "What happens when it is hot, and there is a drought?" Ruqaya responds unfazed:

> "I do not fear not having water; I put my faith in *Allah*, *al-Razzāq* [the Provider], and that the water will return in time" (Interview, farmer, Amerzgane, March 14, 2023).

Here, Ruqaya gives significance to *al-Razzāq*, meaning the Provider, one of Allah's names, to illustrate her steadfastness in Allah's ability to sustain life beyond human prediction and control.

Similarly, and in more detail, Fatima firmly and without hesitation tells me:

> "You need to trust in *Allah* that he will once more bring the rain. Everything is in the hands of *Allah*. Everything. It's what is in the hands of the sons of Adam (human beings) that is hard. It is what we control that is hard. Whatever is in *Allah*'s hands is near. Everything is near" (Interview, farmer, Amazraou, May 24, 2023).

Fatima does not deny the ongoing drought. Her statement is rooted in her understanding of humans' role in the materialization of drought. Instead, what her reflection demonstrates is the distinction between human control and divine will that challenges the assumptions embedded in 'universal truths' of techno-political rationalities governing sustainability and development. What is "in the hands of the sons of Adam", that is, what humans attempt to predict and manage, including the technocratic logics embedded within the GEG–sustainable development nexus. Through her trust in *Allah* and her skepticism of human beings' need for control, she defatalizes the technocratic logics that treat land and water as objects of optimization and that fatalize her subjectivity. By refusing to treat water scarcity, the decline of small-scale farming and the promises of future development as fixed endpoints, small-scale farmers, like Ruqaya and Fatima, keep open alternative possibilities for sustaining life and relations with the land beyond the technocratic, calculative and temporal terms of sustainability governance.

This is true even for farmers who have lost everything. Khadija, from Zagora, shared with me that '*el hob el kabeer'*, or the big love or love of her life (farming), "has died" because of

ongoing and compounding hydraulic interventions, including the NoorO's construction, and the absence of state provisioning. She refers to a time when there was water and attributes that bounty to *Allah*:

> "There was lots of *Allah*'s *baraka*. *Allah* gave us the greenery and water. And now it is dry. The thing you don't get from the *souq,* you won't eat" (Interview, farmer, Zagora, May 24, 2023).

When I ask her about the worsening drought in the region, she tells me:

> "It is in *Allah's* hand, and there is nothing bad [that *Allah* created] on this earth. *Alhamdulillah* (thank Allah)" (Interview, farmer, Zagora, May 24, 2023).

Khadija reframes drought beyond the calculative control of technocratic governance by placing provisioning in *Allah's* hands. While Khadija openly mourns the loss of water and the life-sustaining ecologies that depend on it, her trust in Allah's *baraka* rejects the assumption of predetermined fate that Zagora and its oases have no future and keeps the possibility of renewal alive.

Moreover, Khadija's reflection on *Allah*'s bounty demonstrates her imperative to care for that which is divinely provided. By linking Allah's bounty to her love of farming and by describing the drying of her farmland as the result of misuse beyond her control, she shows how women care for land, water and people as both devotion and ecological stewardship. This care, as I will demonstrate subsequently, is rooted in the spiritual concept of *amana* (responsibility/trust), given by *Allah* to humans toward human and more-than-human life-worlds (Gada, 2014).

***Amana*: Responsibility and the Ethics of Care**

According to Yaseen M.Gada (2014: 135), *amana* is "an ecological ethic, since nature being an estate belonging to *Allah*, has been given to humankind merely as a trust". This is further articulated by Loubna Ou-Saleh et al. (2024), who note that farmers in the Souss-Massa region of Morocco are entrusted by *Allah* with the responsibility of protecting the surrounding ecosystems.

This form of stewardship, according to Ou-Saleh et al. (2024, p. 178), is termed *khalifa*. *Amana* is not seen as a human possession but rather as something to be safeguarded, one that provides sustenance to humans and other living beings but also requires care (Gada, 2014; Ou-Salah et al., 2024).

Below, I demonstrate how *amana* is understood and practiced through women's place-based stewardship of land, water, animals and one another. Importantly, stewardship is often expressed as a form of love that women continue to practice despite state neglect and the temporal cycles of technocratic interventions that have made their ability to farm increasingly difficult to sustain.

The Gendered Complexities of El Hob el Kabeer

To begin this section is to state the complexities of gender and its intersections with *amana* as love. After all, love itself is complex and contradictory. From this standpoint, it is pertinent to note that *amana,* as love, is not lived outside gendered power and norms but through them. Like Na'imah from Chapter 4 and Muna's story in this chapter, and most of the women I spoke to, the *jnān* was not a choice but an entrusted responsibility borne of various forms of gendered violence, both structural and systemic, as well as communal and customary. It is within the context of gendered constraints that *amana* as love becomes an important analytic. While many women feel an obligation to the land because there is no other choice, their expression of love is also a form of agency within obligations that leave them with little room to choose otherwise.

That said, not all the women I met felt farming was an obligation. An example of the nuanced relationship that women have with the land can be seen in Safia, a 49-year-old who came to Tarmigt when she married at 17. Safia works on her husband's family's land. When I ask her why she continues to farm even after her in-laws' passing, she tells me frankly, "So the animals and we can have something to eat" (interview, farmer, Tarmigt, May 15, 2023). Later, when I ask her how she feels when she is in the *jnān*, she responds frankly by stating: "It's not that you love it. It's that it has to be done" (interview, farmer, Tarmigt, May 15, 2023). Safia's response highlights how, for her and others, farming is framed as a necessity rather than a matter of love.

Even Khadija, who framed farming as '*el hob el kabeer*', places it within the gendered constraints that she and others continue to endure, as a widowed woman with no formal education who grew up farming. She states:

> "What is the alternative? This is what I know and love. I gather the crops, tend to the animals and take care of the family. This is what I know. From the day I woke up to this world, I have been here [the *jnān*]" (Interview, farmer, Zagora, May 24, 2023).

Khadija's nuanced response holds together the tension between love and constraint, in which the *jnān* is *el hob el kabeer,* yet also the only world she has known because of the gendered exclusions that rural women face. For Khadija, it is despite the conditions that awakened her to the *jnān* and kept her there that she continues to love it. Thus, she elucidates how these tensions between obligation and attachment are important because they prevent love from being read as a romantic or uncomplicated relation to the land.

With that being said, across many of the women's testimonies, love (*el hob el kabeer*), peace, and divine ordination recur as themes that guide their reciprocity and responsibility to the land. As I exemplify below, the desert, deemed disposable by the GEG–sustainable development nexus and its technopolitical desert imaginaries, is painted differently by the women I spoke to. For them, the desert is the site of skill-building outside formal education, largely constructed through gendered societal enclosures. The desert-lands these women care for give them the practice of farming itself, which they understand as both a livelihood and a lifeworld, whereby it sustains them materially and situates them physically, emotionally and spiritually in the world. For instance, Fatima from Amerzgane tells me:

> "For me, this is my passion. This [pointing at the land] is where I get my good deeds by taking care of the animals and taking care of their souls. I will get great rewards in doing that. My kids say just leave it, you don't need to do this stuff. They say your back is hurting and you are hurting yourself. I tell them, how else will you survive?" (Interview, farmer, Amerzgane, March 14, 2023).

Here, Fatima, like Khadija, articulates the nuances of *amana* as both a form of love and an obligation of survival. She sees caring for the animals, tending the land and nourishing her family through her labour of love as both a material and spiritual practice that gives her a deep sense of

purpose and spiritual reward. Her response to her children's plea is especially important, as it shows that, for her, caring for the land is not only an obligation but also an expression of love. Her survival is tied to the land's survival, and to the labour and care that she continues to perform despite and in spite of ongoing socio-ecological loss. Later in the interview, I asked her how she feels about farming. She responds by saying:

> "I love farming. It's just a matter of health. The work is not difficult for me. Even when I am sick and tired, I just want to get out and be on the farm. It is something that I hold dearly that I go out to the farm. Even when I am tired, I don't sleep. I just want to go out to the farm, and it makes me feel better" (Interview, farmer, Amerzgane, March 14, 2023).

In the excerpt above, Fatima makes clear how she defines love versus obligation, or that which 'needs to be done'. For her, the *jnān* is a labour of love, and this love is reciprocal, not only in its provisioning and ability to provide healing plants but also as a site of refuge and mental clarity amidst prolonged and persistent loss and dispossession.

Working on the land as a labour of love is further expressed by women like Fatima and Ferdous from Ouarzazate. Both women are over 60 and still farming. While the obligation to provision underscores the sentiments they express below, it is also marked by a profound sense of grounding and peace in caring for their *amana*. Ferdous shares this sentiment when she tells me:

> "It is great even when the hot sun is out. I don't feel tired even when it is tiring. I am patient. I feel ease, *Alhamdulilah,* and feel at peace" (Interview, farmer, Ouarzazate, March 21, 2023).

Ferdous does not deny the implications of farming on the body but demonstrates that physical tiredness is not comparable to mental fatigue. Through her narrative, she shows that *amana,* as love, does not erase the hardship of farming but reorganizes how that hardship is experienced. The labour is tiring, but the *jnān* offers a mental sanctuary and a sense of purpose.

The aforementioned testimonies of women farmers show how *amana* is imbricated and intermingled in gendered obligations and survival. In this way, *amana* as a form of love is not pure and straightforward but entangled in gendered exclusion, survival amid socio-ecological loss and intimate relational connection to land. In the subsequent section, I demonstrate how, for some

women, this love is expressed not only through the endurance of obligation but also through a refusal to leave the land when other possibilities are available.

Beyond Obligation: The Refusal to Abandon the Amana

Through their continued connection to land, women complicate the ways their land, water and livelihoods are rendered calculable within technocratic governance. Their refusal to abandon their stewardship of the *jnān*, even when they face drought, shortages and state neglect, cannot be understood through productivity or economic rationality. While for some this continuity is necessitated, for others, as I demonstrate below, it is grounded in their relational connection to the *jnān*. Their ongoing efforts to preserve their ancestral knowledge and way of life suggest that their relationship with the land is more than just about material sustenance, but also offers mental and spiritual grounding. Moreover, they do not see land and animals through the lens of temporal disposability, but as *amana* that must also be cared for relationally. Thus, their stewardship extends beyond mere obligation or religious duty and is expressed through an embodied love for the land and the relationships it nurtures.

For example, Mina the farmer from Amerzgane expresses love as a refusal to leave her *jnān* when she states:

> "I am comfortable here. I feel calm and at peace when I am here. My son in Casa (Casablanca) is telling me to come live with him, but I refuse. I care for my goats and grow fruits, herbs and crops here. My heart is at peace on my land" (Interview, farmer, Amerzgane, March 14, 2023).

Amid technocratic fatalism and loss, Mina can seek refuge with her son, but, as she states, she is "comfortable here". The ability to move to Casablanca with her son means that she no longer has to tend to her *jnān* or care for her goats, nor does she need to lobby the government to build another dam in hopes of securing water for her *jnān* and animals. Her choice to stay and her refusal to join her son in Casablanca is situated in her love for the *amana* and for where her heart is most at peace – her land.

This refusal, embedded in connection, is further evidenced in Aisha, the elderly woman from Fleelo. I ask Aisha whether she still likes farming, to which she states:

> "Yes, I love it, yes. If I didn't love it, I would not come here to do it" (Interview, farmer, Fleelo, June 4, 2023).

Aisha's continued return to the *jnān,* despite the drought conditions, as with Mina and her neighbour in Tamegroute, is a testament to how *amana* is lived out through repeated acts of care, even under conditions of loss. The drought and the subsequent death of many of her apple trees, leaving only 60 on her already small plot of land, have meant that Aisha has had to take on work cleaning other people's homes to make ends meet. Despite this, she still comes to her *jnān.* Her refusal to abandon her land, despite ecological and subsistence loss, unsettles the techno-political desert imaginary that treats land as valuable only when it is visibly profitable and available for technocratic transformation.

Moreover, love for farming is a recognition of its *baraka*, the responsibility to protect it (*amana*), and the water resources that sustain it. For instance, Zakia, a 57-year-old woman from Tamegroute, and Fatima, a farmer in her 60s from Tarmigt, both express unconditional love for farming in their responses, acknowledging its importance as a means of provisioning and survival and as a passed-down tradition. Zakia, with her voice softening, states:

> "Of course, I love it. (laughs). Without farming, there is nothing (repeats this phrase once more). The commune is dependent on farming" (Interview, farmer, Tamegroute, May 24, 2023).

Fatima, who has been farming for over 40 years and started when she was a child, accompanying her mother in the field, echoes this and adds:

> "…Farming is beautiful. Without farming, we would not be anything. We wouldn't exist. Farming provides for the nation's economy. It has the means to provide subsistence. It has everything. We have followed farming practices as our ancestors did. It is an inheritance from our ancestors and that's why we continue farming" (Interview, farmer, Tarmigt, May 18, 2023).

Both Zakia and Fatima's sentiments speak to farming as the condition that makes their lives, the lives of the community, future generations and the sustenance of the nation-state possible. Fatima does not explicitly connect farming for the 'nation's economy' with the technocratic imposition of large-scale technologies and agri-hydraulic policies that have led to the loss of subsistence farming. Rather, for her, the value across time and scale is bound to the place-based subsistence logics that have guided her farming practice and her understanding of the world.

This place-based ethos is rooted in their intimate relationship with their land, one that is neither extractivist nor exploitative. This intimacy rests on a recognition and responsibility, whereby for them to survive, land and water must also be safeguarded. This sentiment was highlighted by Mustafa in Chapter 4, when he describes the wisdom of ancestral traditions, from seeing the palm tree as a protector of crops to the need to protect water "…because it is a cyclical process" (Interview, farmer and environmental activist, Zagora, May 23, 2023). Kawthar from Amazraou, a woman who doesn't know her age, tells me of this cyclical process in simple terms:

> "When the palm trees begin to wilt, the farm wilts because there was no water in the *saqqiya*" (Interview, farmer, Amazraou, May 25, 2023).

The ecological interdependence that Mustafa and Kawthar describe is rooted in stewardship through continued proximity and care. This stewardship does not order itself as hierarchically superior and thus in need of technocratic solutions. Instead, it is rooted in listening to the needs of and continually caring for the ecologies that sustain life in the desert. Thus, attending to the interdependence between the various parts that make up the desert's ecology, from the palm tree to the crops that need it to survive, to the stewardship over the water resource that keeps all the desert's living beings alive. Consequently, the death of the palm tree is a signal of the weakening of the entire *jnān* and its ecologies. In this way, Mustafa and Kawthar show a place-based understanding of the interdependence among water, land and the ecologies sustained by and through them.

Overall, *amana* is upheld as a sustaining praxis that anchors women's stewardship of land and water in an embedded and embodied ecology of care. Through Mina, Aisha, Zakia, Fatima, Mustafa and Kawthar, love as *amana* emerges as a way of remaining with the land, protecting what

continues to give life and refusing to reduce the *jnān* and, the desert ecology to which it belongs, to a singular, void, calculated and repeated site of extraction.

What these farmers demonstrate is that this love is not without its complexities. It is situated in conditions of water scarcity, technocratic interventions and state neglect, as well as the gendered constraints that brought many of the women to the *jnān* in the first place. However, these complexities provide the backdrop from which we understand how, despite the socio-ecological constraints and the fatalizing logics of sustainability governance that engulf women and their ecologies, they continue to defatalize their present by practicing ecological care over the land. *Amana* as love is not only shown in their deep understanding of the ecological care needed to sustain the *jnān* even in times of loss. As I will demonstrate in the next section*, amana* is articulated through restraint and collective responsibility not only to land and water, but to each other.

Taking care of the Amana: Sustainability as Restraint

When I arrive at Jamie's small apartment in Zagora, she excitedly opens the door and greets me. After showing me to the sitting room, which she set up as my bedroom for the duration of my stay, she tells me about a small community of farmers on the outskirts of Zagora that she had been visiting recently. We make plans to visit them together the next day.

Early morning the next day, we wake up and make our way through the streets of Zagora and between *zangas* (small streets) with no farmlands in sight. But I know Jamie and know her amazing knowledge of Zagora, and I don't doubt her and her abilities. She spent much of her time here during her Peace Corps service and while pursuing her master's research. Finally, at the end of a long street of houses along a narrow, barely paved road, we reach a small oasis of scattered palm trees whose rowed path leads us to a cluster of hidden *jnānat.*

It is there I meet the matriarch of one of the farming families, Aisha, a 50-year-old woman who lives with her husband, adult children and grandchildren and farm on their small *jnān*. After our introductions and praise for Jamie's ability to speak to near fluency in both Darija and Tashelhat*,* Aisha begins to tell me about her farming story. I ask Aisha why she and her husband continue to work the land if they rely on the income of her sons, who work 'outside', given the limited water and low output from farming. She tells me what others have told me: it's the love for farming that keeps them. Aisha somberly shares that it wasn't always like this. She recollects her

youth and watching her parents tend the land and "…you could feed your family, sell some extra crops, and give away" (Interview, farmer, Zagora, May 24, 2023).

Later in the conversation, when describing the drought and limited water supply, she has in her well, Aisha, in passing, tells me that when the water does come once a month for two days, she shares it with the neighbours:

> "I wake up at 4 AM, and start the motor (for the well) for a few hours and then someone else will come and use it, and so on until there is no water" (Interview, farmer, Zagora, May 24, 2023).

By stating the time she wakes up, Aisha draws attention to water-sharing practices and their need for coordination and restraint. Waking up before the sun's heat descends upon the *jnān* also ensures that the *jnān* is adequately watered before evaporation intensifies. In turn, this means that she does not use up a significant amount of water, and others are able to access it for their *jnānat.*

As Aisha speaks, I am reminded of the dire water shortages in the downstream Zagora region caused, as explained in Chapter 4, by depleted aquifers due to the GMP's provisioning of large-scale water-intensive farming in Feija and the limited access to water in the *saqqiya* due to the construction of the Mansour Eddahbi and the privileging of large-scale technocratic agri-energy initiatives, including the NoorO. It is in this pondering that I ask Aisha a question, which prompts a puzzled reaction: how does she ensure that her neighbours don't misuse the water in the *bir* (well):

> "No, they will not misuse the water. If you give me something. I will take care of it. It is an *amana*. When *Allah* gives you *baraka* (a blessing), you should share it. You don't feel the need to repay them. You do it for *Allah's* sake. Anything I have and even myself should be given…. Back in my parents' time, when people farmed, they would work together on one another's farms. They would all graze the land, plant the seeds, grow the crops and gather them collectively. Each day, they would work a different field, and then the women would collectively gather all the crops that had grown and divide them. It's called *Twizi*" (Interview, farmer, Zagora, May 24, 2023).

In explaining her trust in her neighbours not to misuse the well water, Aisha is rejecting the premise that scarcity necessitates misuse, or, as highlighted in Chapter 4, the institutional blaming logics of water decline perpetuated by regional bureaucracies such as the Chamber of Agriculture and ORMVA, the regional agricultural authority. Her response positions her and her neighbours as ethical stewards of water, bounded by *amana* and by a shared understanding that what is bestowed upon and provisioned by *Allah* must be cared for. Her understanding of care and responsibility starts with sustaining her immediate family first by watering her own *jnān* before passing it on to her neighbours. At the same time, by starting the generator and waiting for the water to come up, she facilitates access for her neighbours, making it easier for them to draw water. When she turns to the story of her parents' time and the practice of *twizi,* Aisha well-sharing can be understood as an inherited practice of collective responsibility, where water is not seen as private property or a resource to be maximized but as *baraka* that must be safeguarded and shared.

This long-standing understanding and trust is rooted in a shared ethic of taking only what is needed. As Souad, the 60-year-old farmer also from Zagora, tells me:

> "We take only what we need, and we don't take more than that" (Interview, farmer, Zagora, March 16, 2023).

Similarly, Fatima, the 67-year-old widow from Ouarzazate, shares:

> "Small-scale farmers, like me, just take what we need. That's it" (Interview, farmer, Ouarzazate, May 16, 2023).

Souad and Fatima's statements, along with Aisha's, show how restraint is a practice of care and stewardship. They show how collective care through restraint rises from relational obligations to land, water and others, and thus constitutes a refusal of over-extraction and accumulation. It reflects an understanding of land and water as entrusted and thus as communally accessible to all beings, human and more-than-human. In this way, collective care through restraint demonstrates an understanding of sustainability that exceeds the temporal and calculative technocratic logics of hydraulic management, in which access is hierarchically organized to support export-oriented agricultural production and large-scale renewable energy development.

In the final section below, I contend with how this is carried out through what is known as *twizi,* a solidarity-based responsibility/mutual support among farmers that is not separate from relational care for land and water. Through *twizi*, restraint becomes a precondition for collective stewardship whereby it sustains social relations through which work is coordinated and survival is made possible beyond market and technopolitical GEG–sustainable development logics and ambitions.

Twizi: Collective stewardship and shared provisioning

Twizi is the Amazigh term for communal solidarity or mutual aid (Mimouni, 2003). *Twizi* is derived from the Berber root '*wiz*' or '*Iwaz*', meaning "to help". It has been adopted into Arabic as *twiza* and seen as an extension of Islamic teachings on the importance of collectivity and support for one another. According to Mostefa Mimouni (2003), twizi describes the "'voluntary work duty' that members of a community group take on to help one another, or on certain occasions – such as the harvest and picking olives [and] dates…". It is governed by a set of principles for organizing labour, in which tasks are defined and discussed (Mimouni, 2003). Lastly, it is important to note that *twizi* is rooted in relationality and reciprocity, or what Mimouni calls "a kind of reciprocal contract". Underlyingly, there is no exchange of money, nor is there any expectation of payback. This collective labour, grounded in the principles of solidarity and relationality, is an ethos of care in which tending the land and tending to others are inseparable acts.

Throughout my fieldwork, rural women enacted *twizi* in everyday farming practices. From washing clothing together to helping gather crops. This everyday form of cooperation is evident in Kalthoum from Tamegroute, who tells me she uses her husband's uncle's well and pays for the gas to run the motor. Once again, my mind turns to the scarcity and drought that plague the region and specifically the commune of Tamegroute. As I did with Aisha, I vocalize these thoughts and ask her if she has to pay him back for anything. Like Aisha, Kalthoum seems taken aback by my question and pointedly responds:

> "No, it's not paying back; it is cooperation with one another. We don't pay back; we help each other" (Interview, farmer, Tamegroute, May 25, 2023).

This ‘cooperation with one another’ or *twizi*, as Kalthoum notes, is without conditions and rooted in mutual support. What makes *twizi* an important aspect of the place-based practices that farmers engage in is that it is conducted amid dire ecological loss, especially for downstream communities. Though it remains a foundational aspect of their stewardship, the community's shared loss of ecology makes it difficult to practice. Na’imah from Amazraou, whose well no longer produces water, reflects on a time when *twizi* was widely practiced and when the well she and her husband had built was communally shared. I ask whether people used it for free or for a charge, and she replies:

> “For free, of course. As my father says: for the sake of *Allah*, we do it and for the mercy of our parents” (Interviewed on May 24, 2023, in Amazraou, Morocco).

In the same way that Na’imah’s parents taught her, from a young age through their practice and care of the *jnān*, to care for the land, to value the fruits it bears, and to recognize the living beings it sustains, they also taught her to care for and share her *baraka* with the community.

Amazraou, like Tamegroute, is an oasis commune ravaged by drought and where *twizi* is increasingly becoming difficult to practice. However, the women I interviewed describe how they keep the collective care ethos of *twizi* alive through an informal communal crop-and-well-sharing initiative. Like Aisha and Kalthoum, who describe the informal communal governance of well-sharing, Kawthar from Amazraou also relies on shared water to sustain what remains of her farming. After losing her palm trees and much of her subsistence crops, she now depends on her neighbour’s limited well water to grow alfalfa for the few animals she has left. She is sad to tell me that, now, because of the drought, neighbours can no longer help each other or share as they once did:

> “If we had extra produce or we grow something that they (the neighbours) didn’t, and vice versa, we can exchange or give each other, but now everyone is in a dire situation. Now people will come and ask, but you are in the same situation as them” (Interview, farmer, May 25, 2023).

Kawthar’s reflection shows how drought strains the material conditions that make *twizi* possible. While farmers continue to practice it to some extent, the practice has increasingly

declined as the water in the *suwaqi* (plural of *saqqiya*) and traditional wells has dried up. Thus, in the same ways the drought has eroded the land and the crops and the livelihoods that depend on them, it has also impacted the sustenance of *twizi* as a practice of collective stewardship. The inability to practice *twizi* and community care is not just a material loss but a loss of value for the farmers who see this practice as a principle of care rooted in love.

For instance, Fatima, the farmer from Tarmigt who is in her 60s, offers a different account. Tarmigt, an upstream community in proximity to the El Mansour Eddahbi Dam, has not experienced the same level of drought as oasis communities like Amazraou. When I ask whether she sells her crops, she tells me:

> "No, [it's used] only for household provisioning. I feed my animals, take it to my *dār* and I give it to others for the sake of *Allah*" (Interview, farmer, Tarmigt, May 18, 2023).

Later, when I ask her the question I save for last in all my interviews: How do you feel when you are on the land? She tells me:

> "We are happy. We are happy. I am happy when I see the end result of my labour. I am happy that I can provide for myself and give to others, too" (Interview, farmer, Tarmigt, May 18, 2023).

For Fatima, as for many, provisioning for the *dār*, caring for animals and sharing excess with neighbours and family are all sources of happiness. From that which she cares for, tends and which grows from her hands, she is able to provide for other living beings, bringing her much contentment and happiness. While it is becoming increasingly difficult, Fatima is still able to practice collective care by "giv[ing] to others" through farming, thanks to her proximity to the Dam. However, this ethos does not change its tone over time; it is grounded in the teachings of their ancestors, as evidenced by downstream communities, such as Zagora and Amazraou, which continue to share what they have despite worsening conditions of water scarcity brought on by both climate change and climate action in the name of sustainable development. It is in this ethos of care and love, as pillars of *amana,* and in the imperative to safeguard the *baraka* of *Allah* and share it with others, that these women allow us to see a different way of knowing and being.

Conclusion

As I make my way through the lush green barely visible pathways, leaping over *suwaqi,* and their makeshift but sturdy concrete tunnels that give passage to the water to travel through, and follow the sounds of women's voices and laughter, I finally reach my destination. It's a beautiful, crisp March morning, and I decide to sit on the greenery near the group of women gathering their morning crops and tending to the land, still wet with morning dew. I listen to the sound of birds excitedly chirping, harmoniously mixed with the women's animated conversations as I sit, soaking in the last of the dawn's cool breeze and watch the sun rise between the palm trees. I soon realize that, though they work in close proximity to one another, they each have their own small piece of land. After watching the sunrise, I approach Ruqaya and the little girl playing nearby as Ruqaya chops the alfalfa. After our initial greetings, I asked her if the little girl was her daughter. She laughs and says no, then points to a woman nearby and tells me it's her neighbour's daughter.

Later, as we approach the end of our interview, her friends and neighbours, including the girl's mother, come and sit around us, at times chiming in on our conversation. I ask Ruqaya how she feels being on the land, and she and the other women joke among each other loudly in Tashelhat, before she responds:

> "Peace, calm. Happiness, especially when there is an abundance of provisioning" (Interview, farmer, Amerzgane, March 13, 2023).

Ruqaya's description of the land as providing "peace", "calm" and "happiness" speaks to the wider ecosystem of life made possible when there is water and the land is nurtured enough to provide abundance. Her sense of calm is tied to the health of the land and to her ability to sustain subsistence farming practices. Looking around at the women talking and giggling nearby and the birds chirping in the distance as the warmth of the sun begins to fill the air, it's not difficult to see how the land provides these visceral responses.

This scene is one I experienced in the early days of my fieldwork in the southeastern Drâa region; however, it was not the last time I encountered a similar one. Rather, it became one that was re-enacted everywhere I went: women collectively washing clothing in the *suwaqi* in Borem, just outside of Midelt, huddled under the blazing heat in drought-ridden Aït Ben Yacoub, walking

together, carrying cartons of milk on their heads, wheat, alfalfa and barley on their backs. There was shared joy in being together, shared sadness over what has been lost and shared hope that *Allah*'s *baraka* will return.

Ruqaya, like Mina and Fatima, is part of a local women's farming collective called *Tatfi Nufus,* which translates from Tamazight as 'The Flavour of our Hands' (Tatfi Nufus, 2024), where their place-based knowledge and practices guide their work in ancient seed and grain preservation.[37] They use the teachings of their elders and ancestors to harvest local crops such as barley, wheat, millets and sorghum, to prepare foods, including *couscous* and *asida* (North African porridge) (Tatfi Nufus, 2024).

After I finish my interview with Ruqaya, I introduce myself to her friends, who gathered around us. One of those women is Asma, the 40-year-old founder of the initiative, mentioned in the conclusion of Chapter 3. Asma has no formal education beyond what she learned on the land. After we tour the collective's base, which is Asma's family home, shared with her father and aunts, I ask her, "What inspired the women here to take on this initiative?" She passionately declares:

> "Despite the hardships that these women face, from the drought and society, they want to find ways to improve their lives by and for themselves. The woman doesn't want to rely on a man only; she works alongside men" (Interview, farmer, Amerzgane, March 14, 2023).

Asma acknowledges women's gendered constraints and how these are intensified by drought and social expectations within their communities. Because women are structurally excluded from land, resources and decision-making, while also being 'left behind' to care for the *jnān* and the family, they often carry the greatest burden of climatic and social hardship. This is why Asma founded

[37] I want to acknowledge my late friend Jamie's work in making the *Tatfi Nufus* website with care, intention and love. I introduced Jamie to the work of the women's collective while she was embarking on her Fullbright research on ancient seed-saving initiatives in the Drâa-Tafilalet region in April of 2023. She connected and travelled with Asma to learn more about seed-saving practices in a region where imported and genetically modified non-native seeds are widely promoted by the state. As an act of reciprocity, Jamie kindly gifted them the website, which I had the honour of helping Jamie with the translations from English to Arabic. After Jamie's untimely passing, I have had the privilege of keeping the women's work visible and carry forwarding Jamie's dedication and passion to this work, including the maintenance of the website that Jamie co-created with them: https://www.tatfinufus.com.

Tatfi Nufus and why the women of Amerzgane have joined the collective to pave the way for collective stewardship and mutual cooperation. Asma tells me how their collective works together across the full cycle of provisioning:

> "All the women work together and help each other, from planting the seed to grinding the grains and making traditional Amazigh carpets together" (Interview, farmer, March 14, 2023).

The collective's practice of *twizi* is also evident in their care for animals: each woman is assigned a goat to tend, but the goats are collectively owned, and their use benefits the collective. Even decision-making is done collectively, Asma notes:

> "We have meetings, we collectively discuss and come to agreements" (Interview, farmer, March 14, 2023).

The decision-making structure Asma describes is grounded in the participation of all members of the collective, deliberation and shared responsibility. This governance practice around decision-making stands in contrast to the top-down technocratic decision-making practices that I have outlined throughout this dissertation, where agri-energy development decisions are often made through state agencies fulfilling large state-sanctioned strategies, regional institutions, tribal intermediaries, ESIAs and multilateral banks, and rarely with the participation of the women most affected by these decisions. Through *Tatfi Nufus*, women and their place-based knowledge practices are valued and given decision-making capacity.

This ethos, Asma shares, is what their elders and ancestors taught them and what they are preserving for future generations. On *Tatfi Nufus'* 'About Us' webpage, the collective's mission is articulated as: "Striving to pass on the knowledge of traditional food-making to our youth and strengthen the health of our communities."

When situated alongside the broader technocratic sustainability governance of Morocco's agri-energy nexus, these practices become especially significant. Women from *Tatfti Nufus,* as

well as those engaged in small-scale farming across the Drâa-Tafilalet region, continue to sustain place-based knowledge practices of seed preservation, collective labour, animal care and shared decision-making, demonstrating a situated understanding of sustainability as stewardship. However, these practices, grounded in continuity, are increasingly mediated by renewable energy infrastructure, dam-mediated water flows, agricultural modernization and recurring drought.

This chapter's interventions must be situated within the broader dissertation, which sought to delineate the normalization of socio-ecological loss as it moves across representation, administration, temporality and everyday life. Chapter 3 examined how *techno-political desert imaginaries* render desert landscapes available for large-scale renewable energy interventions. I extend Chapter 3's representational and discursive work on the (re)making of the desert as a singular site of extraction; Chapter 4 showed how this is materially organized through calculative loss. It traced how water, land, technology and agricultural recognition are selectively allocated through hydraulic governance and bureaucratic thresholds. Chapter 5 explores how the entangled co-production of calculative loss and the consequential ongoing and cumulative socio-ecological dispossession of small-scale farmers continues as new 'sustainable' agri-energy projects emerge. Through *temporal (sustainable) development amnesia*, the chapter elucidates how processes of dispossession, ecological degradation and policy breakdowns are rendered past, technical or already addressed. Finally, this chapter completes that arc by turning to the women who live amid and embody these cumulative conditions by elucidating how their place-based stewardship sustains other visions of sustainability.

It is important to note that place-based knowledge-practices are not intended to present utopian alternatives to extractive development. Moreover, they should not be read as forms of resistance articulated in the language of 'policy' or 'rights'. Instead, they show us endurance through the quotidian proximity to land and the ways in which care and shared labour are articulated against a backdrop of a capitalist-colonial system of continued erasure and dispossession.

These place-based practices do not resolve the contradictions of Morocco's agri-energy hydraulic governance, nor are they intended to. Moreover, they do not offer scalable 'solutions' to the calculative and temporal technocratic governance failures I have outlined throughout this project. Instead, these place-based life-worlds allow us to see how sustainability is not a calculative

process nor a future horizon to be reached through successive interventions, but a fragile, ongoing practice sustained through everyday relations with land, water and community.

The chapter thus closes with a question that extends beyond Morocco: what forms of political and environmental responsibility become possible when sustainability is approached not only as a technocratic project of renewal but also as a challenge to enduring governance logics and as a relational practice grounded in care, continuity and refusal?

Chapter 7: Conclusion

> "I always ask my parents: why did you choose farming? Why didn't you study? Why didn't you work in something else that would be better than farming?" (Interview, farmer, Tarmigt, May 18, 2023).

It's approximately 9:00 AM and Amira, the 21-year-old daughter of Fathia from Tarmigt, has already prepared breakfast for her parents and her two brothers, one 19 and the other 11 years old. She set down the breakfast tray and continues to air her frustrations to me about the subsistence farming her parents engage in as the rest of the family gathers and sits on the floor around a worn round wooden table:

> "There is no continuity with farming" (Interview, farmer, Tarmigt, May 18, 2023).

Asma later gives more nuance to what she means by this. Their reliance on the ever-increasing drought conditions is tied to the lack of government provisioning received by small scale farmers:

> "It is dependent on the weather and that is something you cannot control. And small farmers have no value because they receive no assistance. Unlike the large farmers. They have help and benefits from the government" (Interview, farmer, Tarmigt, May 18, 2023).

Her parents are small-scale farmers who have only ever known farming. Their parents had been farmers and her mother, Fathia, with the help of Amira, tends to the family's small plot of land while her husband works on the farmlands of big farmers to make ends meet. There is a small pause, and then Fathia's husband, a middle-aged man assertively shims in:

> "Farming is everything. Without farmin,g there is nothing" (Interview, farmer, Tarmigt, May 18, 2023).

Amira snickers sarcastically. I instinctively turn to her and say:

> "I came all the way from Canada to learn about the farming practices held here"

(Interview, farmer, Tarmigt, May 18, 2023).

Amira's dismissal of farming practices does not stem from mere young adult angst rooted in the barriers they have caused her family, particularly her as the only and eldest daughter. She was unable to pursue higher education because her family could not financially afford it (Interview, farmer, Tarmigt, May 18, 2023). Amira's gendered experience comes into perspective as I reflect on the conversation Fathia and I had earlier, during our early morning in the *jnān*. Fathia had proudly shared that her middle son, Amira's younger brother, is the first in the family to go to university and is studying agriculture.

Amira's father continues, now more expressive as he raises his hands, noticing his scaly, dry but strong hands that, like his wrinkled face, give away his years under the sun and in the *jnān*. Fathia nods along and the boys listen and watch their normally reserved father uncharacteristically express himself with assertive passion:

> "[Farming] is life and it is the beginning of humans. We didn't begin except with farming. I love farming. I am a farmer who loves farming. You rely on yourself. It is nice but you only get a bit from it and that's it. When there is water, I can work in it and there is no problem. I adore farming" (Interview, farmer, Tarmigt, May 18, 2023).

Small-scale farming, especially for women, is made increasingly difficult by lingering drought conditions and cumulative technocratic governance logics that have deemed their lands, water and livelihood loss justifiable and at times, necessary. For Asma, in the heat of her frustration, it is an occupational choice; for her parents, who do not use the language of choice to describe their farming practices, it is expressed through the language of responsibility and value. Fathia plainly states:

> "[Farming] is what gives us life and how we live" (Interview, farmer, Tarmigt, May 18, 2023).

Fathia and her husband's excerpts both express their appreciation for farming by tracing it to the beginning of mankind and its provisionary role in sustaining human life. For them, value lies not in monetary gains or material fruits of their labour, but in its taken-for-granted role in feeding and sustaining human life throughout time and space. His comment "you rely on yourself" is of

particular importance and speaks to one of the most glaring aspects of socio-ecological loss I have outlined throughout this dissertation – less self-reliance and more market dependency, whether in terms of work or produce. His account, therefore, points to the autonomous ways of living on and with the land that small-scale farmers are increasingly eroding. Fatiha's short statement beautifully captures how farming is seen as a lived practice, one that dictates how the farmers live through its seasonal provisioning, water allocation mechanisms and the overall needs of desert ecologies, and in this way, the desert survives, thrives, produces and sustains.

Later, as dinner simmers and it is time for the second visit to the *jnān*, Amira leads me downhill into what looks like a hidden garden. Tucked between rock hills and trees, the *jnānāt* of the Tarmigt community fold into one another, sustained by a single flowing *saqqiya*. She tells me I have come at the right time; the recent rains have brought the s*aqqiya* back to life as water dances through its mud path, racing to feed the thirsty soil. As she walks me through the gardens and introduces me to neighbours, who are croached or seated among the tall alfalfa, tending to the crops and speaking across the rows, I notice her energy shift and the frustration she voiced earlier soften.

Throughout the writing process of this project, I have been guided by the voices of small-scale farmers as they expressed an array of emotions, contradictions and reflections. Among them, Amira's has remained with me. As a young woman, she embodies the uncertain future of small-scale farming, marked by her resentment toward her parents' livelihood, her frustration with its constraints, lived most visibly gendered lines, her conflicted emotional attachment to the *jnān,* and her desire to leave behind the ways of living with and through the land. Her experience contrasts with many of the perspectives shared by middle-aged and elderly farmers.

This contrast should not be seen exclusively as a generational one, but as one that points to a deeper rupture that is becoming increasingly more pronounced with every 'new' technocratic sustainable development project rolled out to address a climate that is becoming increasingly hotter. While older farmers express farming and its connected place-based knowledge practices as a way of being rooted in continuity, dignity and relational life, Amira experiences it as limitation, abandonment and foreclosed possibilities. This tension centralizes how the ongoing conditions of socio-ecological loss, rearticulated and reproduced through technocratic solutions, are reshaping the very terms through which small-scale farmers' futures can be imagined, lived and sustained.

Chapter Synthesis of Analytical Frameworks

In this dissertation, I have argued that sustainability governance within Morocco's agri-energy nexus functions as a historically sedimented, technocratic mode of rule that normalizes socio-ecological loss in the pursuit of environmental mitigation and adaptation vis-à-vis renewable energy expansion and agricultural modernization. I challenge the core universalist and abstractive assumption that sustainability governance is a neutral mode of environmental management that seeks to address planetary degradation through development visions. I do so by taking seriously the emergence of sustainability governance as a site where scientific expertise, political authority and development futures are co-produced through climate finance, expert assessments, policy frameworks and infrastructural interventions. Through this lens, the project elucidates how particular understandings of nature and development are universalized, while specific trajectories of progress are made to appear natural and necessary.

Through the analytics of techno-political desert imaginaries, calculative loss and temporal (sustainable) development amnesia, this dissertation demonstrates how sustainability governance projects, by mobilizing the environment as a required site of intervention, justify the (re)organization of the social and political terms through which land, water and rural livelihoods become governable. In doing so, it shows how particular development futures are normalized and legitimized through technocratic expertise, financial logics and institutional authority, even as their costs are hierarchically distributed across gendered and rural populations.

At the same time, the dissertation demonstrates that these futures are neither totalizing nor uncontested. Women's place-based knowledge-practices articulate alternative understandings of sustainability that continue to persist within and alongside the very governance configurations that seek to marginalize them. Through place-based knowledge-practices grounded in *baraka*, *amana* and *twizi*, women small-scale farmers enact forms of care, responsibility and collective continuance that persist within and against the governance mechanisms that marginalize them, challenging the inevitability of technocratic sustainability governance and exposing its limits. These practices do not exist outside the histories, institutions and development projects examined throughout this dissertation. Rather, they emerge in tension with them, revealing other ways of valuing, inhabiting and sustaining ecological life.

Dissertation's Core Contributions

This project makes three core contributions. First, it provides a key intervention in debates on global environmental governance by reframing sustainability as a governance problem rather than a technical solution. It does so by presenting three interconnected analytical frameworks that demonstrate how loss is organized, normalized and made governable within sustainability transitions. Together, these interlinked analytics elucidate how socio-ecological loss is experienced by those in proximity to the material manifestations of the GEG-sustainable development's technopolitical desert imaginaries and how these technocratic governing logics are continually legitimized, normalized and reproduced. By tracing the normalization of cumulative and ongoing socio-ecological loss across Chapters 3–5, this dissertation shows how renewable energy transitions, hydraulic governance and agricultural restructuring intersect in the context of the climate crisis and increased water shortages as lived, uneven and gendered processes.

A second pertinent and connected contribution of the project is both empirical and epistemic. The dissertation takes seriously the relational and place-based knowledges of women small-scale farmers and their intimate connection to land, water and one another. Through the stories and reflections shared by women farmers, the dissertation draws out the tensions embedded in the technocratic governance of Morocco's rural environmental landscape, as well as shows how other forms of sustainability are practiced despite and in spite of ongoing and enduring socio-ecological loss.

The third contribution of this work is my methodological intervention, which utilizes a multi-scalar feminist and decolonial research design that integrates institutional interviews, ethnographic interviews with small-scale farmers, and discourse analysis into a single relational analysis. It treats oral histories, storytelling, poetic expression, and embodied knowledge-practices as sites of epistemic intervention, through which the limits of technocratic sustainability governance are made more prominent and other forms of sustainability stewardship can be understood.

Moreover, this methodological approach allowed me to conceptualize loss through my analytic frameworks (technopolitical desert imaginaries, calculative loss and temporal [sustainable] development amnesia), which emerged iteratively through sustained engagement

with patterns, contradictions and silences across interviews, fieldnotes, institutional documents and visual materials.

Broader Interventions/Scholarly Implications of Research

Scholarly Implications of Research

This dissertation makes two broader scholarly interventions. First, it rethinks how scale is approached in political science and, more specifically, in global (environmental) governance. Rather than treating the global, national and local as separate levels of analysis, the dissertation shows how sustainability governance is produced through their interconnection. In this way, the dissertation demonstrates the entanglements of global climate finance, state renewable energy ambitions, regional water bureaucracies and farmers' everyday practices, and how these sites are mutually constitutive parts of Morocco's agri-energy hydraulic nexus. This intervention is especially important because the dissertation does not assume that farmers' lived experiences stand outside or simply against the state, international institutions or development actors. Instead, as I demonstrate throughout the dissertation, this multi-scalar approach elucidates the tensions, contradictions, and stakes of sustainability governance as it moves across differential scales. In centring the voices of small-scale farmers, particularly women, makes visible how global and national sustainability imaginaries are lived in everyday relations with land, water and livelihoods through their place-based knowledge-practices.

Consequently, by thinking and writing differently about governance and the taken-for-granted hierarchies embedded within it, this dissertation challenges global environmental governance's preoccupation with international norm-making and institution-centred solutions that leave colonial-capitalist hierarchies intact. Rather, it contends that sustainability should be studied as a mode of technocratic governance through which responsibility, legitimacy and loss are organized. Consequently, this intervention urges GEG–sustainable development scholarship to take seriously place-based knowledges that are relational and embodied as pertinent forms of intervention.

Secondly, it contributes to feminist, postcolonial and decolonial scholarship by showing how environmental governance and infrastructures remain embedded in and imbricated with

global colonial structures of extraction and hierarchical provisions legitimized through expertise, regulatory frameworks and institutional funding documents. At the same time, the dissertation does not aim to pigeonhole the Drâa-Tafilalet as a mere site of intervention and extraction. Rather, through its grounded analysis of women farmers' lived and embodied relations to and collective care for human and more-than-human lifeforms, it approaches the region as a site of theory-building. From this standpoint, place-based knowledge-practices are localities from which we may generate critical insights into other ways of understanding and enacting sustainability/governance and ecological responsibility.

Policy Implications of Research

Towards a Historically Accountable Approach to Environmental Governance

To begin, I want to underscore that the following policy implications are contingent on a structural shift that seeks to move beyond description, rhetoric and tokenism of inclusivity and inclusion. This dissertation has critiqued the top-down technocratic practices through which environmental sustainability governance and the ways in which they constitute socio-ecological loss as manageable, deferrable and politically defensible. This critique recognizes, without totalizing, how technoscientific tools and policy assessment frameworks legitimize the respective roles of state agencies, financial institutions, corporations and regional bureaucracies in managing large-scale agri-energy hydraulic infrastructures, while overlooking the socio-ecological harms these infrastructures play a part in producing.

A historically accountable approach to environmental governance would therefore begin by rethinking accountability outside the linear timelines of project approval, mitigation and future technological corrections. Instead, it insists on accountability as an ongoing, community-led process rooted in repair, reciprocity and responsibility for the communities and the lands, waters and ecologies reorganized by technocratic 'sustainability' interventions.

Such a shift requires recognizing place-based knowledge-practices as legitimate forms of environmental governance, grounded in the situated knowledges of rural and Indigenous communities. From this starting point, technocratic assessments of renewable energy infrastructures, such as the NoorO and the Noor Midelt, must be assessed through the cumulative

socio-ecological losses they, and the agri-energy hydraulic infrastructures they are entangled with, are part of producing.

With that being said, the first policy implication this research advances is that renewable energy transitions must be evaluated beyond efficiency, scale, investment and future climate benefit. The policy success of projects such as the NoorO and the Noor Midelt cannot be measured solely by installed capacity, emissions reductions, technological innovation or their ability to attract multilateral financing and private investment. These metrics do not substantively adhere to the cumulative socio-ecological losses produced through the wider agri-energy hydraulic nexus in which these projects are embedded.

A more historically accountable approach would focus on assessing how renewable energy infrastructure interacts with dam-mediated water allocation, agricultural modernization strategies, land acquisition, groundwater depletion, and longer histories of technocratic capitalist governance.

In this vein, the second policy implication requires that we take the costs of the renewable energy transition seriously and consider how they are not always borne through direct displacement or formal land acquisition, especially for small-scale farmers and along gendered lines. Rather, there needs to be an acknowledgement of how they are tied to larger systems and longue-durées of gradual loss, lived through shrinking saqqiya flows, declining wells, reduced subsistence autonomy, increased market dependence, and exclusion from state support. In this way, policy frameworks must recognize the enmeshment of agri-energy hydraulic infrastructures and what that means for the enduring, indirect, and gendered forms of socio-ecological loss that unfold over time and beyond the official boundaries of project sites.

Notably, these considerations must place women's experiences and their layered exclusions at the centre of assessment designs. In other words, gendered evaluation cannot rely on women's formal visibility within existing institutions, because those institutions are often precisely where women are rendered invisible. Assessment frameworks must actively seek out women small-scale farmers, compensate them for their time, ensure confidentiality, and create spaces where they can speak without mediation by husbands, male relatives, tribal representatives, or state officials. It is only through a historically accountable approach, attentive to and guided by care and redress, that policy frameworks can begin to adequately address socio-ecological harms committed in the name of technocratic intervention.

Thirdly, a historically accountable environmental governance policy framework must centre the ecologies it seeks to change. In policy terms, and in line with water as the thread that weaves this dissertation together, water must be treated as a central stakeholder in environmental governance vis-à-vis large-scale agri-energy projects. Thus, water and community cannot be treated as secondary environmental variables managed through technical registers that depoliticize loss and maintain capital-colonial logics of rule. For example, integrated water-food-energy planning through the WEF nexus approach is a starting point for advancing equitable decision-making. The WEF approach recognizes farmers and community members as legitimate stakeholders and affirms their place-based knowledges and belief systems relating to water and land as equally legitimate forms of knowledge (Albrecht et al., 2018; Pardoe et al., 2017; Richelle et al., 2025).

Building on the theme of water, historically accountable water governance should also take seriously long-standing community-governed hydraulic systems, such as *khattara* and *saqqiya* systems, as infrastructures of collective community ecological care and innovative ancient multi-use and water-saving technologies (Remini et al., 2014, p. 260; Remini, 2023; Remini, 2024). These technologies have been governed by locally embedded laws and norms designed to protect, maintain and equitably distribute water resources.

Although colonial and developmental imaginaries often cast such systems as 'backward' and 'inefficient', they reflect precisely the kinds of place-based, relational and collectively governed approaches that challenge top-down technocratic (sustainability) rule. These longstanding technologies are increasingly being introduced as climate-responsive methods for cooling outdoor spaces without relying on energy-intensive systems (Chase-Lubitz, 2024). With that said, historically accountable environmental governance should strive to support a multitude of water management practices by protecting the remaining khattara and saqqiya systems.

Fourthly and connected to the aforementioned policy implications and interventions, is that environmental and social assessment (ESIA) frameworks must move beyond procedural compliance to become mechanisms of ongoing accountability that are co-created by the local knowledge holders, small-scale farmers and, in particular, the women who understand, tend to, and sustain the land and its continuance. In this sense, these frameworks should not be designed by external experts sent by global financial institutions and state agencies to reiterate and confirm what is already framed and decided upon, but should instead adhere to the needs of the community

and their visions of sustainability. As such, the universal standards of ESIA and other regulatory frameworks must be radically transformed into ESIAs that are community-led and centre the multitudes of ecologies, peoples, and their ways of understanding nature and envisioning sustainability accordingly. In addition to embedding intentional, community-led ESIA frameworks, participatory, rigorous monitoring and feedback loops anchored in the community are necessary to minimize harm and ensure the community's vision remains central to environmental mitigation and adaptation projects.

Limitations

This dissertation's multi-scalar approach, particularly its methodology, is robust and not intended to provide an all-inclusive, comprehensive institutional ethnography of actors involved in Morocco's agri-energy nexus. This, in turn, has resulted in unequal access to multilateral development banks, private-sector actors, state agencies and related adjacent documents. As such, the dissertation's strengths lie in its examination of governing logics, tensions, contradictions and, at times, silences, rather than in reconstructing layered internal decision-making across all actors in Morocco's agri-energy nexus.

The second limitation is the project's regional dimension, whereby the three primary fieldwork sites are by no means nationally exhaustive. While water scarcity is increasingly affecting farmers globally, my selection and particular focus on the Drâa-Tafilalet region stem from its pertinence as a site where renewable energy development, hydraulic governance, agricultural restructuring and intensifying water scarcity converge. As such, the regional focus is not meant to tell a comprehensive national story, but to offer a situated account of broader, interlinked processes through which socio-ecological loss is produced and lived by the human and more-than-human communities that call the region home.

The third limitation of this work concerns the range of stakeholders included in the dissertation. Although a broader analysis of civil society actors, NGOs, pastoralists and waged farm labourers would have further enriched the project, this dissertation necessarily narrows its focus to small-scale farmers, particularly women, and to the institutional actors, policy frameworks and project documents that govern Morocco's agri-energy hydraulic nexus. During fieldwork, I interviewed some of the aforementioned actors, as well as engineers from ONEE, MASEN, and

ACWA Power, but did not include them in the dissertation. The narrowing of actors occurred during the coding and organization process for my dissertation, when I realized that including more actors would muffle the voices and experiences of small-scale farmers, particularly women.

These limitations speak to the partiality of all research, but they also illustrate the commitments that have greatly influenced the formation of this dissertation. In pursuing this project, I did not seek to tell every story within Morocco's agri-energy nexus, nor to confine my analysis within the borders of institutional imaginaries of renewable energy transitions and environmental governance frameworks. Rather, I sought to extend the possibilities of what this research could make visible by remaining with those most often marginalized within these dynamics and by taking seriously the relations, contradictions, and ways of knowing, being and surviving that persist despite their exclusions and socio-ecological losses. It is perhaps fitting, then, to end not with the institutions that structure this nexus, but with the world that stayed with me most. A world that gives us a glimpse into the multitudes of sustainability governance beyond extraction and centred on relationality with one another and more-than-human beings.

Conclusion

The day after Jamie's untimely passing, in a blur of disbelief and grief so painful that numbness was all I could feel, the last thing I wanted to do was call Asma in Amerzgane and tell her that Jamie was gone. When I shared the news with Asma, we mourned together on the phone, recalling, crying and sitting in silent disbelief at the loss of someone who felt deeply, forged meaningful and intentional connections and lived the values she carried. Though it was difficult to pick up the phone and call Asma, it didn't take long for me to feel solace in sharing our grief with one another. After what felt like an hour on the phone, I knew it was getting late for Asma back in Amerzgane, so I let her go to rest, promising to check in the following day. Shortly after hanging up from Asma, I noticed a WhatsApp voicenote from Amira.

Like Asma and other women I met in the field, I had kept in touch with Amira, often communicating via voice notes and WhatsApp messages. I did not think Amira knew Jamie and was surprised to find that she had not only heard of Jamie's untimely passing but that she knew Asma, who had relayed the news to her. I was grateful to her for expressing her condolences, but also confused about how she knew Asma, since their communes were a 45-minute drive apart.

Months later, while checking in with one another, Amira told me that she had met Asma by chance on an NGO-funded trip that brought together farmers from different communities for a day away. She told me they had bonded over their connection to me and that Asma's energy, knowledge and her work with the women's cooperative had given her another perspective on farming. Amira's experience with farming was purely survival-based and predicated on gendered enclosures, government neglect and increased water scarcity, which, combined, have stifled provisioning for small-scale farming, particularly women.

In the summer of 2025, Amira messaged me to say that she was now married. She shared pictures of herself and her husband on their wedding day. Dressed in a green-and-gold traditional Moroccan kaftan and adorned with gold jewelry, she and her husband sat on a modest sofa draped in black cloth, she smiling shyly at the camera, and he bearing a toothy grin. After congratulating her and having been privy to her open resentment towards farming, I jokingly asked her whether her husband was also a farmer. Laughing, she tells me no, he is a teacher, but he owns a small *jnān* that has long been left unattended. She subsequently shared a photograph of the small *jnān,* confirming her earlier statement about the limited water access they had there. The *jnān* was marked by dried soil, shown through its light brown colour and sparse greenery. However, there was excitement when she spoke about what she hoped to grow on their small plot, a stark contrast to her tone when I first met her.

Now, outside the immediate demands of farming for survival and the technopolitical currents of statecraft, global capital and linear expert imaginaries of sustainability, Amira seemed less resistant to the small-scale farming practices her parents cherish and value. She appeared more willing to embrace the knowledge-practices she had not long before deemed inefficient, ready to carry them into this new life. Ending with my longitudinal exchange with Amira is not to show a definitive, romanticized trajectory of a happily-ever-after return to the land. Rather, through her and the stories I saw and heard from women across my field sites, I have come to understand that what is at stake is not only whether farming can continue as a livelihood, but whether the relations that make life with land possible can still be felt, remembered and sustained. This newfound excitement in the *jnān* does not undo the conditions of loss and their entanglements with gender that I have traced throughout this dissertation. But it does remind us that even amid cumulative loss and temporal enclosures, other ways of living, knowing and belonging continue.

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