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A SERIES ADDRESSING DESERTIFICATION

01 Volume One

Project Brief
August 9th 2020

02 Volume Two

Design Proposition
September 6th 2020

03 Volume Three

Final Project
November 1st 2020

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Architect



BRIEF

LOGIC

Introduction of the project issue, understanding the project brief and the background behind the project.

GOAL

Determine the project issue, parameters, its significance and support structures.

BACKGROUND

Desertification is an issue that does not just affect the environment, but humanity, biodiversity and climate change all around the world. The impacts of desertification are associated with issues that contribute to climate change (Adeel; et al., 2005; Minchin, 2019; Pickup, 1998).

According to the United Nations Convention to Combat Desertification (UNCCD), desertification means “Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities” (United Nations Convention to Combat Desertification, 2017).

The cause of Desertification is a topic of contention, as Geoff Pickup suggests in his article “*Desertification and climate change - The Australian perspective*”, there are two perspectives; The first is that desertification is caused by natural fluctuations in climate patterns. The second perspective is viewed from the effect of human induced activity, and humanitarian factors such as population growth and poor land use management increase the pressures on the land resources (Pickup, 1998). Both perspectives hold a level of validity, however neither answer all the questions. It is in response to this that both should be looked at in conjunction and with a level of consideration to effectively address the issue that is desertification. On a humanitarian level, outdated land management practices combined with pressures from our changing climate are amplifying the effects of desertification, effecting even the most fragile of communities and accelerating land degradation and climatic change.



IMAGE 1- (Panoramas, 2014)

On a localised level, disadvantaged areas such as those in the African Sahel are at a downfall when it comes to addressing the issue. Unlike communities throughout the African Sahel, developed countries such as Australia have high socio-economic stability, and therefore a stronger resilience to the effects of desertification. It is low socio-economic stability that is the major issue facing these fragile communities. However, they are also face with associated issues such as;

- Food in-stability
- Low socio-economics and poverty
- Drought
- Land degradation
- Bio-diversity and
- Soil infertility (resulting in a decrease of palatable trees and shrubs)

Colonisation of western countries such as Africa introduced what was impulsive behavior by the European settlers. With the settlement, western culture, came ill-informed land management practice and cultivation methods that have since drastically degraded landscapes and ecosystems. By using a bipartisan approach and help from stakeholders, this project will provide a framework to be built upon by Landscape Architects as part of the design team to strategically develop a landscape framework that addresses desertification and its associated issues.

Stakeholders include but are not limited to;

- International Federation of Landscape Architects
- United Nations
- United Nations Convention to Combat Desertification
- Local Agricultural Profifers
- Local communities

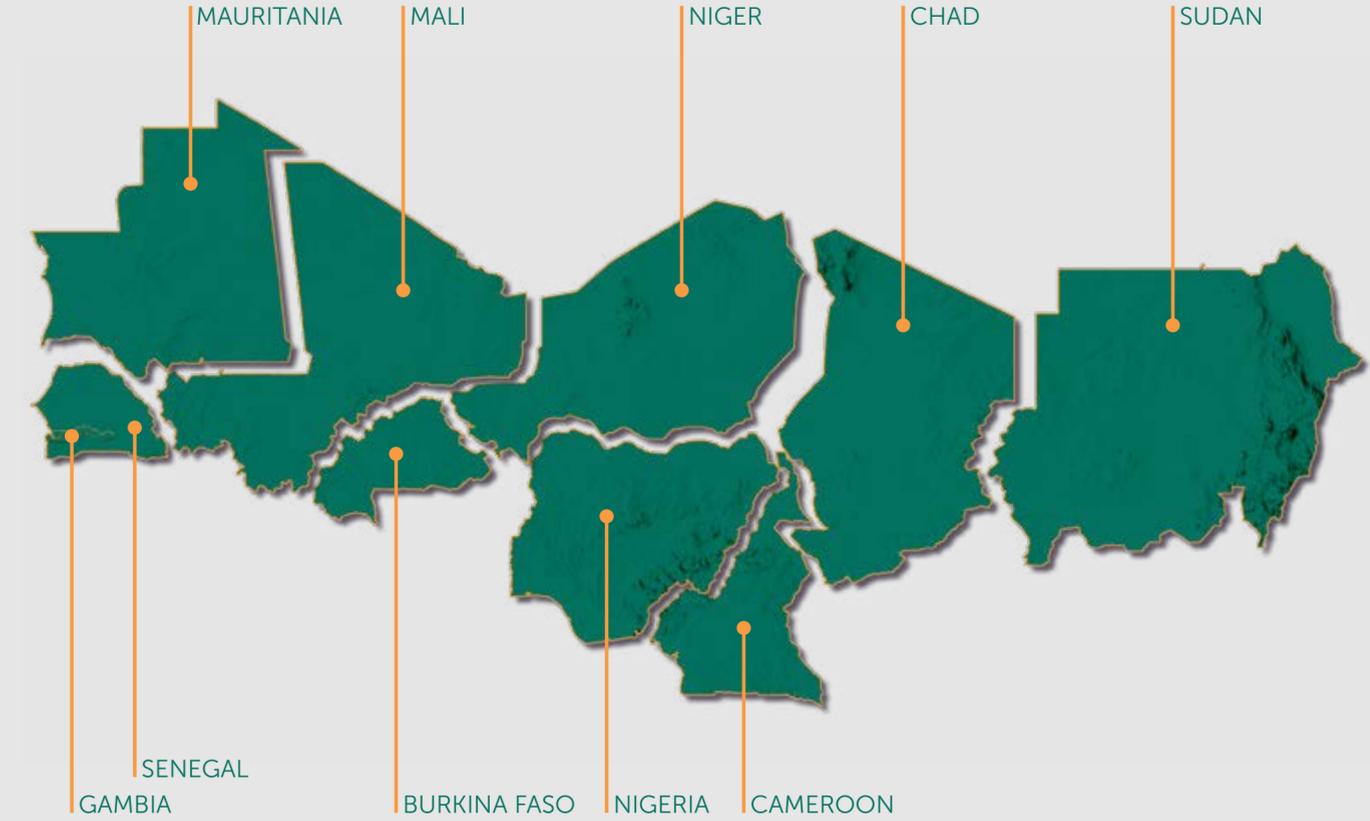
PROJECT LOCATION

This project is focused throughout the Sahel region of Africa, this site analysis breaks down the region using an Integrated Contextual Analysis approach to effectively choose ideal "sites" for this project to operate at.



All data was sourced from Amerigoess under the United Nations Humanitarian data and collated using ArcGis Pro 2020

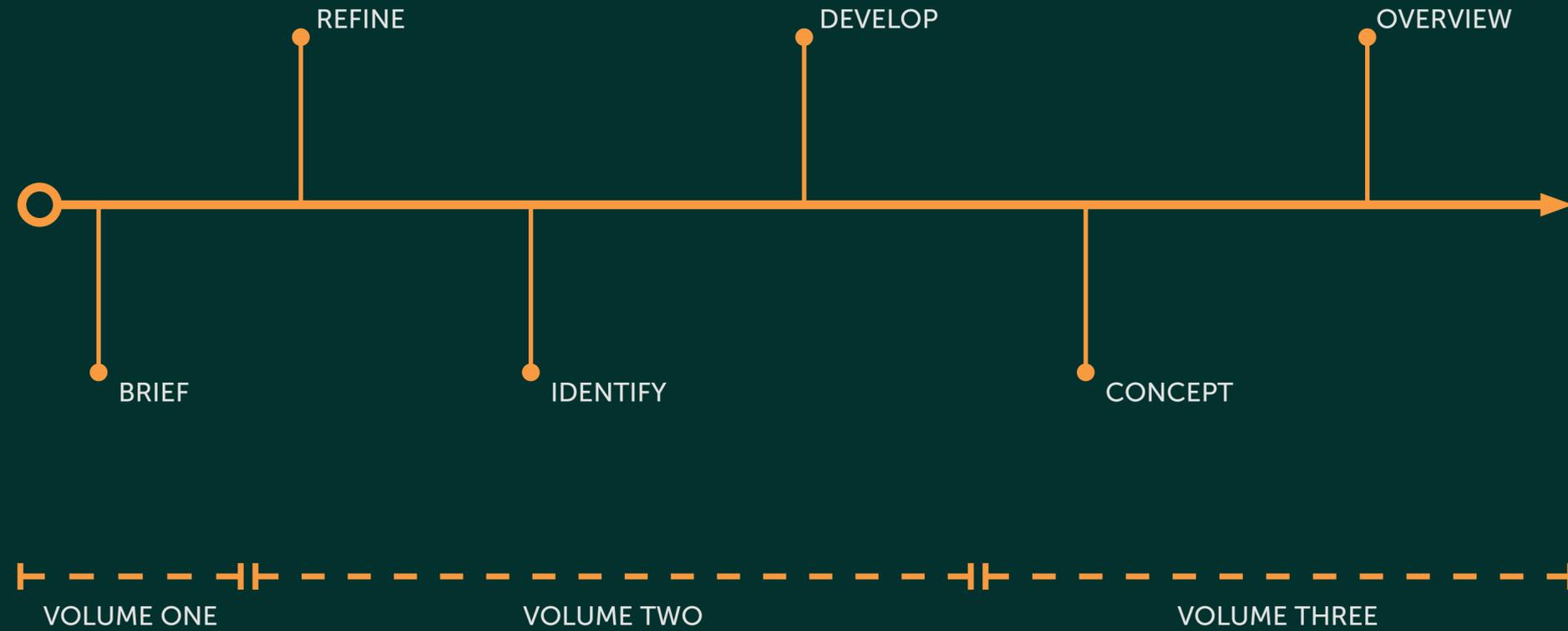
SAHEL REGION



All data was sourced from Amerigoess under the United Nations Humanitarian data and collated using ArcGis Pro 2020

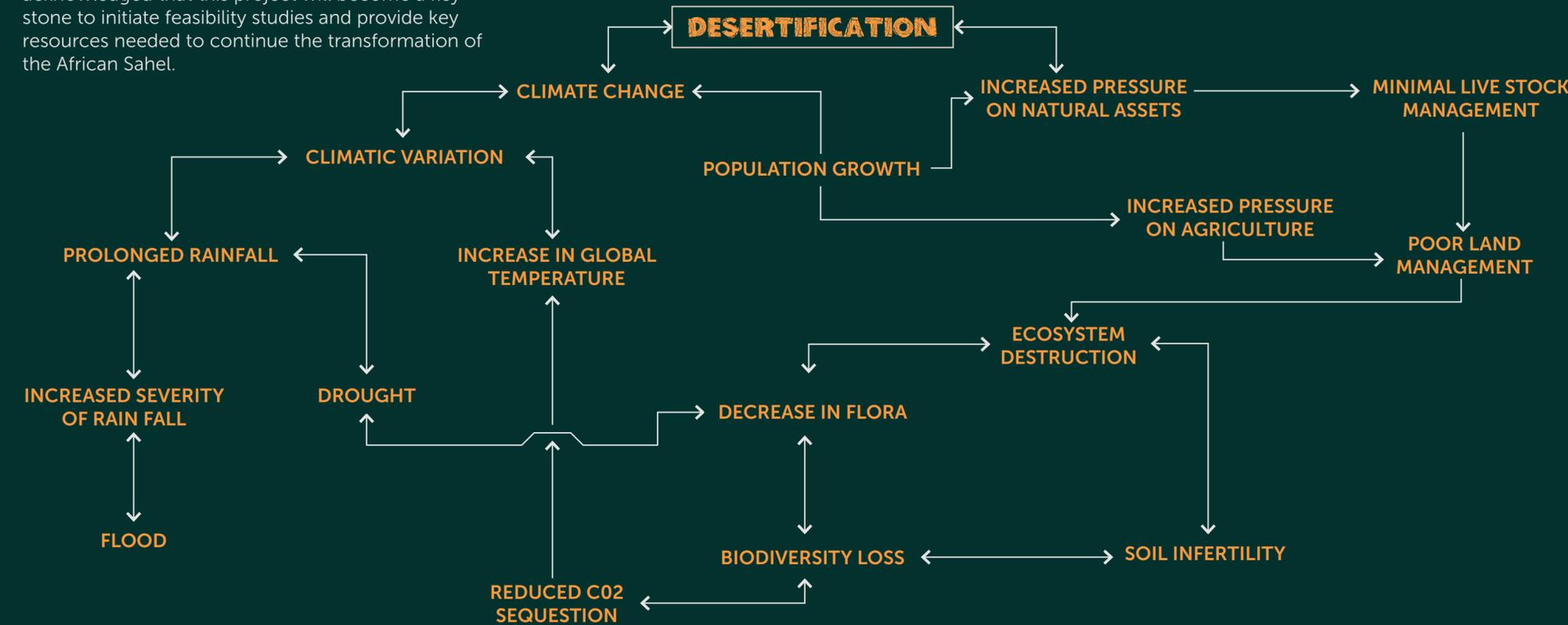
PROJECT FRAMEWORK

The methodology framework sets the narrative for the project and ensures that the information being presented maintains a logical flow for you (the reader) of this report.



IMPACT

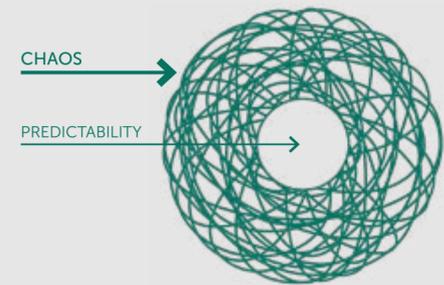
Climate change stems from a variety of underlying global issues many of which are associated with desertification. The research of this project will inform the design outcome that will effectively address the issue of desertification and the many systemic issues that derive from it. While the significance of the work being produce holds high value to increasing the quality of life for the many fragile communities within the African Sahel, it is acknowledged that this project will become a key stone to initiate feasibility studies and provide key resources needed to continue the transformation of the African Sahel.



THEORETICAL FRAMEWORK

The design outcome of this project will be informed by the synthesis of the following theories and ideologies. The works of Ron & David Poet, Brian Walker et al and Kristina Hill will be used to develop a strategy that will help in building a resilient system within the Sahel region.

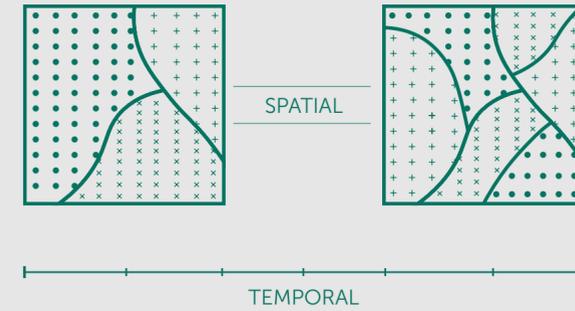
UNDERSTANDING



CHAOS THEORY

Chaos Theory is the predictability within the unpredictable. It explores the notion that unpredictable systems are two sided. One side is the unordered chaos and unpredictable. The second is the ordered and predictable. (Borwein & Rose, 2012). For example, cyclones are the front page of chaos, however we can predict their progression, movement and most importantly despite its chaos we can predict the impact it will have on a system.

APPLICATION

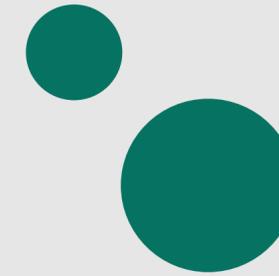


SHIFTING MOSAIC

Kristina Hill, 2005

The dynamic mosaic or shifting mosaic is the landscape ecology metaphor that represents the creation of ecosystem types through dynamic change within a landscape based on spatial and temporal patterns. Ecological theorist use this concept to consider the non-equilibrium notion of dynamic scale, in the way that while small scale change is happening, it simultaneously influences change to the large scale functions, a core concept for developing a resilient system.

APPLICATION



CONTEMPORARY ECOLOGICAL THEORY

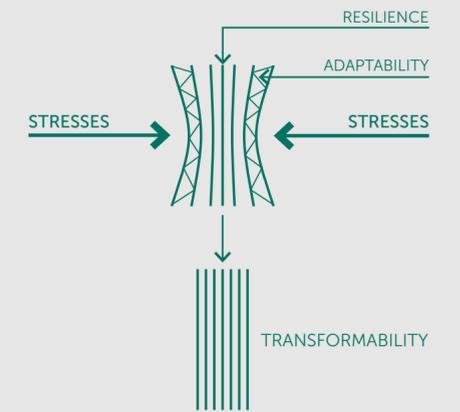
Kristina Hill, 2005

Ecologists and theorists used fundamental units of nature to predict the "nature of nature". However, it should be seen at a scaled approach, looking from the bottom up rather than the top down. So, if systems exist within systems all of which are at diverse scales, the source of influence for the larger scale systems, stems from the local systems, the local level is then a source for future influence.

SUMMARY

Using a combination of dynamic mosaic and contemporary ecological theory, we can develop a new model for influencing larger systems from a finer detail level. Harnessing the sites spatial and temporal patterns to generate a model based of the idea of a non-equilibrium system, in doing so we can mitigate the impact of desertification and issues associated with the topic. Each one the four theories each contribute to a role within the new framework developed in this project. Chaos theory is used as a metaphor for understanding the flux that the system undergoes annually. Both Shifting Mosaic and Contemporary ecological theory are the core drivers behind the framework in which will inform the fourth theory which is the outcome. Resilience, adaptability and transformability theory are the core end drivers that the new theoretical model will achieve.

OUTCOME



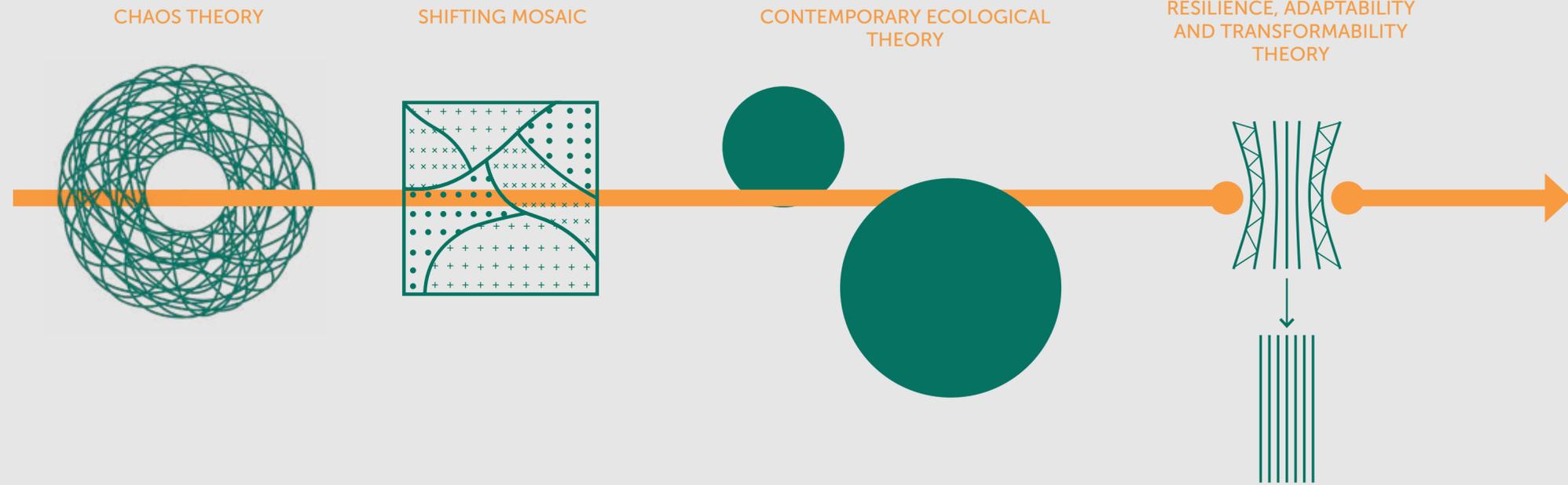
RESILIENCE, ADAPTABILITY AND TRANSFORMABILITY THEORY

BRIAN WALKER et al, 2004

Resilience: "The capacity of a system to absorb disturbance and re-organise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks".

Adaptability: "The capacity of actors in a system to influence resilience".

Transformability: "The capacity to create a fundamentally new system when ecological, economical or social conditions make the existing system untenable"



TERRA
 "Refers to the land or earth"
 Collins Dictionary. 2020.

FRACTION
 "The small part of something or a small amount"
 Cambridge Dictionary, 2020.

TRANSFORMABILITY
 "The capacity to create a fundamentally new system when ecological, economical or social conditions make the existing system untenable"
 BRIAN WALKER et al, 2004

TerraFracMa (Terra-Frac-Ma)
 (noun)
 Transformation of a land or system, initiated from the micro-systems within itself.

T
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 FRAC
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 MA

METHODOLOGY

With the immediate threat not just in developing countries, but in your our very own 'backyard', it is clear that we need to start investigating how we can mitigate the effects of desertification and work towards future proof solutions that are adaptive and resilient. This section of the report initiates this investigation by collating various approaches to projects that are direct & indirectly related to desertification. It starts to focus further research and prompt brief design discussions.

MALIN FALKENMARK- Researcher in Water Resilience

Methods:

Falkenmark suggests that the key to building resilience in fragile societies is actually within the agricultural practice. Current efforts against water scares areas are reactive, resulting in poor agriculture methods. The current approach towards farming in the Sahel region is to produce few higher yielding crops resulting in more sensitive crops. Resulting in smaller scale eco and agricultural systems. He suggests that resilient agricultural systems is within intensified crop, soil and water management, furthermore he also suggests that the achieve best management practice, ecosystem and agricultural landscapes should be embedded within each other, creating a continuous positive feedback loop.

Approach:

- Maximise the base flow of water, while minimising the effects of water erosion (through vegetation cover and maximised landscape that promotes infiltration).
- Creating a water management strategy that focuses of avoiding up stream consumption.
- Promoting agricultural growth in the tropical savanna, however, that may not be possible for the arid regions, the secondary method would be to maximise surface water runoff capture and green water regime.
- Where agriculture resilience is prone to failure, social resilience should take its place. Management strategies come down to water management strategies at an individual level to help prolong total water loss. For farm dependent communities, Falkenmark suggests seeking alternative strategies such as relocation.

WAIYEE CHOU - Graduate Landscape Architect

Methods:

Waiyee Chou's student project is focused on sustaining the heritage of agrosystems within the Turpan, China region, particularly the methods of the Karez. Chou uses an ecological and agricultural lens to assist in realigning the ideologies of cultural heritage and heritage management processes. She uses not only written media but also displays a series of diagrams that assist in developing and displaying the implied methods within each of the agriculture and cultural systems. The aesthetics with a combination of isometric and sectional diagrams, effectively communicates the intentions of the research and the outcome, while applying a James Corner Layering approach within her visuals.

Approach:

- The background of her project outlines three key methods that she used to establish a resolution.
1. Underpins the core value of the project (Heritage) and the ideologies associated with interpreting to the value.
 2. Stage 2 involved a rigorous investigation into the system that would be the key stone heritage system of the project.
 3. The final process combines the application of research and GIS to develop an analysis of the underpinning systems, to which is used to inform the design outcome.

ALLAN SAVORY - Grassland Ecosystem Pioneer

Allan Savory is a leading researcher in addressing desertification, his childhood in African is what inspired him to study biology and ecology, which he later used in his life's mission to mitigate the effects of desertification. Savory's solution to desertification is unique to that suggested by other researchers. His proven solution to desertification is to use livestock and stricter management processes in a bio-mimacry approach. His research found that the dampening of the expired crops by herds of animals was in fact the key to maintaining successful regrowth and soil structure, his solution mimics this 'natural' process by managing mass livestock to dampen harvested crops in the dry season.



IMAGE 3- (Savory, 2013)

MENTOR

Using a combination of dynamic mosaic and contemporary ecological theory, we can develop a new model for influencing larger systems from a finer detail level. Harnessing the sites spatial and temporal patterns to generate a model based of the ideal of a non-equilibrium system, in doing so we can mitigate the impact of desertification and issues associated with the topic.

OWEN CAFE - Graduate Landscape Architect

In his project Systemic Resonance, Owen addresses climate resilience in Developing Nations, his approach to the issue deconstructs current attempts at responding to changing climatic conditions. 'Systemic Resonance' investigates the ideologies behind building climatic resilience using Mozambique as a keystone. Owen's has demonstrated extensive research in climate resilience and has a background in photography. Both aspects will be useful in the application to my project. His brief experience in the academic field of Landscape Architecture challenges my research and influences my critical thinking.



IMAGE 2- (Cafe, 2019)

PARTNERSHIPS

To assist with providing directive, this project is looking at partnering with Land 8 Landscape Architects Network and an African based agriculture and sustainability organisation called Farm Africa. These two partners have been suggested because they both address diverse audience members.

LAND 8 Landscape Architects Network

Who they are

Land 8 is an online social and business network for Landscape Architects and associated disciplines, such as environmental science. The online website provides the opportunity to promote jobs, products, projects and advocate for issues such as climate change, biodiversity loss and many more. I will be pushing this project to a point in which it can be put forward to the network to initiate awareness and advocate for the importance of building resilience against desertification.

Land 8 and desertification

When searching words such as desertification into the land 8 search bar, you will get three results. Compared to the 200+ results for topics such as climate change or the 100+ for biodiversity. This small exercise demonstrates the importance of advocating for this complex problem which is desertification.



What Landscape Architects Need to Know About Water Shortages

LAN | April 25, 2012 | No Comments | 1102 views

Water shortages are becoming more and more an ever evident occurrence in our daily lives in the western world. While underdeveloped countries have dealt with the extreme effects of droughts for decades, the Western world has escaped much of the hardship through quick fix solutions. These include damming rivers, piping water halfway across the landscape and installing more and more irrigation. Something's gotta give, sooner or later. The current problem in many cities and countries worldwide is declining precipitation rates, a problem that is exacerbated by aging infrastructure. This is most evident in London, where a hose pipe ban is currently in place. The situation is so dire at the moment that the ban is being touted to be in place from now until early 2013. Other problems caused by a combination of intensive agricultural practices and climate change include soil desalinization and desertification. But worryingly, 40% of the world's population currently faces water shortages, with water supply expected to drop by 30% per person by 2030.



Arid land may become a common sight, credit: Tanawat Porthour / shutterstock.com

2012 article by Joe Clancy on the topic of drought and the importance for Landscape Architects to address like minded issues.

Farm Africa

Who they are

Farm Africa are an organisation that work within the South-East region of Africa, they work within this region to help farmers and locals build resilient agriculture and work to increase food security. Although their main focus is on agriculture, resilience within the agricultural system is the core foundation to building resilience to desertification. Agriculture improves soil quality leading to improvements to ecosystems and biodiversity which results in reduced effects of climatic variation (increased rainfall, reduced risk of erosion, reduced temperatures ect). Although the organisation currently only works within the South- East region of Africa, this project will focus on pushing for work external to their current region of work.



MISSION

Drive agricultural and environmental change to improve lives through

AGRICULTURAL EXPERTISE

MANAGEMENT + PRESERVATION OF ECOSYSTEMS

THE POWER OF BUSINESS TO DRIVE PROSPERITY

VALUES

EXPERT

Deep expertise and insightful evidence-based solutions are at the heart of everything Farm Africa does.

GROUNDLED

Positive change starts with Africa's people, so our experts work closely with local communities, engaging them in every level of decision-making.

IMPACTFUL

We take a long-term view so we can deliver lasting changes for farmers and their families.

BOLD

We model innovative new approaches and are not afraid to challenge strategies that are failing.

PURPOSE

Everything we do as landscape architects and professionals should be done with intention and purpose. Whether its for the client or for a particular outcome, there should always be a driver for our research and design.

So who is this project for?

This project was initiated by myself because of a discussion based on potential topics for this unit. The discussions had lead to the talking point of adapting our coastlines against climate change. This then lead to the topic of the recent bushfires sweeping the eastern coastline of Australian and how this was linked to Desertification.

This is where my story begins, in the 4 years of my study as a Landscape Architect, never had I heard or knew what desertification was, let alone the extend of its impacts. Therefore I dedicated this semester to learning and understanding the issue. In short this project is for me, but in particular, it is a journey focused on education for myself and its extended audience.

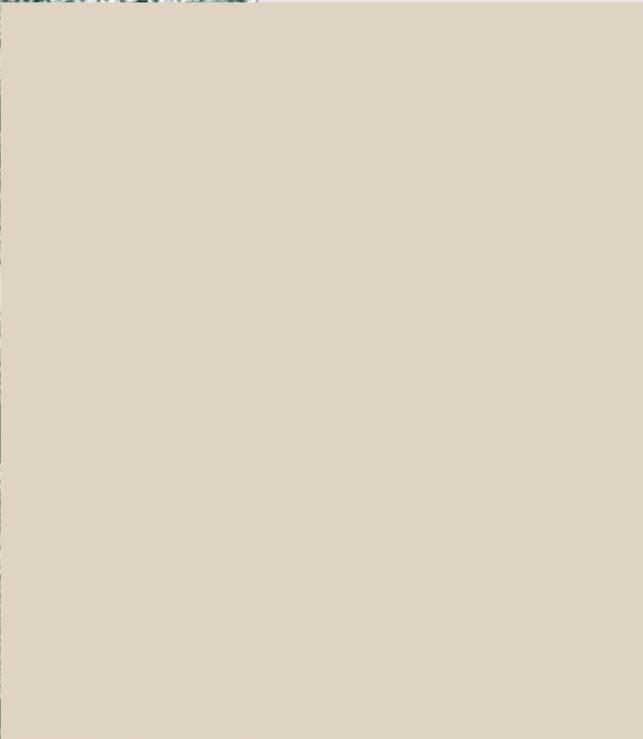
What is the purpose of the project?

This project is as personal journey to understand what desertification is, the systemic issues it causes and investigate how we can build resilience against it. Because of the nature of the project and its relation to a CRA, I wanted to ensure that I would learn new skills, to do this, I chose to look at Desertification in fragile communities and low socio-economical areas. This poses challenges in itself, with lack of information, data & resources, therefore setting the perfect challenge for this project.

INFLUENCE

Besides my passion for Landscape Architecture , I also find enjoyment in landscape photography. This is a passion that has provided a number of opportunities to integrate my two passions into a singular format. Photography for me, particularly landscape photography isn't just about pointing and shooting. A photograph should be cherished, it is true what they say "a picture tells 1000 words", but more importantly it captures a single fragment of time. For a landscape every photo you take will be unique, something will have changed, it may be as small as a cloud moving or if we are looking at photos that are years apart there will be a lot of change. This ideology as a photographer will be Using this lens as a landscape architect, we can demonstrate how the existing system will transition within time.





REFINE

LOGIC

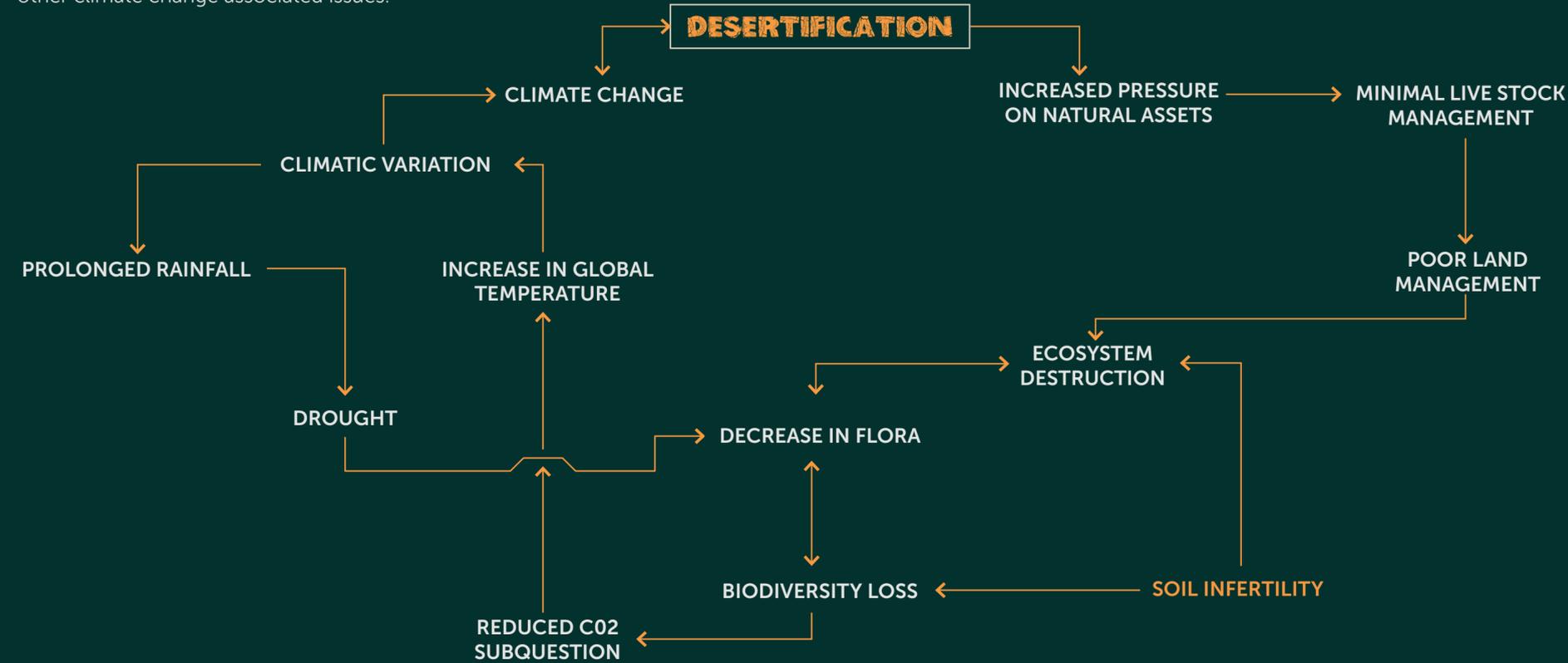
Determine the adverse effect of desertification with the largest influence throughout the issue scale and refining the projects limits by selecting an area of control.

GOAL

Refine the project to achievable parameters for the set time-frame by selecting a catalyst site and desertification issue.

ISSUE

Alternative to the previously describe diagram on page 11. This diagram demonstrates the flow of positive change or (positive systemic change) in soil infertility, and demonstrates that just by focusing on this small issue, we can create a systemic changing cycle like the ripple effect and help to build resilience against desertification and contribute to other climate change associated issues.

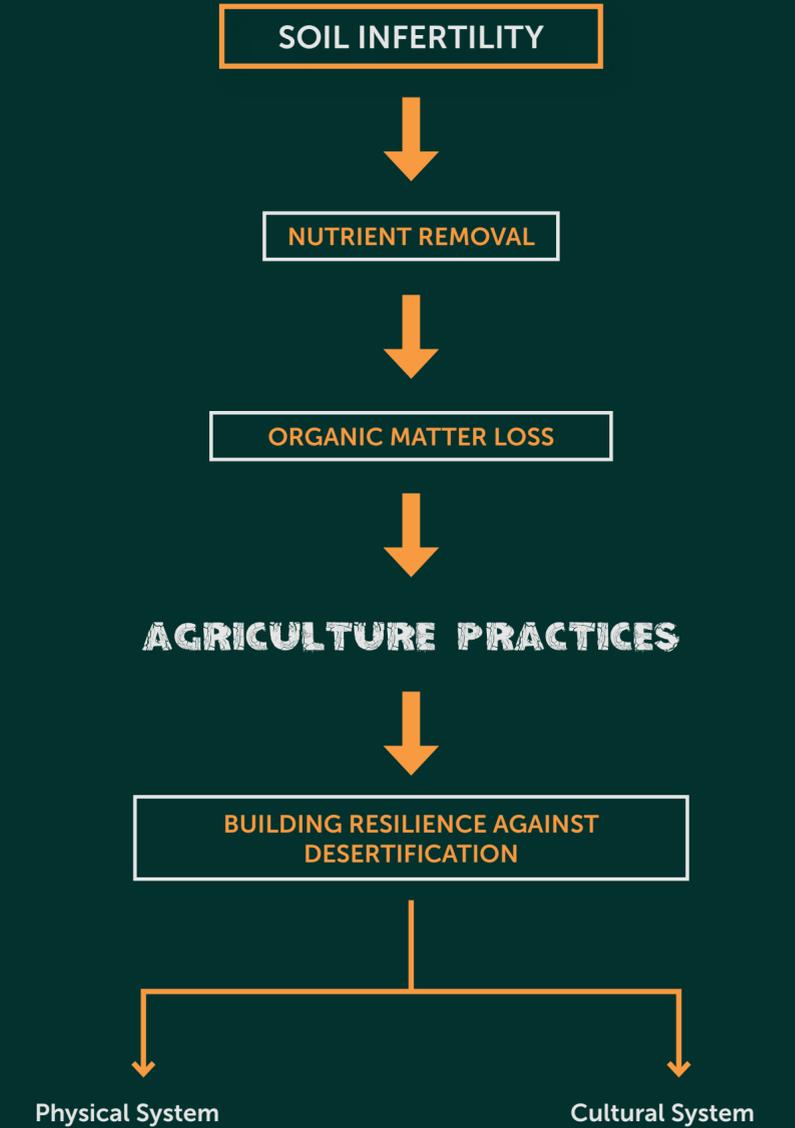


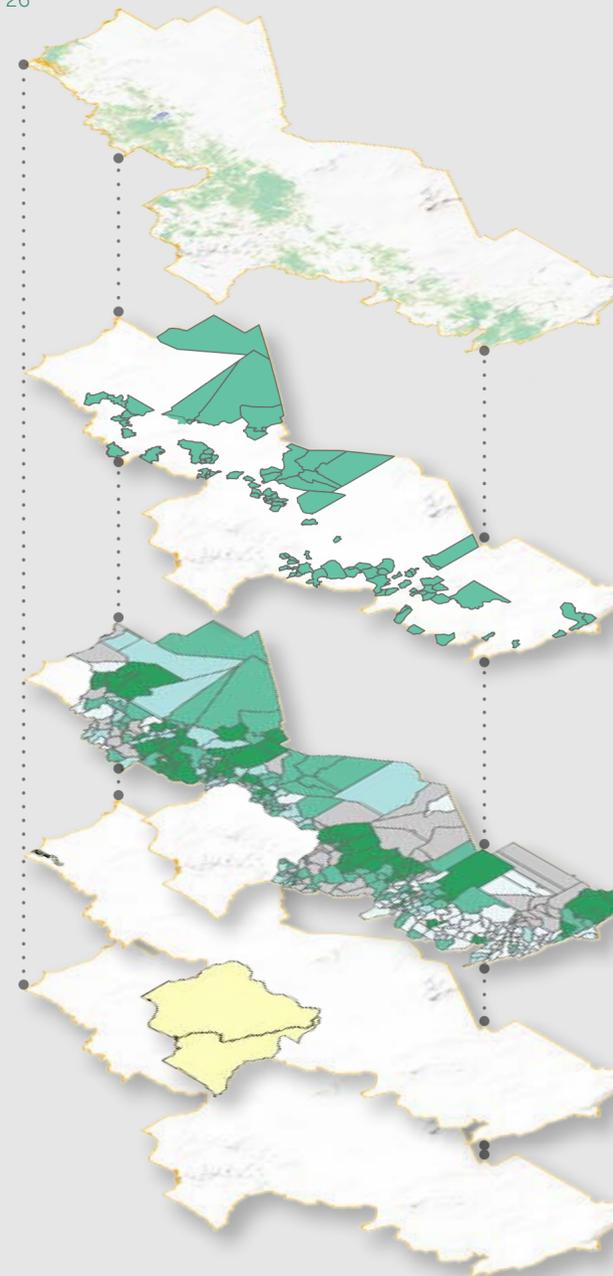
PROJECT FOCUS

The project focus provides an additional layer of strategic direction for this project, it acknowledges the scale and complexity of desertification and is therefore determined that a project focus will inform the narrative of resilience against desertification within this fragile system.

The flow diagram represents the breakdown of soil infertility and its link to agricultural practices. Soil infertility occurs es when the nutrients within the soil are removed. Soil nutrients are provided from organic matter, current agriculture practice such as harvesting and post crop management such as burning or removal of crop stalks removes the nutrients stored in the remainder of the crops.

It is therefore indicated that by focusing on agricultural practices we can build resilience to desertification within the physical and cultural system. Only through a holistic and systemic approach can we achieve this, the focus on agriculture addresses the issue of soil infertility resulting in increasing the strength of the ecosystem, and progressing to reducing the impacts of desertification.





AGRICULTURE

These areas are indicative agricultural areas composed of general agriculture (cultivated crop lands) and paddy agriculture (crop lands characterized by inundation for a substantial portion of the growing season).

ICA CATEGORY 2

This layer includes only those areas within category two of the 'criteria', indicating the runners up to worst areas

INTEGRATED CONTEXTUAL ANALYSIS

The ICA includes data for; Flood, Drought, Land degradation, food Insecurity risk and natural sensitivity.

FEASIBILITY STUDY AREAS

Areas that do not have ICA data available, and will be included in later feasibility

SAHEL REGION

Combined area of all countries included in the Sahel Regional Area.

INTEGRATED CONTEXTUAL ANALYSIS- AREAS

An ICA or Integrated Contextual Analysis compiles a wide spread of data based on conditions of particular areas. The objective for an ICA is to integrate different data sets into single data package, that is then broken down into areas and categories based on the level of severity of each condition within the dataset.



VULNERABILITY TO FOOD INSECURITY

NATURAL HAZARDS	L/L	M/L	H/L
	L/M	M/M	H/M
	L/H	M/H	H/H

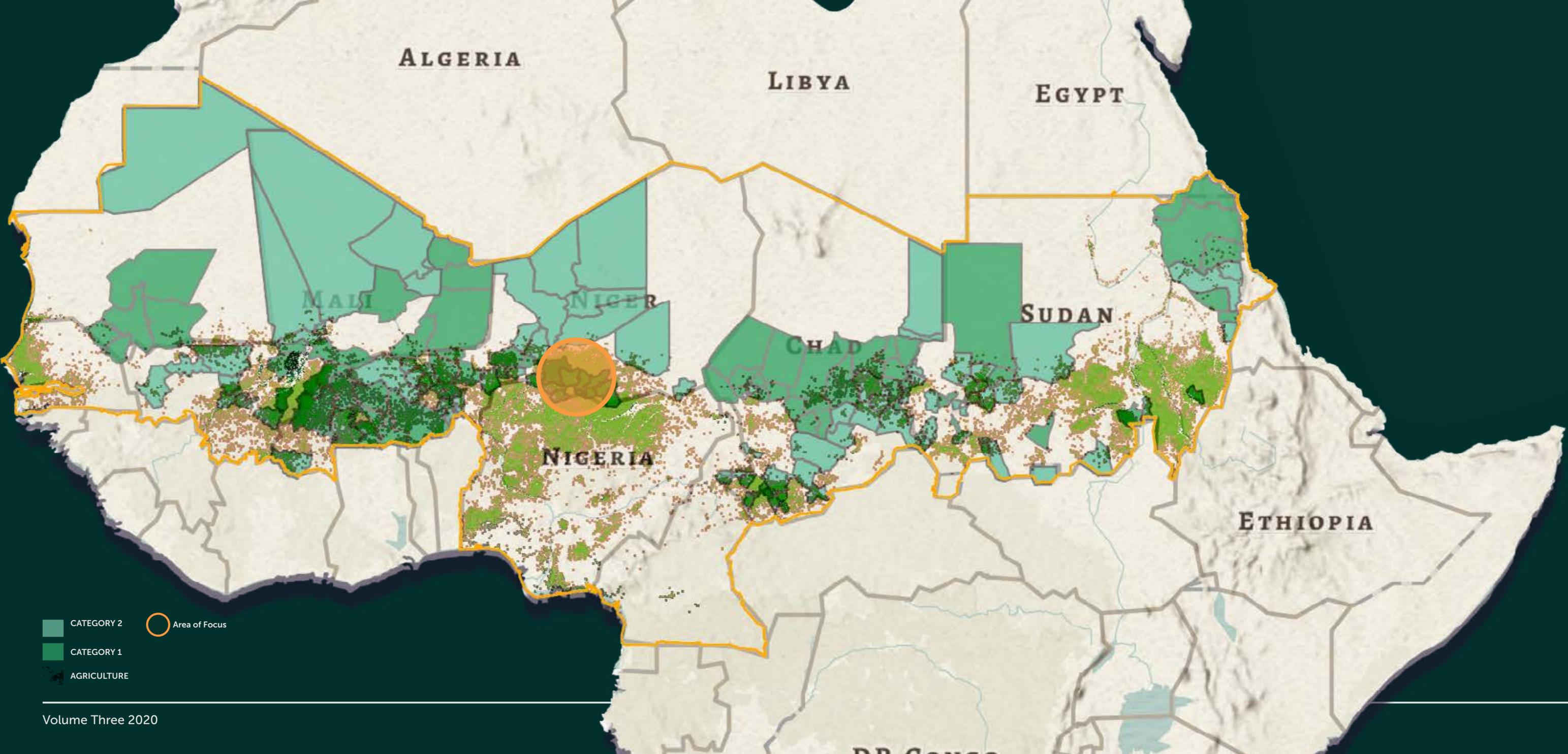
INTEGRATED CONTEXTUAL ANALYSIS- CATEGORIES

The ICA areas as discussed above are then categorised into five different levels of severity with category one being the most at risk and five being the least.



- CATEGORY ONE
- CATEGORY TWO
- CATEGORY THREE
- CATEGORY FOUR
- CATEGORY FIVE
- UN-CATEGORISED

All data was sourced from Amerigoess under the United Nations Humanitarian data and collated using ArcGis Pro 2020



PROJECT AREA REFINEMENT

The following assessments were overlaid to produce the site selection.

- Integrated Context Analysis for drought, food insecurity, flood and natural sensitivity.
- Integrated Context Analysis of Land Degradation
- Land Cover - Agriculture

From the mapping overlay, a site area was selected. This selection focused on the ICA category 2 areas and was then overlaid with the agricultural areas. The reasoning behind this method involved rethinking the approach. Rather than looking at the worst areas (Category one areas) like the exercise in volume one, this approach looks at category 2 areas because they;

1. are at risk of becoming category one areas
2. are not yet at the highest risk, they still contain support structures (such as vegetation, agriculture ect) within them and pose the ideal areas for building resilient agencies.



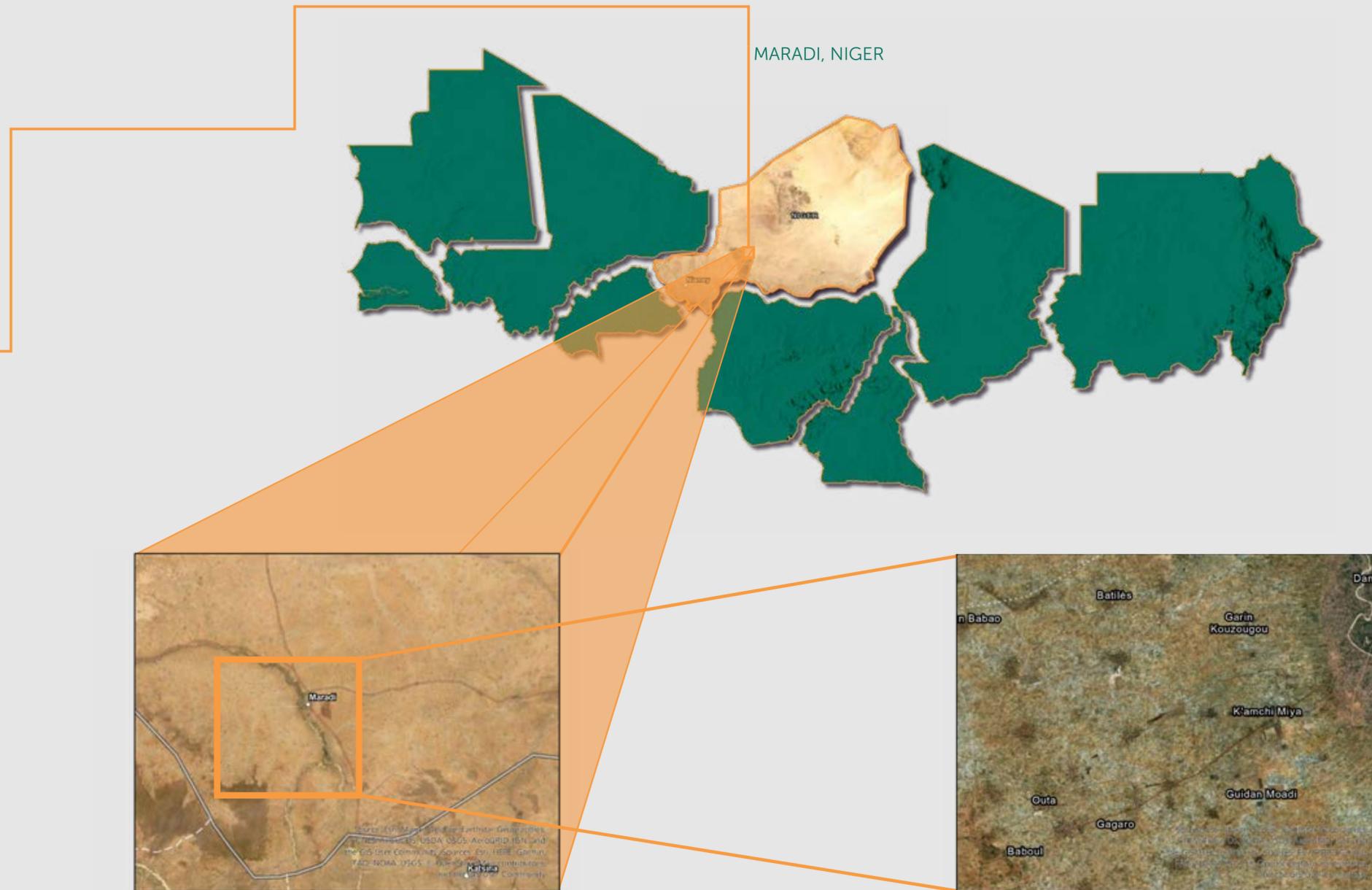
IDENTIFY

LOGIC

Identify the key strengths and opportunities for the chosen area of control, Interpret and understand how these can be developed into agents of resilience.

GOAL

Conduct mapping and design exercises to synthesis the data and develop a simplified outcome for a complex problem.



CULTURAL INSIGHTS

To implement a system that effects both the physical and the cultural environments we must first understand the circumstances in which we are influencing

NIGER HAS THE **HIGHEST FERTILITY** RATE IN THE WORLD, WITH AN **AVERAGE** OF

7 CHILDREN PER WOMAN.



A **BIRTH RATE** OF

47.5 BIRTHS

1 000 PEOPLE

THE POOR LIVING CONDITIONS OF NIGER ARE EQUALLY REFLECTED WITHIN ITS STATISTICS AS IT IS WITHIN OUR SOCIAL AND POLITICAL OUTLETS. NIGER'S LOW SOCIO-ECONOMICAL STRENGTH

POPULATION OF

22,772,361
AS OF 2020.

WITH **70%** OF THAT POPULATION **UNDER** THE

AGE OF **25**, FURTHER TO THAT **50 %** IS **UNDER** THE AGE OF **14.**

POPULATION GROWTH
RATE OF

3.66%

A **MATERNAL MORTALITY** RATE OF JUST OVER,

50%



INFANT MORTALITY RATE OF,

67.7 DEATHS

1 000 PEOPLE

45.5%

OF THE POPULATION **LIVE**

BELOW THE **POVERTY** LINE

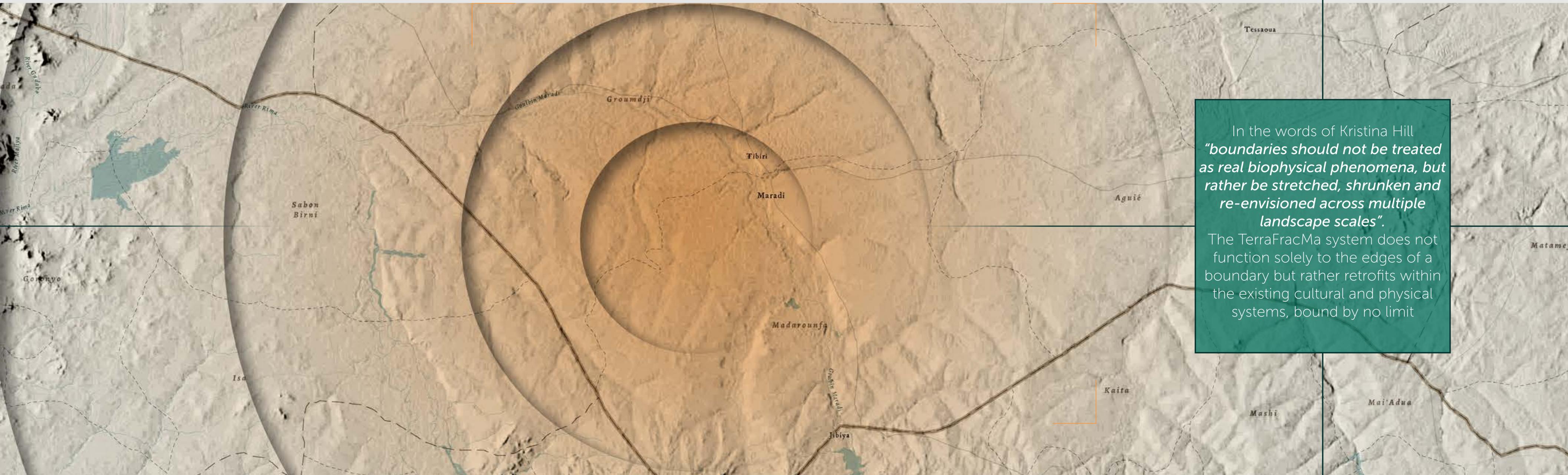
79.2%

OF THE **LABOUR FORCE** WORK WITHIN **AGRICULTURE.**

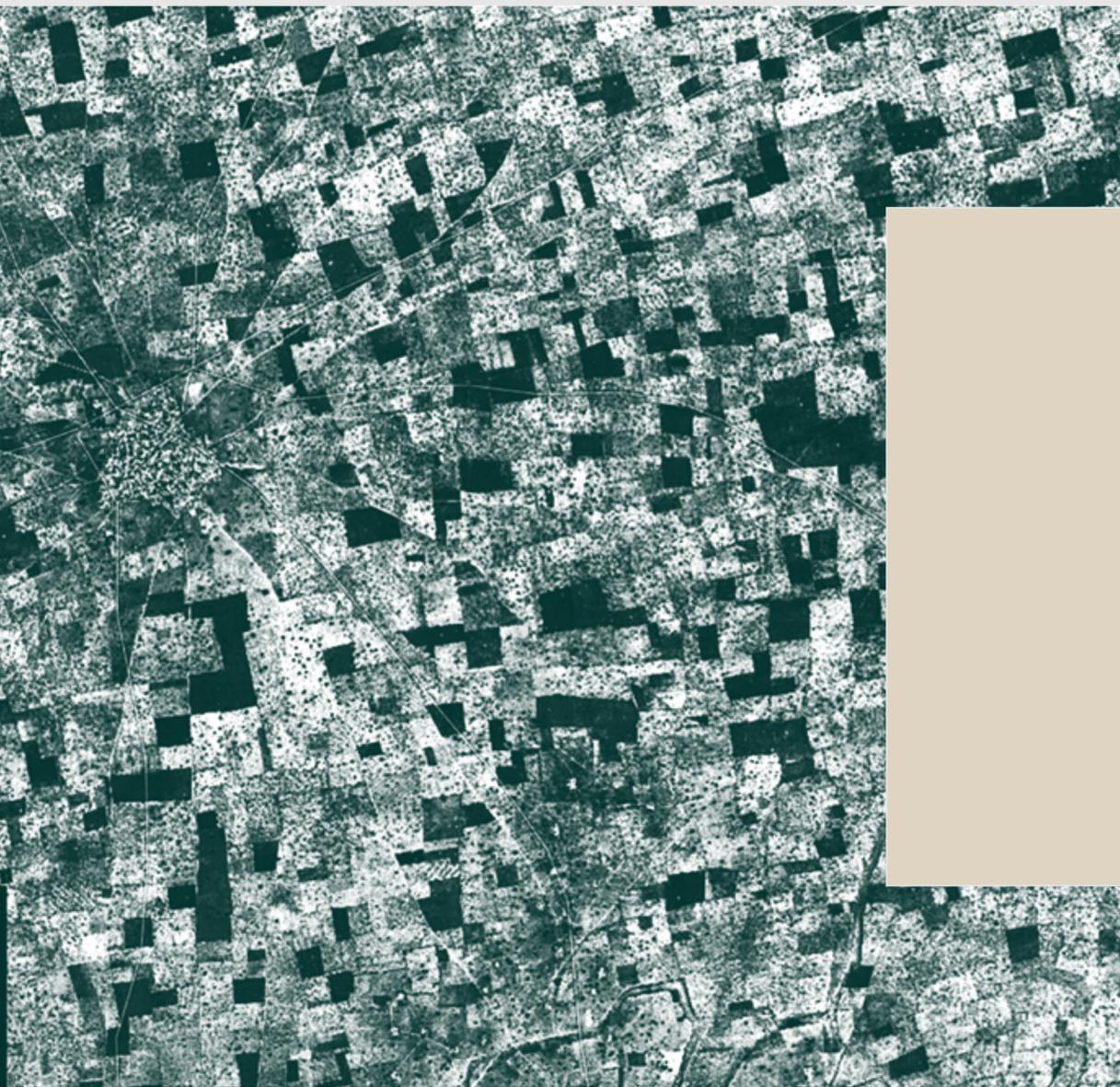
WITH AGRICULTURE CONTRIBUTING **41.6%** TO THE **GDP.**

NIGER'S **PRODUCTION** FOCUS

- COWPEAS
- COTTON
- PEANUTS
- MILLET
- SORGHUM
- CASSAVA (MANIOC, TAPIOCA)
- RICE
- CATTLE
- SHEEP
- GOATS
- CAMELS
- DONKEYS
- HORSES
- POULTRY



In the words of Kristina Hill
"boundaries should not be treated as real biophysical phenomena, but rather be stretched, shrunk and re-envisioned across multiple landscape scales".
The TerraFracMa system does not function solely to the edges of a boundary but rather retrofits within the existing cultural and physical systems, bound by no limit



DEVELOP

LOGIC

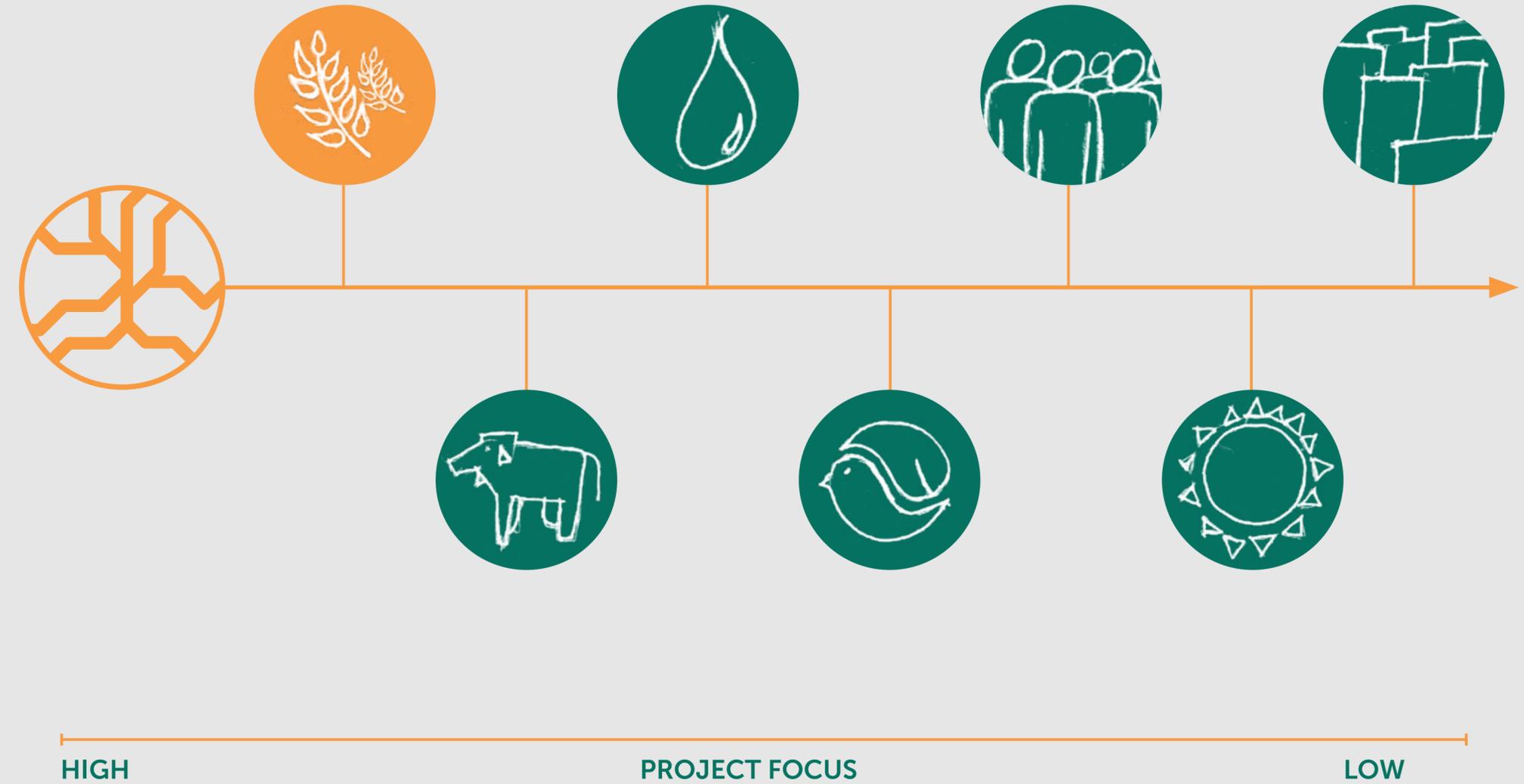
Using the background of data produced from the previous sections, start to appraise how this information will be used for building resilience.

GOAL

Research relevant methods and agents that can be applied to the area of control and assist in developing an equilibrium within the resilient system

DESERTIFICATION INFLUENCE CATEGORIES

The following icons represent the categorical issues linked to desertification and climate change. The categories are then re-formatted into a scale based on their relevance to addressing desertification. The process is based on a systemic approach starting with desertification, working through the system, establishing influences throughout the system.





PRIMAL SYSTEM

CURRENT SYSTEM

TERRA-FRAC-MA SYSTEM

HISTORICAL
TURNING POINT

-

+

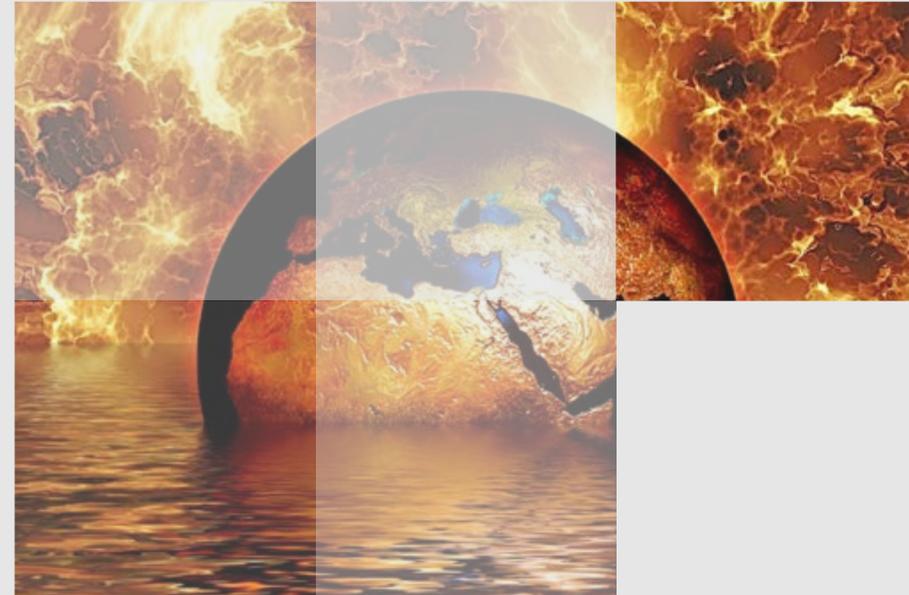
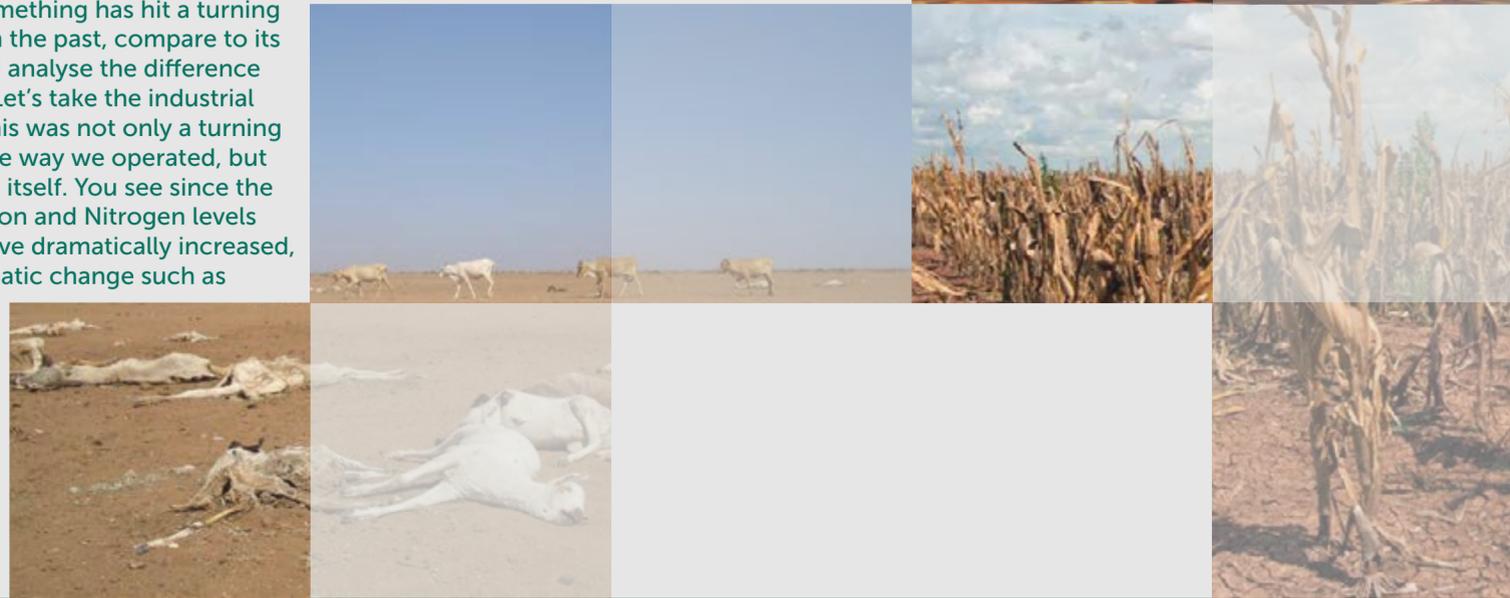
THE TURNING POINT

THE TURNING POINT

Over many centuries of human activity, we have come to a point in the humanitarian's lifespan where we need to decide. A decision based on what direction our planet will head in, this is what is called a turning point, and we are at that point. The biggest problem we are currently facing is one of a multitude scales, and impact. Climate Change, global warming, desertification, and many others are reflections of sanctioned humanitarian behavior, leading us to this point in history, the turning point.

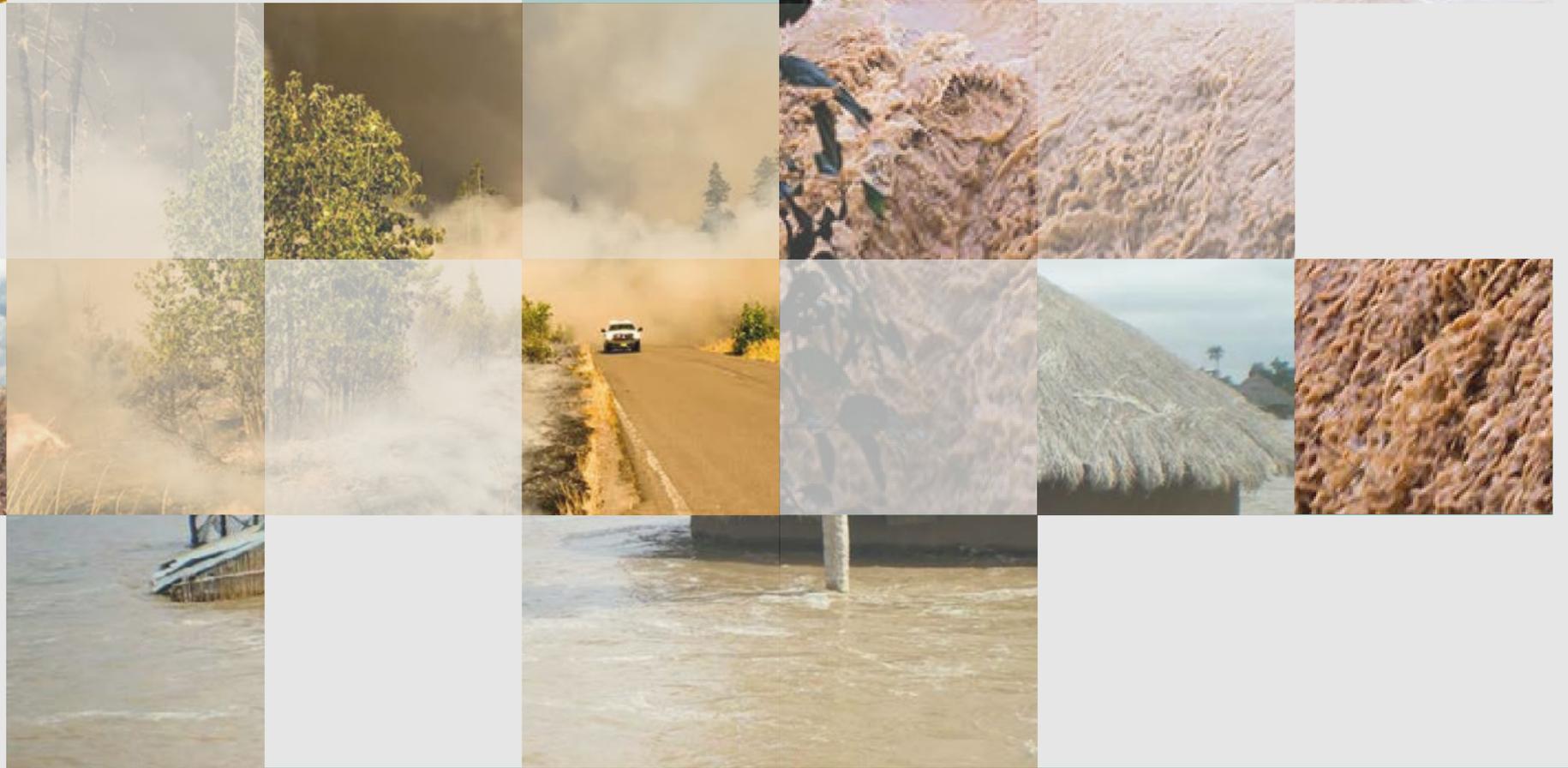
WHEN IS THE TURNING POINT ?

To determine whether something has hit a turning point, one must reflect on the past, compare to its current state of being and analyse the difference between the two points. Let's take the industrial revolution for example, this was not only a turning point for humanity and the way we operated, but for the climate and planet itself. You see since the Industrial revolution Carbon and Nitrogen levels within the atmosphere have dramatically increased, leading to prolonged climatic change such as desertification.



WHAT IS A TURNING POINT ?

The point in time of which a situation or circumstance begins to change in an influential way. (Cambridge dictionary, 2020). It can be contested that the turning point is in fact the point of which the decision is made to move towards a particular direction. This being the beginning of the turning point, and the change we see being the conclusion.



THEORY / RESEARCH

TOPIC: Biodiversity Restoration
PERSON / ORGANISATION: John D.Liu
BACKGROUND: John D. Liu's Work has been focused on ecological restoration within arid regions such as Jordan, Ethiopia & Rwanda. The crucial part of his methodology is in fact the beginning which begins by limited landuse through land dedication.

TOPIC: Grassland Ecosystem Pioneer
PERSON / ORGANISATIONS Allan Savory
BACKGROUND: Savory is a leading researcher in addressing desertification, particularly within Africa. His methods of planned grazing have proven to be successful in the regrowth of vegetation.

TOPIC: Water Resilience Researcher
PERSON / ORGANISATION: Malin Falkenmark
BACKGROUND: Falkenmark's primary research goal has been to develop resilience against drought and associated issues. From his research he has developed an approach in which assists in achieving his research aim.

TOPIC: Productive soils
PERSON / ORGANISATION: Chris McDonou & Dr. Gupta Vadakattu
BACKGROUND: McDonoi & Dr Vadakattu both team up in 2010 to develop research into transforming unproductive sand soils into some of the most consistent soil types within the Mallee region

TOPIC: Urban Farming
PERSON / ORGANISATION: Chris McDonou & Dr. Gupta Vadakattu
BACKGROUND: Urban farming is a concept that has been on the uprising within home growers and the agricultural sector over the past few decades, substituting natural process with artificial elements, such as green housing and shade clothing crops.

PROJECT DRAWDOWN

Project Drawdown is a global advocacy, research and awareness project that is invested in providing research based solutions to large scale issues such as agriculture, Industry and many others which have also been linked to social and physical problems such as desertification and climatic variations.

KEY DRAWDOWN TOPICS

MANAGED GRAZING

NUTRIENT MANAGMENT

USING DEGRADED LAND

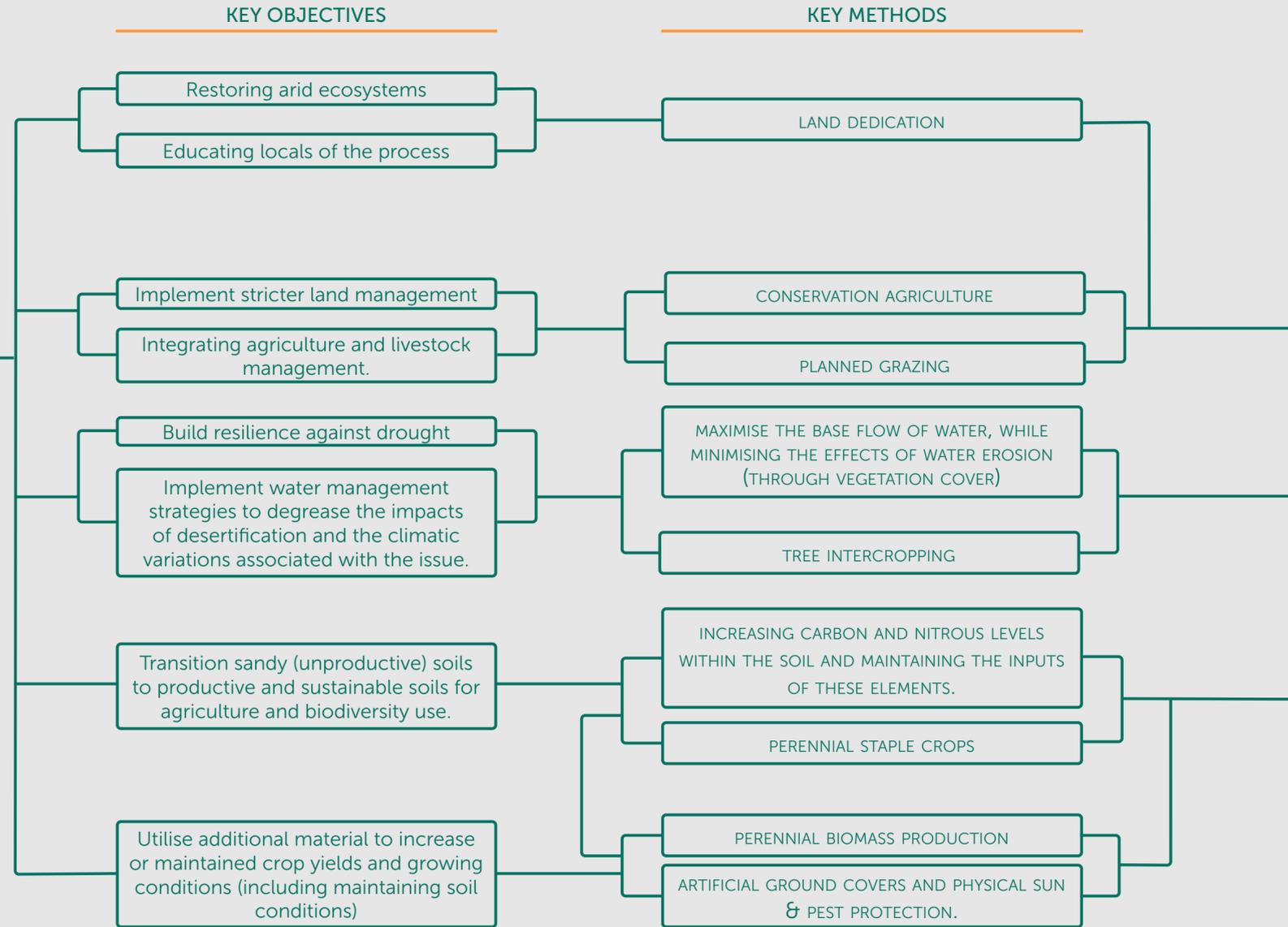
CONSERVING AGRICULTURE

SHIFT AGRICULTURE PRACTICES

PROTECT + RESTORE ECOSYSTEMS

REGENERATIVE ANNUAL CROPPING

T E F R A C M A



THE CONCEPT

To ensure that the project is manageable within the limits of this unit, the concept is focused on the speculation that by the year 2050, the globe will continue to produce carbon emissions and in doing so new weather patterns have indicated that their will be an increase in rainfall for the Niger region. It can be assumed that from the current weather pattern predictions that this increased rain fall will be shorter but more intense. (Based on ESRI Africa "World Precipitation Change 2050 Scenario 8.5" data, 2020).



CONCEPT

LOGIC

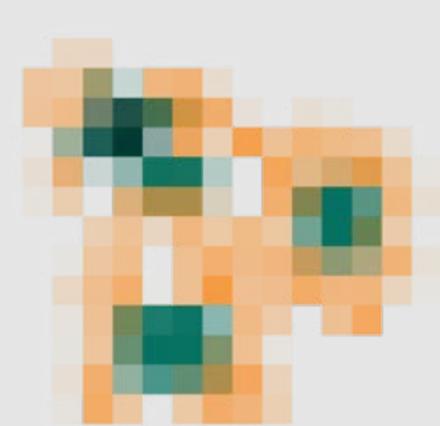
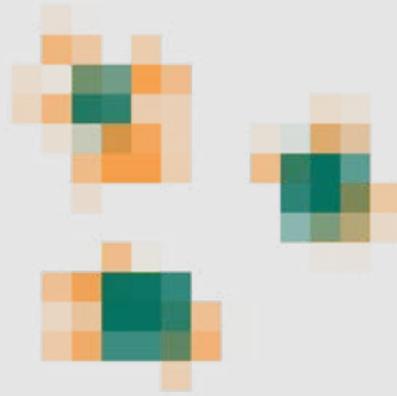
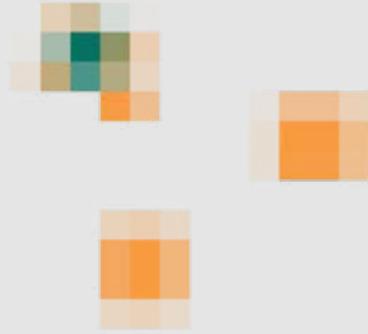
Using all the information and research discovered throughout the project, develop the TerraFracMa system in which will superimposed within the Niger region to build resilience against desertification.

GOAL

Develop the TerraFracMa system and demonstrate how this system responds to the projects brief of building resilience to desertification.

THE CONCEPT

CONCEPTUAL DIAGRAMS



AGENCY Phase 1

LAND DEDICATION

FRACTION Phase 2

CONSERVATION AGRICULTURE

INCREASING CARBON AND NITROUS LEVELS WITHIN THE SOIL AND MAINTAIN THE INPUTS OF THESE ELEMENTS.

PERENNIAL BIOMASS PRODUCTION

FORMATION Phase 3

PLANNED GRAZING

GROUND COVERS, PHYSICAL SUN & PEST PROTECTION.

MAXIMISE THE BASE FLOW OF WATER, WHILE MINIMISING THE EFFECTS OF WATER EROSION (THROUGH VEGETATION COVER)

PERENNIAL STAPLE CROPS

CONNECTION Phase 4

TREE INTERCROPPING

OBJECTIVES

BUILD RESILIENCE AGAINST DESERTIFICATION

DEVELOP RESILIENCE AGENCY

INFLUENCE CHANGE

PROVIDE SUPPORT WITHIN THE CULTURAL SYSTEM

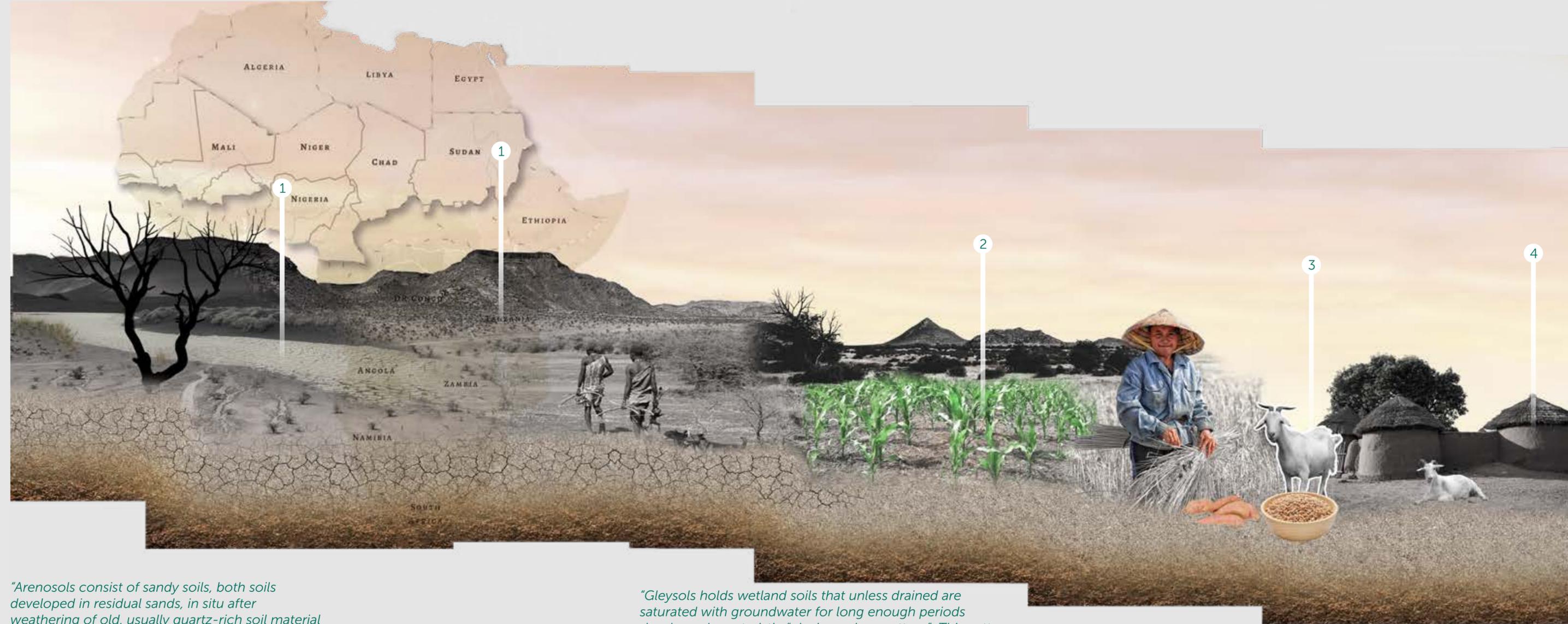
IMPROVE ENVIRONMENTAL CONDITIONS

CONSTRAIN LAND MANAGEMENT

INTEGRATE SUSTAINABLE CONCEPTS

THE EXISTING

- 1 The current landscape conditions demonstrates strong impacts of desertification. The outline of the annual water ways is imprinted in the fragmentation of shrubbery and grasslands.
- 2 Agriculture makes up 79.2% of the labour force, but it doesn't just form part of the countries income. It also provides the sustenance for the people of Niger. The current agriculture system is dependent on the annual wet seasons to produce a somewhat successful yield. However, current soil conditions are a large contributing factor to the success of the agricultural system.
- 3 Livestock also contributes to the countries income and food supply. However, the issue is not within the supply and demand of livestock, it is how they are managed that is contributing to desertification and other associated issues such as land degradation.
- 3 Although Maradi is a "city" and majority of the population are clumped together. The surrounding populations are subject to nomadic lifestyles, and this lifestyle correlates with the changes to the landscape, particularly how the landscape influences agriculture.

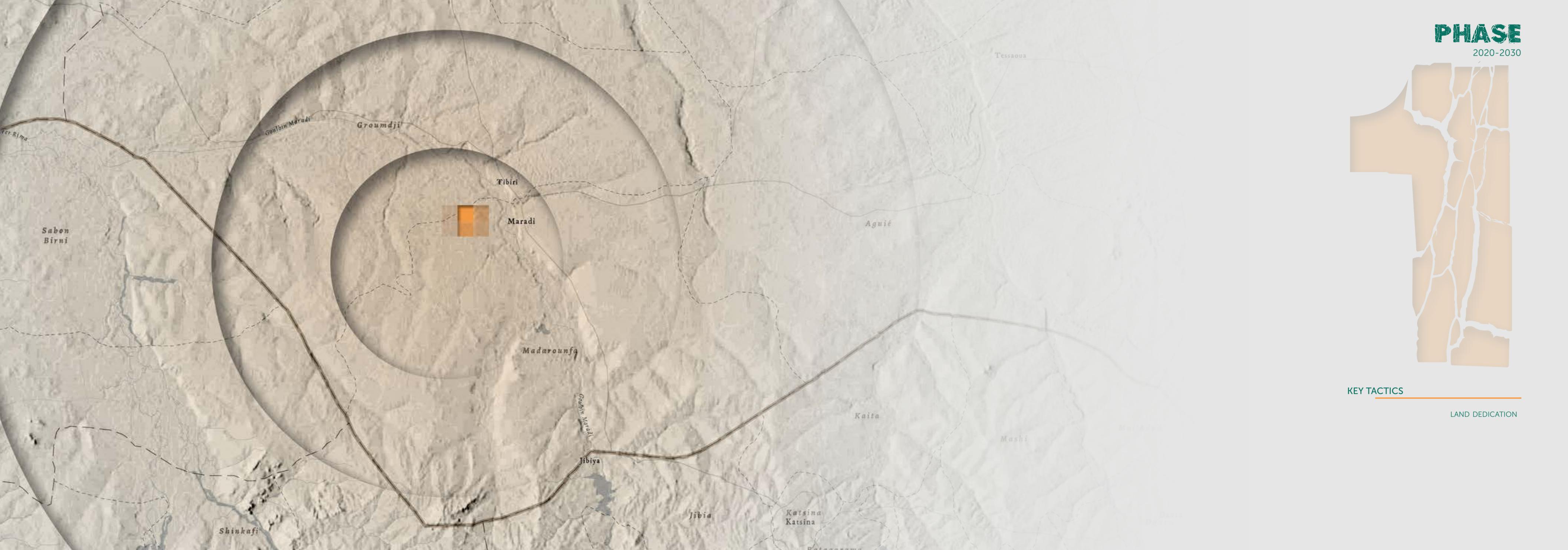
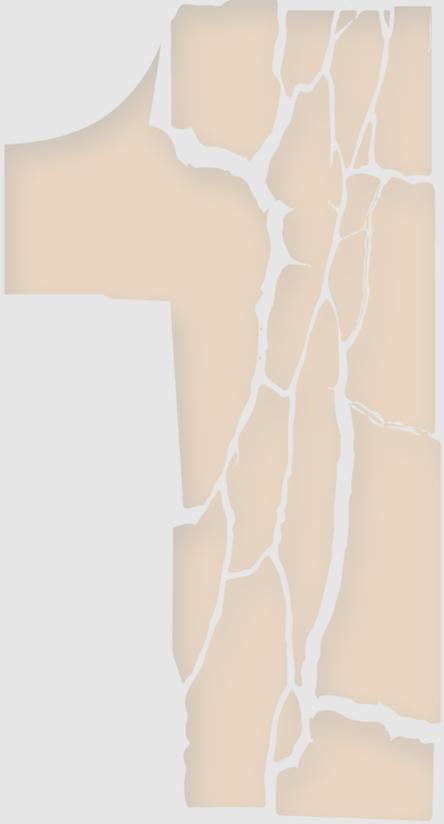


"Arenosols consist of sandy soils, both soils developed in residual sands, in situ after weathering of old, usually quartz-rich soil material or rock, and soils developed in recently deposited sands as occur in deserts and beach lands" (ISRIC, 2020)

"Gleysols holds wetland soils that unless drained are saturated with groundwater for long enough periods develops characteristic "gleyic colour pattern". This pattern is essentially made up of reddish, brownish or yellowish colours at ped surfaces and/ or in the upper soil layers(s)." (ISRIC, 2020)

PHASE

2020-2030

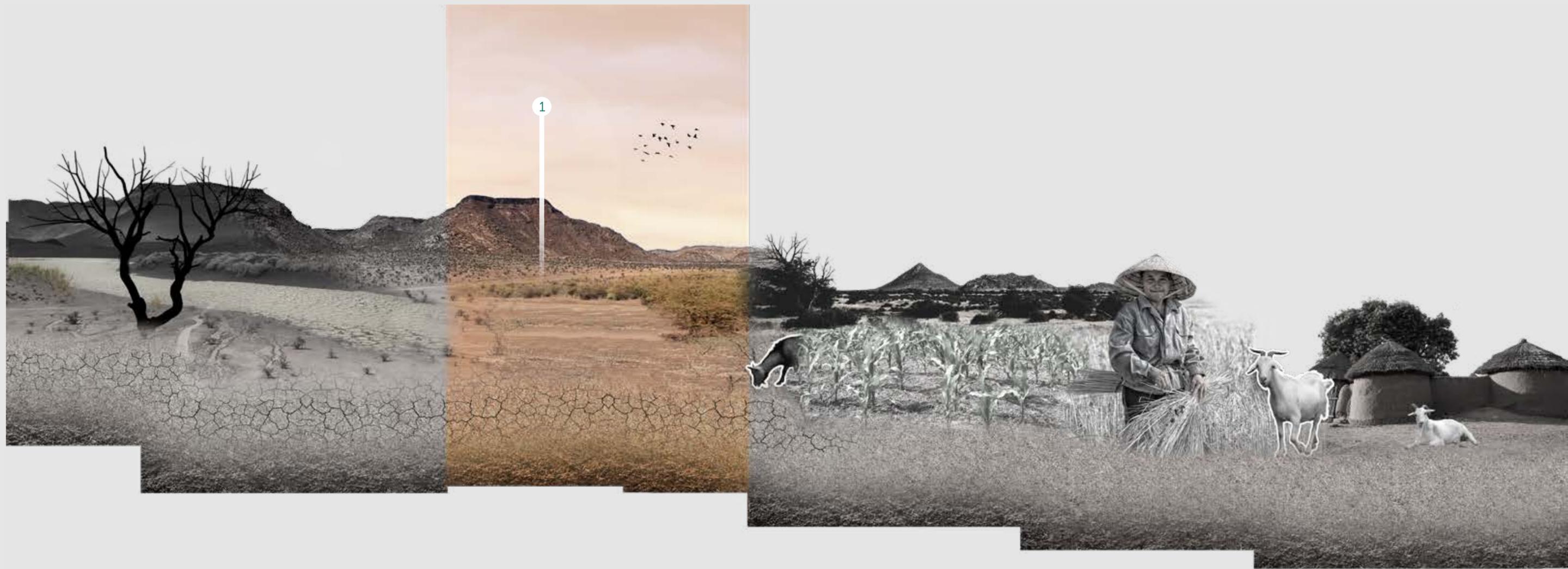


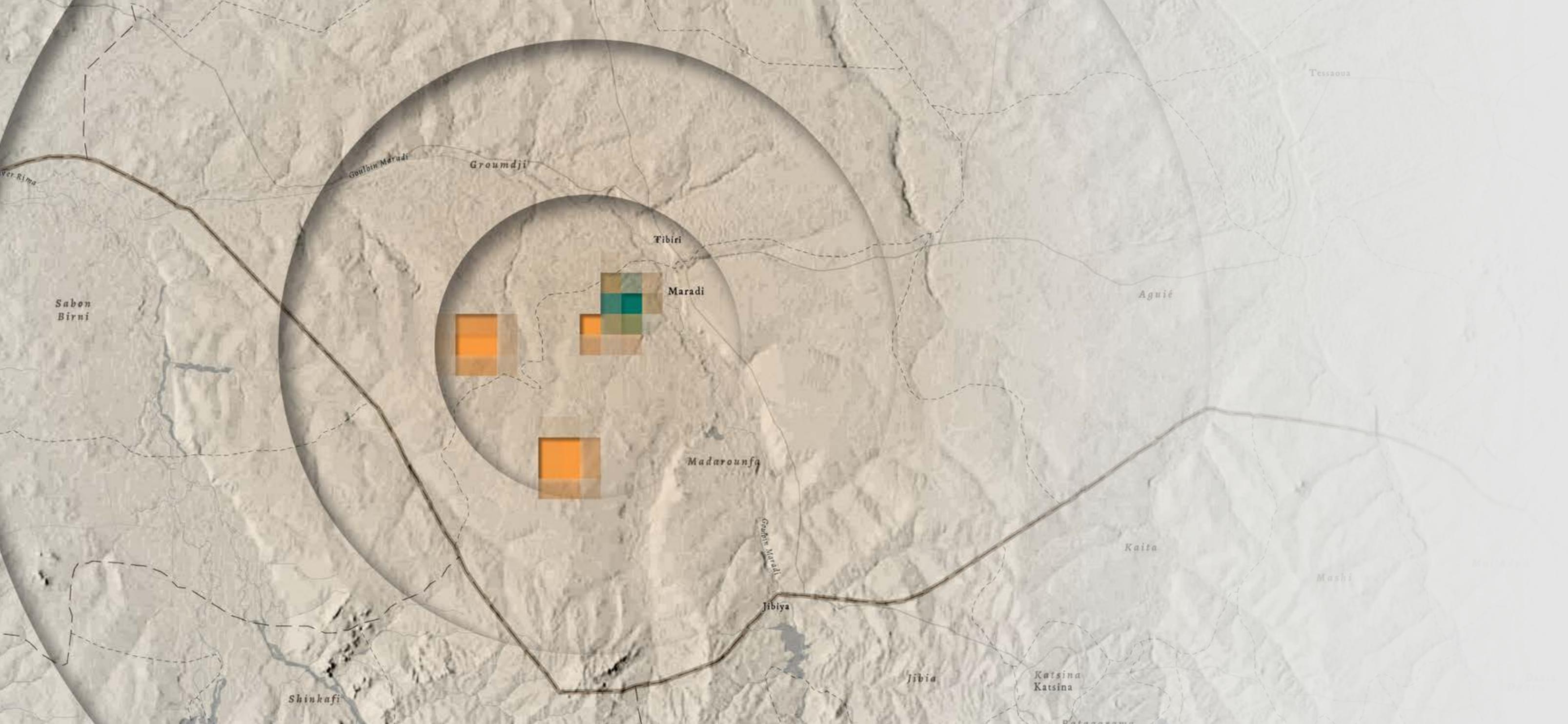
KEY TACTICS

LAND DEDICATION

1

Phase one introduces the method of land dedication, which has been proven to be successful in similar countries such as Jordan and Uganda by environmental and scientist John D.Liu. This method reserves chosen parcels of land and isolates them from negative land management methods. In doing so, it invites the return of native vegetation and the systemic implications of doing so. However, it should be help in conjunction that this process is one of which that allows observation and understanding of the landscape and biodiversity.





KEY TACTICS

CONSERVATION AGRICULTURE

INCREASING CARBON AND NITROUS LEVELS WITHIN THE SOIL AND MAINTAIN THE INPUTS OF THESE ELEMENTS.

PERENNIAL BIOMASS PRODUCTION

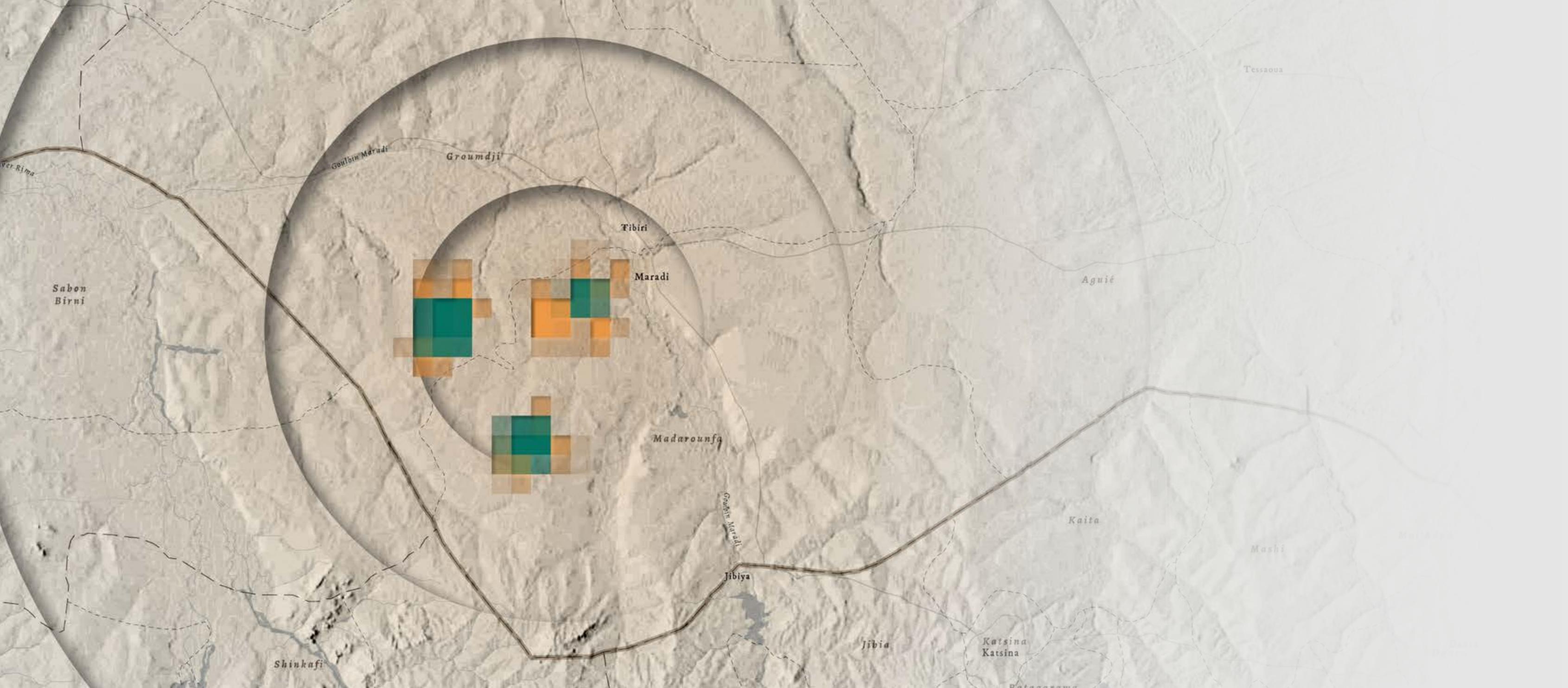
PHASE 2

- 1 Phase two assumes that land dedication has promoted native vegetation cover and continues to restore ground cover and soil composition.
- 2 The perennial biomass tactic uses specified plant types such as the Moringa Oleifera. The Moringa tree is a unique tree used commonly in permaculture because of its rapid foliage growth that is harvested from the tree and laid onto the crop beds for ground cover and biomass. In the conditions of the Maradi, resulting in restoring nitrogen and oxygen into the soil and assisting in transitioning the soil to as productive state.
- 3 Conservation Agriculture is a scientific method adapted from "Project Drawdown". This methods uses a combination of cover crops, crop rotation and reduction in tiling to help improve soil quality through soil protection, carbon subquestion (carbon is then stored into the upper layers of the soil).



PHASE

2050-2070



KEY TACTICS

- PLANNED GRAZING
- GROUND COVERS, PHYSICAL SUN & PEST PROTECTION.
- MAXIMISE THE BASE FLOW OF WATER, WHILE MINIMISING THE EFFECTS OF WATER EROSION (THROUGH VEGETATION COVER)
- PERENNIAL STAPLE CROPS

PHASE 3

1 The continued regeneration of native vegetation assist in minimising and harnessing the effects of the annual wet season. With an increase in groundcover, there is a reduced risk of land degradation and erosion.

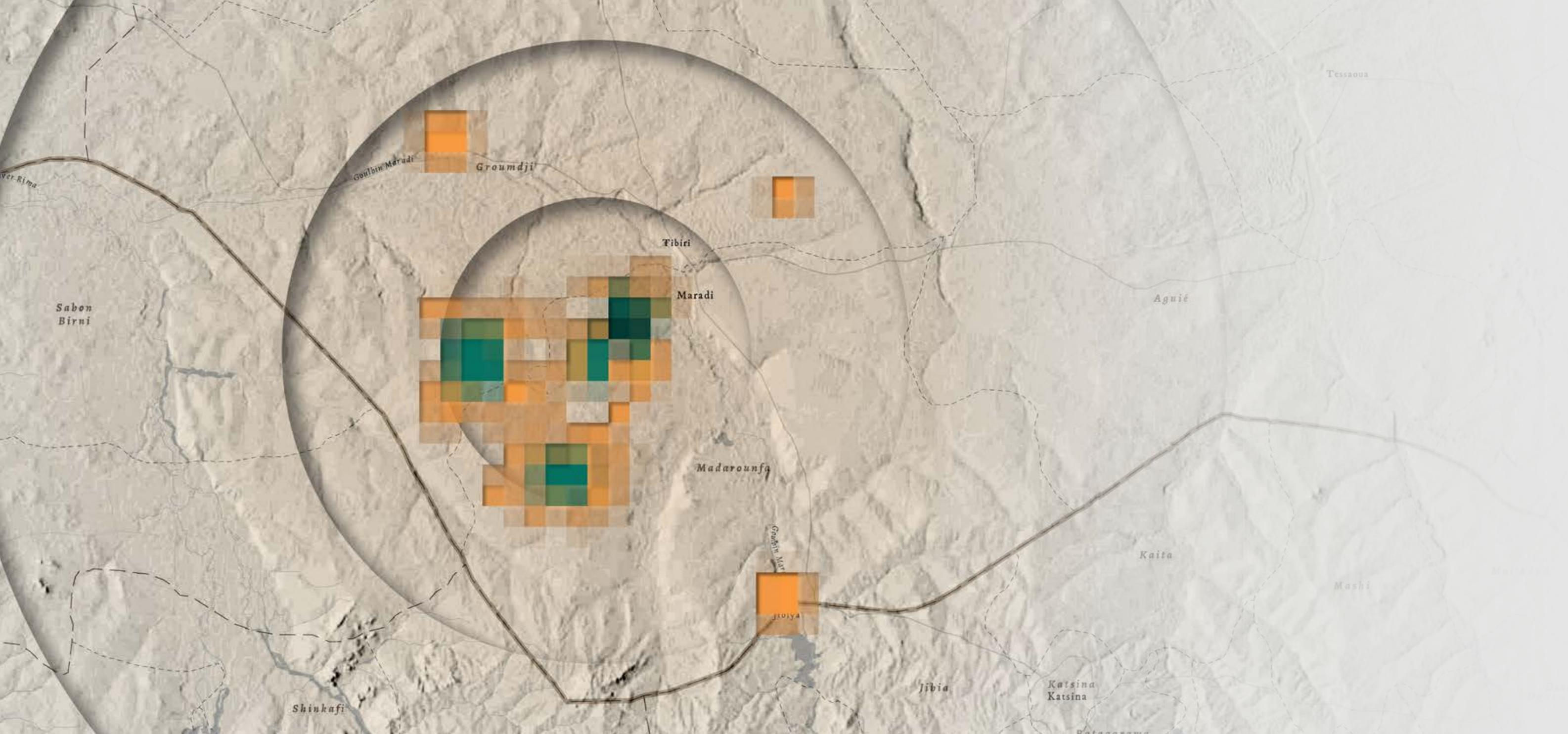
2 Planned grazing or managed grazing is a method explained by Allan Savory a grassland ecosystem pioneer, who has dedicated his whole life to researching how to improve the African ecosystem. Savory explains how we can combine post crop harvesting and livestock management to become one process that improves soil quality and as a result improving vegetation cover, crop yields and carbon subquestion. This process works by allowing light livestock to graze and roam through the pastures of harvested crops, this beds down the remainder of the harvest into the soil, returning all the nutrients that still remain within crop yields. This process works because it allows the old crop to act as ground cover, biomass and adds to the soil structure.

3 Perennial staple crops are used in general to provide food stability and maintain a higher carbon subquestion. Rather than the typical annual agriculture practice that occurs in many parts of Niger and Africa, staple crops don't need to be replanted each year and much of the waste from their production can be recycled into compost and soil nutrients for plant grow and soil structure.



PHASE

2070-2100



KEY TACTICS

TREE INTER-CROPPING



PHASE 4

1

Phase four continues to implement the previous tactics, while introducing Tree Inter-cropping. This is a using a combination of shrubs and trees that are then integrated with agriculture to improve biomass, soil quality organic matter and carbon

sequestration. Along with other implications such as providing ground cover, pest control and weather protection.



OVERVIEW

LOGIC

Use the work and information gathered so far to inform the programming and structure of an applicable resilient system.

GOAL

Develop an systemic cycle that replicates the flux of the system is will operate within.

PROJECT OVERVIEW

WHAT WERE THE LIMITATIONS?

- Obvious limitations was of course knowledge. If I were to have looked at applying this project to the Australian system, there could have been strong assumptions made based on existing knowledge of the country.

- Other limitations were of course accessibility to data and information. This made the research and analytical section of the project tedious. General access to climate data, contours and statistics were among the few topics that I struggled to find initial information on. However, with my little knowledge of GIS, I was able to source spatial files which then had to be overlaid, merged and analysed in software such as GIS, CAD and Rhino/ Grasshopper.

- Alongside the limitations for data, was obviously time, scope and skills. A project addressing an issue at this scale requires rigorous and in-depth analytics and research, both of which were not deemed achievable within the 14 week study period. Other limitations were software based, again coming down to time. If the project had a longer timeline, I could use that time to expand my knowledge further into GIS and other software such as rhino, to be able to test how various elements of the system would react to different conditions tested with GIS or Rhino.

WHAT HAVE I LEARNT?

- I now have a deeper understanding of desertification and the linked systemic implications of the issue.

- I now understand basic soil structure and permaculture concepts.

- Sustainable and adaptable ways to farm/ grow food and manage livestock.

- I have gained insight into a diverse culture and physical system other than my native country of Australia. Commonly where frequent assumptions can be made based on existing knowledge.

- I have further developed my skills in project communication and engaging with colleagues and professionals.

- I have further developed my skills in GIS and learnt how to translate information between software such as rhino, CAD an google earth.

- Utilising data to the best of its ability to explore, compare and interpret patterns.

WHAT WAS SPECULATED?

- The visualised outcome of this project is, in a way a tunnel visioned approach. This was however intentional for the primary reason of the projects complexity. By taking a tunnel vision approach, I could use a single grouping of information to create a speculated scenario in which to aim for, this ensured that the project remained within the limits of the semester. If this project were to consider all variable it would become to complex for a single unit of study and for a single person.

- It was also assumed that the current state of the countries civil + political affairs will remain the same and therefore limiting the socio-economics of the country.

VOLUME OVERVIEW

VOLUME ONE

[FORMAT: A3 DOCUMENT]

- Project background and site context
- Brief site analysis/ justification towards site location
- Underlying methods of the project and researchers
- Theories of applicable ideologies and research
- Project significance and impact
- Additional style approach through digital story telling
- Project Planner

COMPLETE

VOLUME TWO

[FORMAT: A3 DOCUMENT]

- Comprehensive site analysis
- Revised theoretical framework
- Design concepts and schematic design
- Stakeholder management schedule
- Draft story board for digital story
- Design strategy
- Project Planner Tracker

COMPLETE

VOLUME THREE

[FORMAT: A3 DOCUMENT + MULTIMEDIA EXHIBITION]

- Synthesised theoretical framework
- Project Planner reflection
- Design strategy
- Concept schematics (diagrams)
- Digital Story
- Polished Exhibition Boards

COMPLETE



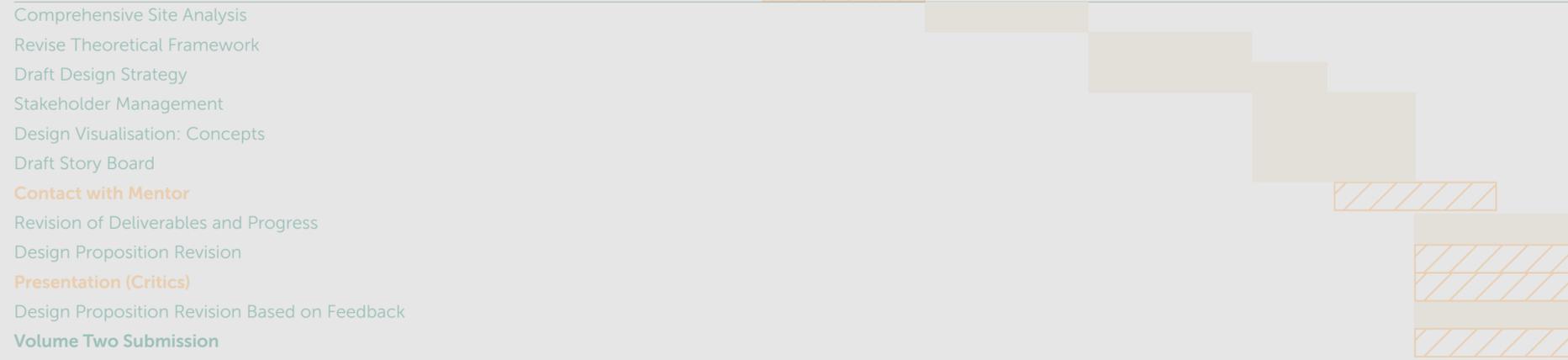
PROJECT PLANNER

TASK WEEK ONE WEEK TWO WEEK THREE WEEK FOUR WEEK FIVE WEEK SIX WEEK SEVEN

Volume One

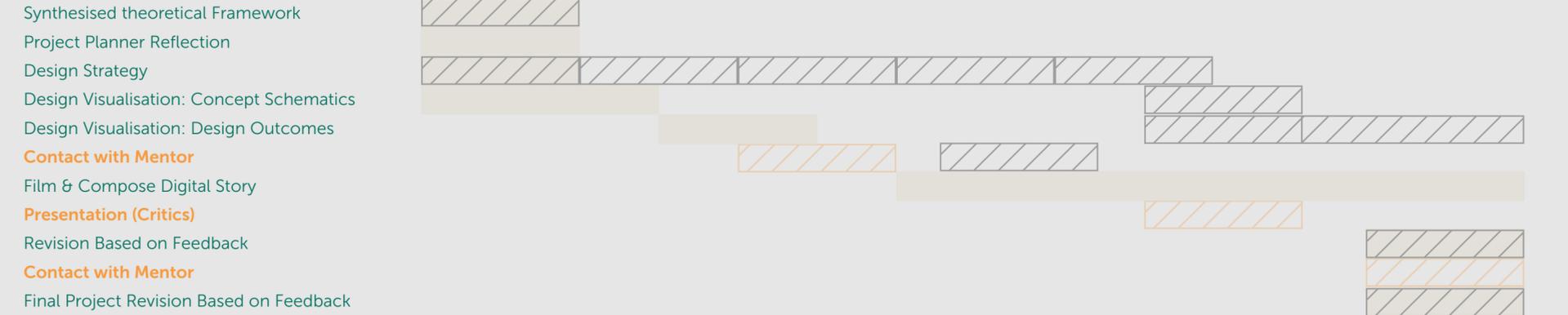


Volume Two



Volume Three →

TASK WEEK EIGHT WEEK NINE WEEK TEN WEEK ELEVEN WEEK TWELVE WEEK THIRTEEN



WEEK FOURTEEN

WEEK EIGHTEEN

**VOLUME
THREE
SUBMISSION**

EXHIBITION

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