PASTORALISM IN THE ENNEDI NATURAL AND CULTURAL RESERVE

Interim consultant's report

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Table of Contents

1. Purpose and methodology

a. Key objectives

The work outlined in this report sought to provide a brief analysis of pastoral dynamics across the ENCR and was intended to be the first stage in a two-part study. The research outlined below intended to provide an overview of pastoral systems active within the reserve with a focus on general dynamics, movements, decision-making processes, and governance systems. It further aimed to provide insight into veterinary service provision, and how pastoralism within the reserve is linked to the wider economic landscape.

This research was commissioned to support the development of concrete guidelines on how to improve the sustainability of pastoralism within the reserve and includes a set of specific recommendations to be taken by APN to further this objective.

Research was carried out in the field across the ENCR over a month period in June 2023, coinciding with the late dry season and onset of the rainy season.

b. Methodology

In situ-data collection was primarily conducted using flexible semi-structured interviews carried out at key water points, and communities in the western, northern, Archeï and Plaines d'Aloba zones of the ENCR[1]. In line with the principles of ethical anthropological research, all responses were de-identified and prior consent was obtained from all relevant local authorities, customary leaders, and respondents. In addition to interviews, direct observation of pastures, water points and other areas of interest were carried out. Best efforts were made to follow local cultural guidelines, and to minimise disruptions for participants and the communities in question. All interviews were conducted through a translator selected by ENCR management. In line with APN guidance and local custom, symbolic gifts were distributed following the completion of each interview. Where culturally appropriate best efforts were made to ensure the input, perspective and needs of women were fairly included in all interviews, reporting and recommendations.

c. Limitations

The methodology and findings of this report suffer from several substantial limitations. Due to very strict time constraints, it was impossible to visit communities to the east of the plateau. While best efforts were made to identify and interview residents of these areas outside their home communities and to collect secondary information, analysis of local dynamics remains insufficient. Time constraints further meant that it was impossible to make any systematic efforts to conduct an accurate disaggregate or total count of livestock numbers.

[1] The interview guide developed and used for this purpose has been included in Annex 2.

Limited to short visits, it was impossible deeply to probe sensitive lines of questioning (especially related to pastoral impacts on wildlife populations). Additional challenges were created by early onset of rains, which precipitated the departure of many herders to more distant pastures. This limited the availability of participants, and in some cases their ability to confidently respond to questions.

While it was initially planned to conduct a second study during the rainy season (approx. September 2023), the findings in this report strongly recommend against such an approach. As noted here, and in all prior studies of the subject area, communities within the ENCR are prone to an extremely high degree of research fatigue. All communities expressed a high degree of mistrust in APN's ability to translate findings into action. This supports the conclusion that until steps are taken to implement the findings of previous consultancies, further research would likely cause more harm than good.

Prior to the initiation of any further research ENCR management must develop a clear roadmap for the implementation of projects in a direct effort to restore trust and confidence. Suggests for suitable engagement are discussed further in section 10 (recommendations).

2. Pastoral dynamics

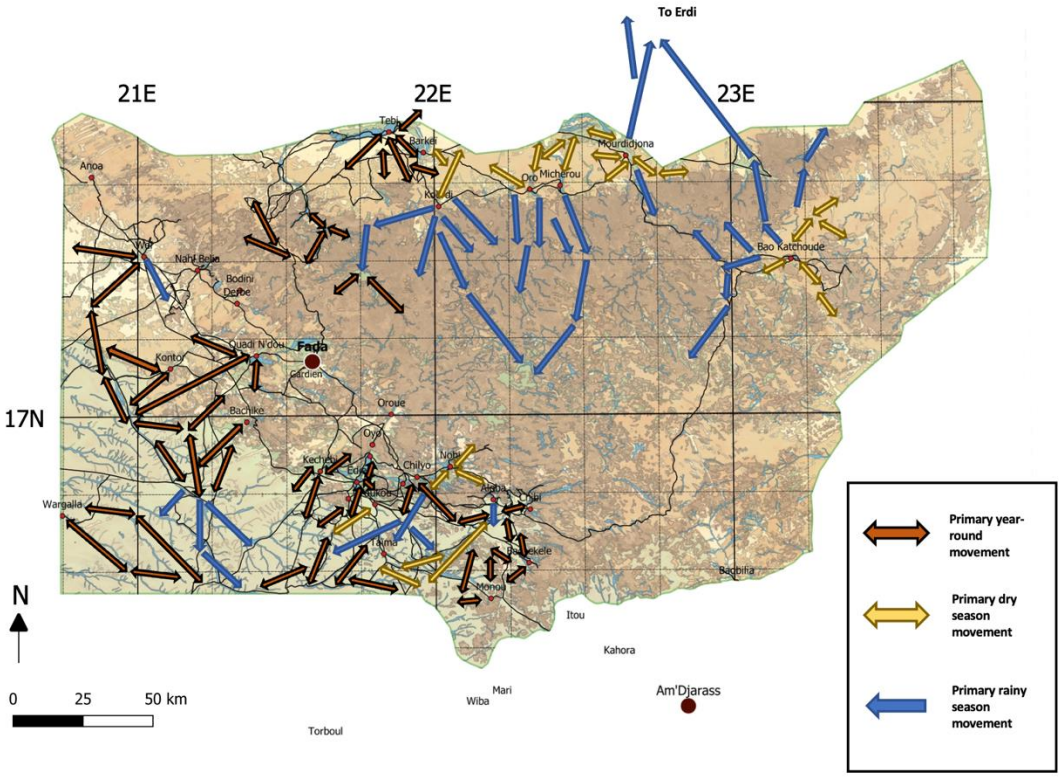

Figure 1: General overview of key pastoral movements within the ENCR.

a. Overview

Defined by centuries of extreme isolation, pastoral dynamics within the Ennedi Natural and Cultural Reserve (ENCR) are remarkably variable, self-contained, and highly distinct from those found across the wider Sahelo-Saharan landscape. Unlike in much of central and northern Africa, pastoralists within the system rarely practice long-distance transhumance and most local dynamics exhibit only broad seasonal trends rather than well-defined specific seasonal movements. The system is characterised by a highly flexible form of semi-nomadism, defined by the opportunistic use of pastures across wide areas of the reserves. Movements throughout the ENCR follow a similar broad pattern, with herders remaining closest to their communities during the long dry season (October-June), before dispersing towards more distant pastures following the onset of rains. The primary constraint on pastoral movements is distance from preferred water points, and choice of pasture is largely a function of personal preference and short-term variations in rainfall rather than specific environmental factors.

Herds typically remain as close as possible (<50km) to their home communities year-round, practicing an indigenous form of rotational grazing across as many as 30 distinct pastures. These movements anchored by an extreme fidelity towards specific "home" water points, and further movements are only made when surface water is present in or near pastures during the rainy season. Livestock management is characterised by a flexible approach to unrestricted grazing, with most herds moving freely and with limited oversight. Within each community the movements of individual livestock are determined by their relative water and fodder requirements. Goats are kept in and around[2] home compounds year-round, allowing for a consistent supply of essential milk and meat. Sheep are similarly kept nearby where possible, but often must be grazed further away (in or near pastures used by camels) owing to their higher relative fodder requirements. Camels are typically grazed across a range of more distant pastures and are rarely found near communities except when taking water[3].

b. Water point and pasture use

Throughout the dry season (late September – June) all livestock are watered in their home communities where possible. Herders only use "foreign" water points when faced with short-term supply challenges[4], or when forced to travel usually long distances in search of suitable pasture. However, while distance from a suitable[5] water point is the main constraint to pastoral *movements* throughout the dry season, it is important to note that water is relatively abundant within the ENCR, and absolute shortages are rare. Supply issues are typically resolved quickly, and with alternative water points accessible throughout the ENCR fidelity towards specific points is largely the result of individual preference rather than absolute need. For example, while many Gorane communities state they do not feel comfortable using the forages in and around Diré[6], they will often do so if needed.

[2] Usually within one hour walking distance.
[3] Or being used for transportation.
[4] Usually the result of a broken forage.
[5] Familiar and affordable (preferably free).
[6] Ostensibly due to the fact that they are owned and operated by Zaghawa groups based south of the reserve who often do not speak Gorane.

Five main types of water points exist in the ENCR: deep project wells, shallow concrete wells, traditional hand dug wells, boreholes (forages) and natural water points. Deep project wells are reinforced with cement, capped, and typically reach depths of 50 to 70 meters. These are considered the most desirable[7] water point within the system, being extremely reliable and providing water that is perceived to be of the high quality. Due to their high technical and material requirements these are usually constructed by NGOs or the government. The construction of shallow concrete wells is typically organised by the communities themselves and remain uncapped. Less reliable and more prone to breakage than project wells, they are nevertheless highly valued for the quality of the water they provide. Simpler, and now rarely used within the southern zones of the reserve, are traditional hand dug wells. While these can be cheaply and quickly constructed without outside technical or financial support, they are very prone to breakage and are not considered very reliable. Boreholes within the reserve are typically powered by diesel or solar generators and are often privately owned. While they can be quickly constructed and provide large volumes of water, the need for constant technical supervision creates an ongoing cost that is often passed on to users. While their reliability varies, many herders complain that the quality of the water they provide is inferior to well-water. Forage water is typically "saltier" and is associated with a range of poorly understood negative health effects[8]. Natural water points come in a range of forms, most notably being the Gueltas. While Gueltas are the most highly valued water point, their scarcity within the reserve mean they do not constitute an important source of water for most communities. Gueltas are valued for the quality of the water they provide, for their ease of access and reliability. Gueltas have the lowest labour requirement of all water sources, and often have deeper social importance, serving as an important place to relax and socialise. The most commonly used natural water points are accumulations of surface waters found in Wadis and pastures during the rainy season, and natural rock pools in the plateau.

Water point selection is typically a function of cost, reliability, comfort, and quality. While communities are without exception able to take water freely at their home water points, and it remains socially unacceptable to deny access to other herders, it has become an increasingly common practice to charge visiting herders a fee for water use at forages. Costs vary, based on forage ownership and while rarely if ever prohibitive, serve as an important disincentive to forage use. Costs are lowest in communally owned forages, and often appear to be flexible based on the means of individual prospective users. Access fees are either payable directly to operators for each use or are paid on a communal basis. In addition to financial costs, herders explicitly factor in labour and time requirements associated with water use at a specific point. While all herders seek to minimise costs, final decision-making is highly dependent on individual circumstances and users are often willing to pay for water access to save time or labour even where free water may be available nearby.

Reliability is another key factor, with all herders taking measures to avoid specific water points perceived as being unreliable. This is especially important during the late dry season, where travelling to a defunct water point poses a direct threat to animal and human health. Other factors including comfort and quality are more difficult to define, and again seem highly contingent on the personal circumstances of each herder. All Gorane respondents indicated

[7] With the exception of the Gueltas.

[8] The composition of forage water and any potential links to adverse health reactions requires further study.

they avoid forages operated by non-Borogate Zaghawa (especially in and around Diré) because they felt uncomfortable. Similarly, herders routinely would accept a high degree of risk by relying on lower quality water sources rather than seeking access to forages where the ownership was unclear or “foreign”.

Although the onset of the rains allows most herders to access more distant pastures (see figure 1 for a general overview of seasonal patterns), few[9] follow well defined transhumance routes or move more than two days walking distance from their home community. Instead, camels and men of herding age move quickly to whichever pastures received the first substantial rainfall. Small ruminants are also moved beyond their dry season pastures but typically remain near their home communities unless herds[10] are particularly large, or their owners move their family compounds to follow the rain.

Figure 2: Pasture dominated by "Malé" grass.

As in the case of water points, the factors determining choice of pasture and duration of grazing are highly contextual hinging on both the quality of the individual pasture in question, its location and relative grazing conditions in the broader area. While respondents were unable to articulate a clear classification of different pasture types and quality, there appear to be four broad categories. The best grazing is typically found in open areas dominated by

[9] Communities in the northern sector.
[10] Particularly of sheep.

thick stands of *Malé*[11] grass (see figure 2). *Malé* has a high nutritional value and is generally set aside for camel grazing. While Malé grasslands are relatively common and found throughout the reserve, they can become quickly depleted and herders avoid prolonged grazing. The second most common kind of pasture is dominated by *Ginshi*[12] (see figure 3). *Ginshi* is tougher and has lower nutritional value than Malé and despite its ability to withstand more prolonged grazing is mainly used for grazing sheep and goats. The third most important type of pasture are open areas of with relatively dense tree cover found primarily in and along Wadis. These pastures are suitable for all livestock, with camels able to browse when shorter grasses are depleted. The lowest value type of pasture are the rocky and sandy areas with very sparse vegetation. While these areas provide valuable supplementary grazing during the rainy season, they do not support long-term grazing and are typically avoided where possible.

However, while the qualities of an individual pasture are the critical determinant of how long a given area is grazed, rainfall and broader context are the most important factors in overall pasture selection. Without exception, all herders move to the first pasture within reach[13] to receive rainfall with the onset of the rainy season. Throughout the rainy season pasture selection is determined by the spatial distribution of rainfall, which during this period has a far greater impact on pasture quality than vegetation. As surface water begins to accumulate, herders are able to move further from their home water points but the relationship between rain and pasture choice remains unbroken. While vegetation becomes a more important factor during the dry season, all respondents confirmed that rainfall history (within the past year) remains the key determinant. Thus, areas dominated by *Ginshi* may be grazed by camels if nearby areas of *Malé* did not receive sufficient rainfall during the previous rainy season.

[11] English name unknown.
[12] English name unknown.
[13] Acceptable walking distance

Figure 3: Typical "Ginshi" dominated pasture.

Practiced throughout the ENCR[14], this system is finely attuned to the specific needs of each species, and the unique environmental attributes of the Ennedi. While the reserve encompasses vast areas of pasture, most are of relatively marginal value and cannot support sustained grazing throughout the long dry season. To prevent the depletion of pastures during this period, herders practice extremely low intensity grazing. By being allowed to graze freely, camels and small ruminants naturally disperse over wide areas, ensuring that pressure is moderate, and evenly distributed across the landscape. Each pasture is grazed only briefly, enabling adequate recovery during the short growing season, and preventing localised vegetation loss. This system of free grazing further reduces labour requirements, allowing relatively small populations to sustain remarkably large herds.

By moving away from their home water sources during the early rainy season, herders ensure that “inner” pastures within a few hours distance from their home water sources remain intact for as long as possible. This is crucial to ensure that livestock can graze within easy walking distance from their preferred water points during the hottest months of the year when fodder and water are most scarce. This both allows herders to better meet subsistence needs for milk and meat during the harsh dry months and avoid the costs associated with using paid water sources outside of their home communities.

[14] Key exception Mourdijona discussed in depth on page X.

Despite the near limitless availability of pasture within the ENCR, the area's vast size and low overall rainfall make it challenging to predict when and if certain pastures will come into their prime in any given year. Herders must thus be exceedingly flexible to ensure they are able to quickly select and access the best pastures based on short-term variations in rainfall. With limited competition for space and a context defined by very high social cohesion, this favours spontaneous movement over the development of the fixed transhumance routes seen elsewhere in central Africa.

The key exception to this pattern Is found to the north of the massive. Communities along the southern fridge of the Mourdi Depression (Kourdi, Warta, Oro, Micherou etc.) practice a form of relatively well-defined short-range transhumance. Camels and small ruminants graze near their home communities throughout the dry season before moving up onto the plateau with the onset of the rains. While they disperse widely across the plateau during this period, movements are much more regular in the south due to a higher relative reliability of pasture and water availability on the plateau.

The most pronounced form of transhumance is practiced by the communities of Mourdidjona and Bao-Katchoude, who self-identify as a distinct community (*Mourdians*) in part due to their pastoral practices. All livestock graze near their respective communities during the dry season before making the long journey north to the Erdi Massif or to a lesser degree the eastern core of the Ennedi Plateau. In addition to the better reliability of these pastures, these communities identify extremely low levels of human pressure as a key motivation for these comparatively long-distance movements. Rather than driven by purely by environmental factors, these movements also appear to have strong cultural roots. Both communities maintain close ties with the Libyan province of Kufra, and transhumance to Erdi is accompanied by important seasonal trade north to Libya.

a. Livestock

While time and resource constraints made it impossible to conduct an accurate quantitative assessment of livestock populations within the reserve, this section will provide a brief overview of key livestock found within the reserve and their respective cultural, economic, and ecological significance. Traditionally pastoral livelihoods within the ENCR are based around the husbandry of camels – which serve as the primary value store – and small ruminants to meet more regular subsistence needs. These are raised in conjunction with donkeys, who despite their limited economic value retain an important practical role. While the introduction of new medicines and fixed employment has allowed livestock populations to grow, the first substantial shift in livestock ownership came with the introduction of cows to the system in the mid-late 2010's. Cows not only have fundamentally different environmental needs and impacts but represent a fundamental shift from subsistence to commercial pastoralism.

Uniquely adapted to the harsh environment of the Sahara, camels are the most culturally and economically important domestic animal for both the Gorane and Zaghawa communities of the ENCR. Camel ownership is a crucial determinant of social status and plays a vital role in customary wealth exchanges and dispute resolution. Due to their relatively high value, camels are the primary value store for most herders, and are seen as an effective insurance against future adverse events.

While camels are the most common tool to finance large purchases, they are infrequently sold, and most exchanges are customary in nature. Camel value is determined via a complex system of grades factoring in their health, aesthetic qualities, and physical capabilities. In addition to their social and economic importance, camels have a much higher remnant practical value than elsewhere in the Sahara. Rarely eaten except on special occasions, they still serve as the most important form of transport and are needed to draw water from many of the deeper non-mechanised wells. While camels have a higher relative fodder and water requirements than small ruminants, they still place relatively little pressure on the natural environment. Reproduction is relatively slow, and camels remain the most difficult and labour-intensive animal commonly reared in the ENCR.

Goats are the most common small livestock across the plateau but have relatively little economic value and are primarily raised for their subsistence value. Goats are the most common local source of protein, and their low labour, water and fodder requirements allow them to remain near communal centres all year round. Unlike camels, goats are commonly managed by women and children and put relatively little pressure on the environment. Due to their high reproductive rate, they are frequently sold, and fund most routine purchases.

Sheep sit somewhere between camels and goats, having intermediate value, resource, and labour requirements. While most sheep are raised for their subsistence value in manners analogous for customary goat husbandry, large herds are increasingly brought into the reserve by investors. Due to their relatively high water and fodder requirements, commercial sheep herding is a common driver of water truck usage. Relatively affordable, and with a moderate reproductive rate sheep are commonly eaten and sold.

Donkeys are commonly kept in all communities in northern Chad, but have very little cultural, subsistence or economic value. Donkeys are primarily raised as beasts of burden and remain an important source of transportation. Of particular note is the very large population of feral donkeys now found throughout the ENCR. Despite their low water and fodder requirements, the size of this feral population and their ability to access important grazing areas used by wildlife high in the plateau puts significant pressure on fragile ecosystems without imparting any perceptible value to local communities.

b. Perceptions of sustainability

The ENCR's pastoral system – and the wider landscape – are perceived by all users to be extremely resilient, and able to support substantially higher populations of livestock. There is a deep-rooted belief that current levels of pastoral pressure are not having any adverse environmental impacts, and that any supply[15] issues are the result of poor infrastructure or factors beyond their control (e.g., rainfall and or "God's will"). While all communities expressed concern of inadequacies in water availability, water is in itself neither perceived nor managed as a scarce resource. Herders are highly aware of the ENCR's vast groundwater reserves and believe that any future issues can and should be resolved through the construction of further wells or forages. Thus, although water availability remains the primary

[15] In the terms of both water and fodder.

constraint on pastoral movements, water point selection is based primarily on convenience, comfort, and personal preference, rather than need. Pasture is similarly perceived by most communities as a near limitless resource. While the quality of specific pastures is unreliable as a function of year-on-year variation in rainfall, the vast size of the ENCR fuels a deep-seated belief that adequate grazing "will always" be available somewhere within the reserve.

Recognising the spatial unreliability of both water and fodder, resilience at the system level is thus built on the ability to freely access a huge range of different pastures and water points with few to no restrictions. To this end, traditional governance systems within the ENCR favour highly conciliatory, "hands-off" approaches to natural resource management. Unlike in landscapes to the south and west, natural resource access is not restricted, and strict taboos exist against exclusionary practices (e.g., refusing another herder/community the right to graze or water their animals or charging prohibitive prices for water access etc.). This internal freedom is coupled with an extreme resistance to external change. Pastoral livelihoods within the ENCR have changed relatively little in the past 50 years, despite a general trend towards sedentarisation. While the vast majority of the population has become sedentary and relatively few families move their home compounds during the rainy season, spatial resource use patterns have remained remarkably unchanged. The driving cause of this sedentarisation has been the development of non-pastoral livelihoods (most notably NGO/government employment in Fada, mining, and smuggling/human trafficking) creating a financial disincentive to irregular population movements.

c. External pressure

A distinguishing characteristic of pastoralism within the ENCR is the extent to which dynamics are self-contained. Herders and livestock based within the reserve rarely if ever[16] leave the boundaries of the reserve, and pastures/water points within the park are almost exclusively used by local residents. This is both due to the ability of local communities to meet all pastoral needs[17] locally, and due to extremely high resistance towards external pressures. While local Gorane and Zaghawa communities are effectively able to access resources throughout the reserve with few to no restrictions, this is not the case for herders from further afield. While Arab herders from Wadi Fira and Bourkou are allowed access to water and pasture on a limited basis, this occurs on an individual basis and severe restrictions apply. External land users are rarely permitted to exploit scarce resources like medicinal herbs, and hunting is strictly prohibited.

However, while external pressure on the ENCR's ecosystem remains exceptionally low, this is beginning to change. Pastures to the south of Aloba and Archeï are coming under increasing pressure from Zaghawa groups based outside of the reserve. Typically linked to the politico-military elite in N'djamena and President Deby's family, this pressure is associated with substantial adverse changes in land use. Unlike traditional forms of pastoralism practiced within the reserve, this pressure is explicitly commercial in nature, providing very little subsistence or social benefit to communities based within the reserve. As in other examples of "neo-pastoralism" seen elsewhere in Central Africa, this trend is characterised by

[16] With the exception of transhumance between Mourdidjona/Bao Katchoude and the Erdi Massif.
[17] With the exception of veterinary medicine.

extremely large herd sizes, aggressive tactics, and the use of paid herders[18] (mostly from central and southern Chad).

Backed by substantial financial and political resources, this phenomenon is directly tied to two of the most urgent threats to nature conservation and sustainable pastoralism within the reserve – the introduction of cattle and the use of water trucks. While substantial archaeological evidence suggests that cattle were once widespread across the plateau, they disappeared from the landscape as it became increasingly arid. With far higher feed and water requirements than camels, sheep or goats, cattle husbandry in the Ennedi was impossible prior to the introduction of the mechanised forages.

While their high commercial value, ease of sale and fast reproduction rate make cattle the most attractive prospect for commercial pastoralism, their presence presents a direct threat to the ENCR's fragile natural resources and traditional livelihoods. Not only do cattle consume far more water and fodder than camels, goats, or sheep, but their inability to tolerate long periods without water limit their movements to the immediate vicinity of suitable water points. This results in far more intense, concentrated grazing patterns associated with a risk of overgrazing and long-term ecological damage.

While cattle remain a relatively new phenomena, herders already report that pastures frequented by cattle recover more slowly following the onset of rain and show lower overall levels of vegetation. The impact of this trend is heighted by the ability of cattle owners to aggressively occupy prime areas of pasture, and to install additional water points as needed. Cattle are further associated with the introduction of new diseases presenting a threat to both wildlife and livestock populations throughout the reserve. As discussed in section X, the level of veterinary health care within the ENCR is exceptionally poor, and many herders confirmed that the introduction of cattle precipitated outbreaks of previously unknown diseases they struggle to control.

In addition to these direct environmental impacts, cattle pose a significant threat to local socio-economic stability. Cattle, and particularly the associated use of water trucks, are perceived by all local communities as foreign, and dangerous. All communities surveyed are acutely aware that Ennedi's pastures cannot support the sustained level of grazing associated with cattle husbandry and the use of water trucks. While communities have been somewhat successful in their attempts to ban the use of water trucks, the power balance remains strongly in favour of the wealthy, politically connected absentee cattle owners. This allows them to routinely circumvent these and other regulations and has become a growing source of intercommunal tension around Diré and around the southern boundary of the ENCR. While most cattle owners are Borogate, many of the Zaghawa involved in the operation of cattle focused forages originate from far outside the reserve in Tiné or across the border in West Darfur. While no incidents of interethnic conflict have been reported, several respondents indicated that their presence has become a significant source of concern and tension amongst adjacent Gorane communities[19]. Although livestock theft is extremely rare in the ENCR, the

[18] Almost exclusively from central and southern Chad.

[19] Interestingly, despite high levels of overall suspicion against perceived "outsiders", paid herders of non-Zaghawa (e.g., Peulh) are not perceived as a source of tension and are commonly employed by the Gorane to herd camels and sheep.

high value and ease with which cattle can be sold could further increase overall levels of insecurity.

Despite strong negative sentiment towards cattle, recent years have seen an increasing number of local Zaghawa experiment with cattle ownership. While this remains relatively rare, should the phenomenon spread, it would represent a fundamental shift in local pastoral livelihoods. A widespread shift to cattle rearing would dramatically increase pressure on the ENCR's fragile resources and would likely result in the acceleration of existing trends towards sedentarisation.

While the use of paid herders is most pronounced amongst commercial cattle and sheep owners, it is increasingly common amongst all sectors of pastoral society. The relatively low cost of paid herders makes their employment accessible to most families within the ENCR, and crucially allows small families to maintain large herds or for male herders to take up lucrative temporary employment in the mines or as smugglers. The revenue from these activities is in turn used to purchase more livestock or reduce the number of animals sold each year. Despite general hostility towards outsiders, paid herders are viewed neutrally and do not appear to contribute to social tensions. Instead, they are seen as an effective tool to support the growth of livestock populations, that benefits society overall. Social interactions between local communities and the paid herders are limited and there is no indication that any have or intend to settle in the reserve permanently.

Additional external threats include but are not limited to market fluctuations, in-migration, and conflict spill over from Tibesti and Sudan. While the isolation and subsistence character of pastoralism within the ENCR provides some insulation, market fluctuations remain an important driver of pastoral behaviour. While livestock remain the primary value store and revenue source for all communities within the ENCR, only a small percentage of the value is generated locally. Although individual goat and sheep are commonly sold in Fada, major exchanges – and the sale of camels[20] – occurs almost exclusively in the regional markets of Kalait, Tiné, and Kilinje (Libya)[21].

While inter-ethnic relations remain calm across much of the Ennedi, there is increasing evidence of strain on local Gorane-Zaghawa relations. While the cause of these tensions remains unclear, they are likely inflamed both by the commercialisation of the pastoral system described above, and Gorane-Zaghawa conflicts in Tibesti. Recurrent conflict between Gorane and Zaghawa groups in the gold mines of Tibesti has resulted in hundreds of fatalities since 2017 and poses a latent risk to the stability of intercommunal relations in and around the ENCR. While local dynamics remain calm, this could change as more young men return from Tibesti and grievances may spread.

In addition to Chad's internal tensions, regional conflict such as the ongoing Civil War in Sudan create further risks to the sustainable management of the ENCR. Not only has the war impacted regional livestock markets[22], but it has driven the displacement of several hundred

[20] While livestock are frequently transferred between owners and communities within the reserve, these exchanges are usually as part of marriage or inheritance payments and rarely involve cash.
[21] For a detailed overview of relevant regional commercial networks see section X.
[22] See section 6.

thousand refugees into eastern Chad. Ties between the displaced (many of whom are Zaghawa) and communities within the ENCR create a risk of further in migration, while political connections between Chad's ruling Zaghawa class and ethnic militias operating in Darfur raise the threat of cross border violence. While the situation in Libya is currently calm, instability their remains a persistent vulnerability for the Ennedi's socio-economic system. The impacts of conflict in Libya are likely to remain highly contextual and are largely the result of northern Chad's high level of dependence on commercial connections to Libya.
A significant recent development is the increase in migration into the reserve from Wadi Fira. Recent years have seen a growing number of Borogate and Bideyat clans moving their households and livestock into the southern sectors of the reserve particularly around Archeï and Aloba. Dominated by families who emigrated from the reserve during the Civil War and Great Sahel Droughts of the 1980s, this influx is not perceived by local communities as an example of "foreign" settlement and is thus permitted with few to no restrictions. While this makes the trend difficult to isolate and quantify, this influx driven by declining socio-environmental conditions to the south will likely increase pressure on some the ENCR's most valuable and overstretched resources including Guelta d'Archeï. In addition to the direct environmental impacts of an increased human and animal population, this demonstrates how the relative abundance of pasture and water within the ENCR make it an attractive target for migrants.

Beyond the threats outlined above, it is important to discuss the impact of water point construction within the reserve. All communities continue to push for the construction of more water points, which they see as essential to alleviating hardship and growing livestock populations into the long-term. While new water points are regularly constructed (most often by local and INGOs), there is little to no coordination between different actors in the space and APN. As a result, new wells are established in a haphazard manner with no regard to the ENCR's conservation objectives. The construction of new water points not only increases the number of livestock communities are able to maintain but changes pastoral movements while opening new areas to more sustained patterns of grazing. While this does not represent a fundamental threat to the character of local pastoral systems, it raises the risk of overgrazing and facilitates the movement of livestock throughout the reserve.

d. Medium to long-term trends

As discussed above, pastoral dynamics within the ENCR are perceived as being sustainable and generally stable by all land users. Despite the growing prominence of other employment – most notably mining[23]), government/military/NGO work, and commerce[24] pastoralism remains seen as the most honourable, reliable, and profitable livelihood. In conjunction with its social importance which has remained relatively intact, this economic importance is unlikely to diminish in the medium term. In conjunction with the perceived sustainability of current land-use patterns and the "inexhaustibility" of the ENCR's resources will continue to incentivise the aggressive growth of overall livestock populations. This will put continued pressure on fragile resources, especially in the Zones of Archeï and Aloba which already suffer from overcrowding. Without targeted intervention, this is unlikely to be matched with

[23] See section 8.
[24] See section 6.

adequate improvements in veterinary care, substantially increasing the risk of infectious disease to livestock and wildlife alike. The greatest threat to the character of the pastoral system will continue to come from the introduction of cattle, and the expansion of water truck use. While currently confined to the southern sectors of the park, this will result in the depletion of key pastures. While the direct impacts of cattle require further study, this would likely lead to substantial damage.

This growth in livestock numbers will likely be matched by substantial population growth, putting further pressure on the reserve's limited resources. Without targeted interventions from APN, livestock numbers will continue to fall both as the result of poaching and indirect competition for resources. While the lack of market opportunities and social restrictions will keep overall rates of poaching low, the trend will likely result in further local extinctions over the next 20 years.

3. Animal health

The veterinary heath situation in the ENCR is extremely poor, presenting both a key concern for pastoral populations and an important opportunity for APN engagement. Disease remains the number cause of livestock mortality throughout the reserve and constitutes the main barrier to further growth in the livestock population. All respondents reported that the epidemiological situation has declined significantly over the past three years, but technical awareness of veterinary health is extremely low, and few were able to provide a detailed overview of the situation.

The most common illnesses affecting camels are worms[25], scabies ("*La Galle*") and Gézéré (English translation unknown but affects the lungs and internal organs). Goats and sheep are most commonly affected by various lung illnesses (including tuberculosis and contagious caprine pleuropneumonia), and worms. The general incidence of illness (and worms in particular) appeared to be most severe in the southern (Archeï and Aloba) and western (particularly around Wadi N'dou and Sala), correlating highly with livestock density. Conversely, for unclear reasons worms appeared least frequent to the north of the plateau between Tebi and Mourdidjona.

Knowledge of veterinary care, treatment and epidemiology was extremely low throughout the surveyed area, and all communities reported that they are unable to obtain or correctly apply effective treatments. While price remains a factor, the main barriers to effective treatment appear logistical. Although affordable, effective medicines are available in Kalait, most herders are unable to spare the necessary time and resources to regularly obtain treatment there. As a result, most illnesses are left untreated or are addressed with whatever medicines are locally available regardless of their intended purpose. The efficacy of treatment is further undermined by pervasive veterinary malpractice. Treatment cycles are rarely observed, with most animals receiving an improper dosage over an improper period of time. This increases the risk from drug resistant treatments and can endanger human health when

[25] No herders were able to offer any more specific information on the most prevalent types of worms, or if this has changed.

proper withdrawal periods[26] are not observed. Non-medicinal treatments such as quarantining infected livestock, are rarely implemented and poorly understood.

In the face of these difficulties, many herders prefer to wait for government or humanitarian interventions and show limited initiative in addressing veterinary health issues independently. Communities in the north are more proactive, with communal councils in Tebi, Kourdi and Warta pooling funds to obtain both medicines and the service of trained vets who travel to the area from Kalait or Abeche. This appears to be highly effective and has resulted in improved socio-economic conditions.

Becoming involved in veterinary service provision not only offers APN the opportunity to make meaningful development impacts, but to meet one health targets and achieve modifications in pastoral behaviour. Animal health is one of the most pressing development concerns held by the community, and far outranks other interventions including human health and education in terms of desirability. By providing training and or medicine delivery APN could achieve rapid, meaningful economic improvements in a manner directly responsive to local aspirations. While the risk to wildlife posed by the current epidemiological situation is unclear and requires further research, several locally common diseases are known to infect ungulates including Addax and Oryx. This makes disease management an important part of the long-term reintroduction strategy. Animal health interventions further provide opportunities to conduct an accurate censorship of livestock numbers/ownership and have been proven as an effective tool to incentivise behavioural modification.

[26] The time that must elapse between administration of veterinary medicine and the slaughter/production of food from that animal to ensure levels of medicine in animal products remain below safe residue levels.

4. Economic networks

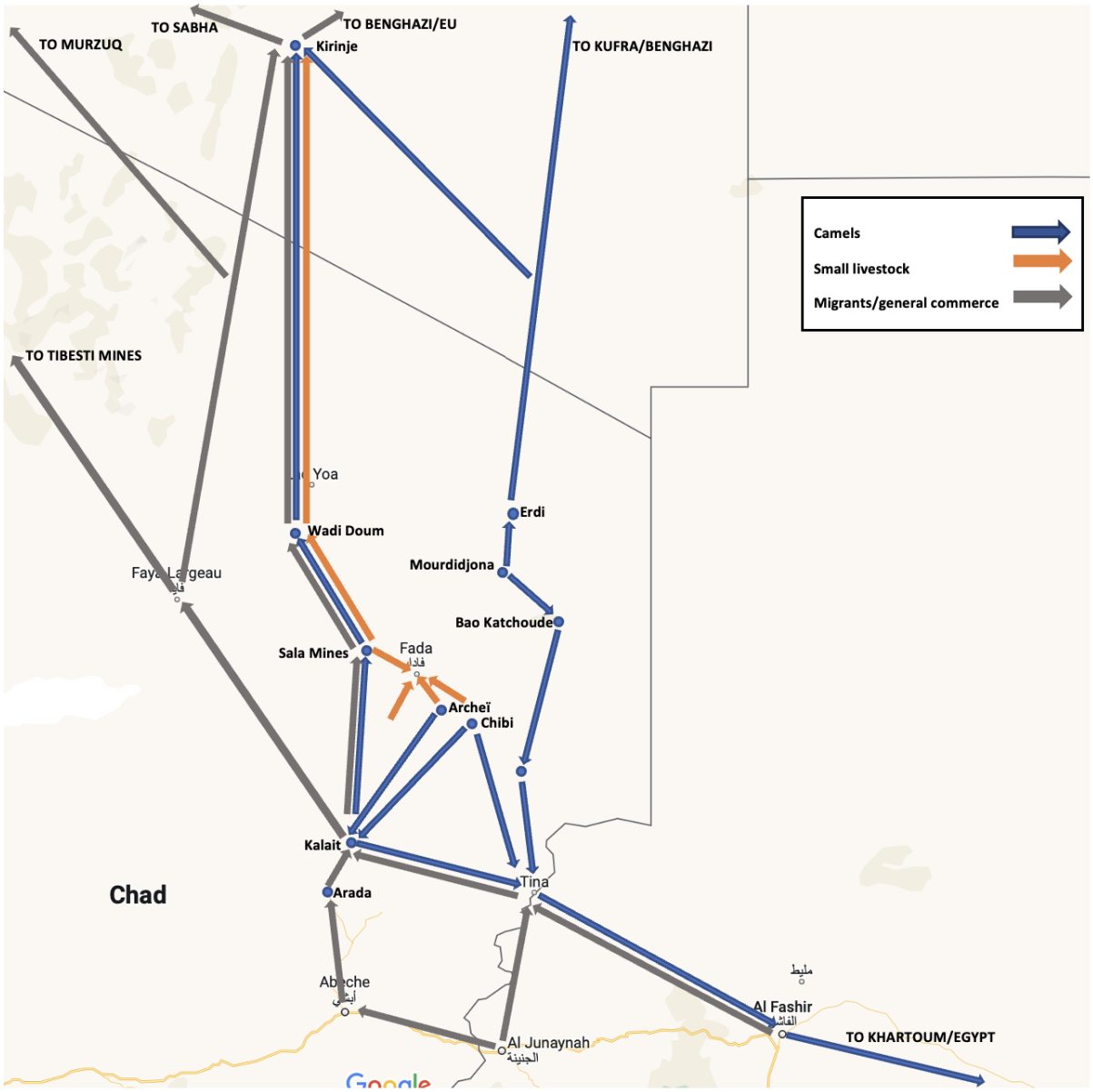

Figure 4: Key economic networks in the greater Ennedi Region.

Despite the highly self-contained nature of the ENCR's pastoral system, it remains highly reliant on several economic networks linking northern Chad to Libya, Darfur, and N'djamena. These economic networks play an important role in pastoral movements and decision-making, coupling pastoral livelihoods to other potential sources of land use change and environmental degradation in the ENCR. The fragility of these economic networks is both a key source of vulnerability for the Ennedi's pastoral communities but creates an important opportunity for meaningful engagement on behalf of APN.

Economy extremely reliant on pastoralism – other trades growing, but generally supplement rather than supplant pastoral livelihoods.

Reliance on few markets is a source of vulnerability. – but overall economy is resilient. Resilience developed further by expansion of secondary business like mining, human trafficking and NGO employment in Fada.

While communities within the reserve are able to meet most subsistence needs directly from the pastoral systems, the capacity of local markets (primarily Fada and Archeï/Edie) is extremely limited. Crucial non-perishable goods including veterinary medicine are rarely available, and herders are unable to sell or obtain favourable prices for their livestock within the reserve. Conducting these exchanges is the primary reason for herders to leave the reserve, and is the source of most long-range movements observed during the study?

The ENCR's pastoral system is fundamentally sustained by three main economic dynamics: trade with Kalait (Wadi Fira), localised commerce centred on Fada, and long-distance trade with Tina (Wadi Fira). At the nexus linking Chad's most influential trans-Saharan trade routes, Kalait is by far the most important pastoral centre in the Ennedi Region. Kalait is the only accessible market where it is possible to obtain a full range of veterinary medicine and the services of qualified veterinary technicians. In addition to hosting the region's largest livestock market, it is the cheapest and most reliable place to obtain other key goods and services including non-perishable items and food. A limited trade in natron between the Wadi Doum continues to be practiced by camel caravan, but its current socio-economic importance remains unclear.

While all communities rely on Kalait to some degree, the strength and nature of this connection is a function of both geography and deeper social ties. The key obstacle to market access for communities within the ENCR is the time and labour required to reach larger settlements like Kalait. Without access to vehicles, most must complete the journey to Kalait on foot or by camel at the expense of significant effort for both those travelling, and those left to mind remaining herds. As a result, trips are sporadic (two-five times per year), and generally occur only when major purchases are needed, or substantial numbers of stock are ready to be sold.

Unsurprisingly, communities in the southwest of the reserve have the closest ties to Kalait, almost to the exclusion of Fada, which they visit only rarely. While ties to Kalait are substantial in all communities south of Wei, those in the zones of Aloba and Archeï are able to meet routine needs in Archeï/Edie or Fada. However, while the expansion of markets in Fada and Edie has been significant, the absence of sufficient veterinary medicines and opportunities to sell livestock limit their importance. In addition to – and partly as a result of – its economic importance, Kalait has developed significant social importance. Many important Chef de Cantons and traditional leaders from the ENCR have relocated to Kalait, and commercial visits to the city are often connected with more subtle socio-political activities. Many key decisions regarding natural resource use, and pastoral development are now made here, and it is a critical point for further engagement by APN.

The key exceptions to this pattern are communities to the north and east of the plateau. Not only do vast distances make regular travel to Kalait unfeasible, but special ties to Libya and Sudan allow Mourdian herders to access markets inaccessible to other communities. In the north small livestock are typically moved by truck, and camels by caravan to the Libyan mines

at Kilinje, or from Mourdidjona towards Kufra. In the east, herders from Bao Katchoude move their caravans to the south travelling on foot directly to Tina and the border with Sudan. While trade with Tina occurs year-round, caravans are only able to move to Libya at the end of the wet season when camels are in peak physical condition and some remnant water can still be found on the long route north. While these movements involve far greater distances and hardships than trade with Kalait, access to these markets allows herders to obtain far higher prices for their livestock than would be locally possible in Chad. Other local economic centres are Mourdidjona, which services northern communities with a limited selection of non-perishable goods and the mining settlements of Wadi Sala. While large numbers of small livestock are sold to service the mines at Wadi Sala, this trade appears to be dominated by a small number of individual families and has not had a transformative effect on the pastoral economy.

Within a cash poor and heavily saturated market, the trade in livestock within the reserve is effectively limited to the sporadic sale of goats and sheep for immediate consumption in Fada. Especially notable is the limited local trade in camels. Despite being the primary value store and commercial backbone of the ENCR, camels are rarely sold locally. Although camels are frequently exchanged both within and between communities, most local exchanges are not monetised and occur as part of customary marriage, dispute settlement or inheritance practices. While some are sold to travelling Sudanese traders (primarily Zaghawa operating out of Tina), the vast majority of camel sales are conducted in Kalait or Tina directly. While the final destination for Ennedi's camels is almost without exception Libya or Sudan, most herders do not feel safe or comfortable doing business directly with export markets. Gorane herders routinely expressed hostility towards the Zaghawa community in Tina, while insecurity has effectively closed the traditional trade with Kufra to all but certain Mourdian clans who maintain a special relationship with authorities there.

All respondents indicated that the main factors in the decision to sell livestock were overall mortality rates and personal circumstance. Herders place high importance on growing their herds over time, and any sales are kept below the projected rate of reproduction for a given herd. However, the relationship between mortality and sales is complex. While all herders reduce their sales during periods of higher mortality, they are most likely to sell when faced with hardship. As hardship often co-occurs with epidemics and insufficient rainfall, creating an unpredictable pattern of behaviour.

The same rings true for the timing of livestock transactions. While sales increase in the leadup to Islamic holy days such as Eid al-Adha, most herders attempt to ensure that sales are relatively consistent throughout the year in order to minimise the impact of fluctuating herd sizes. Notably the biggest constraint here is the ability to travel to livestock markets like Kalait, with communities practicing transhumance to Erdi effectively only selling stock once a year. Understanding commercial livestock transactions is complicated by social taboos[27], and other drivers of significant changes in herd size (e.g., inheritance, marriages, and the payment of customary fines) which may obscure important factors not discussed here.

[27] Livestock numbers, and the details of specific transactions or trends which may provide insight into the economic state of a household are considered highly sensitive, private information.

The lack of an effective pastoral market within the ENCR was identified by all respondents as a significant barrier to sustainable development and source of vulnerability. While reliance on middlemen leads to substantial lost revenue, the ENCR's pastoral economy remains highly exposed to external market pressures. The current conflict in Sudan has precipitated a massive livestock selloff in Darfur, and effectively shuttered the transborder market at Tina. This has had a dramatic result not only devaluing the camel market in north-eastern Chad but reducing opportunities for sale. This is likely to have an adverse impact on local economic conditions within the ENCR and could incentivise participation in more environmentally damaging economic practices. Given the social importance of camel ownership, the events in Sudan are likely to reduce the sale of camels from with the reserve and incentivise the purchase of further camels. This would accelerate the growth of livestock populations within the ENCR, further increasing pressure on pasture and water resources.

Of particular note is the growing trade in non-animal natural resources with Libya. While the cutting of trees within the reserve remains rare, a substantial quantity of dried wood is collected in the reserve for sale in Kilinje. Most of this collection appears to occur in the western sector of the ENCR and is tied to both the export trade in small livestock and general commercial movements. While further study is needed to understand the scale and impacts of this trade, the commercial harvest of dried wood is unlikely to be sustainable. Over the long-term, this could force local communities to cut living trees and irreversibly damage the ENCR's fragile vegetation.

Beyond pastoralism, the main economic activities in the reserve are government/military/NGO employment in Fada, mining, and trade/human trafficking. Despite the growing importance of these businesses, they have yet to supplant the importance of pastoralism. On the contrary, most evidence collected during the course of this study indicates that participation in these activities is often a direct attempt to bolster pastoral resilience and growth. Many young men of low social standing see mining as an easy way to obtain the funds needed to establish their own herds and gain the associated status and social recognition. As long as pastoralism remains perceived as the most honourable, stable, and profitable long-term profession it is likely to remain the most important economic activity within the reserve.

5. Interactions with wildlife

Although poaching is uncommon amongst pastoral communities within the ENCR, it remains a persistent threat across the reserve. Poaching is typically opportunistic, and with the exception of bushmeat destined for the mines of Wadi Sala, is never commercialised. While the only species routinely targeted for bushmeat are Moufflon and Dorcas Gazelle, all herders take aggressive, indiscriminate actions to control the threat posed by large predators including Hyenas and Jackals. Although customary governance structures are highly effective at limiting poaching by outsiders, enforcement against local poachers is hindered by the deep-seated perception that poaching is a "legitimate" crime. Coupled with the widely held belief that traditional hunting did not contribute to the local extinction of key species like the Addax, this makes elders reluctant to impose penalties on blood relatives or during times of hardship.

Unlike in many protected areas, there is little evidence that pastoral livelihoods are directly linked with poaching in the ENCR. Although all respondents acknowledged ongoing wildlife declines, most indicated that poaching has decreased and is only practiced by a few well-known individuals. However, any decrease in hunting is likely the result of smaller wildlife populations, reduced reliance on bushmeat and increased involvement in more lucrative activities (especially human trafficking and mining) rather than law enforcement efforts.

While hunting has historically played an important role in local livelihoods, both as a source of supplementary protein and recreation, it was tightly regulated under traditional systems of natural resource governance. Underpinned by customary Islamic law, strict penalties were applied to unsustainable practices (e.g., the killing of females, hunting during mating season, killing excessive numbers etc.), and hunting by non-locals was totally prohibited. However, while poaching by outsiders is dealt with severely, "unsustainable" practices when committed by locals remain classed as a "legitimate crime"[28] and are met with relatively low social and financial penalties.

Importantly, under this framework hunting in itself (when practiced by locals) does not constitute a violation of customary law. This stems from the deeply held belief that local hunting is sustainable and was not responsible for the localised extinction of large mammals including the Addax and Oryx. Instead, all communities blame external factors and the suspension of customary law during the prolonged war with Libya. Thus, while all communities were aware that hunting within the reserve is illegal, few perceived it as unsustainable or a significant threat to remnant wildlife populations. As a result, communities rarely if ever act to sanction poachers despite the fact that most openly admitted to knowing which individuals remained engaged in the practice. In those cases where individual elders *did* perceive hunting as unsustainable and worthy of punishment, they complained that popular opinion made it impossible to apply punitive actions. Thus, while communal governance structures may retain the necessary capacity, concerted outreach and education efforts are needed to ensure they can play an effective role in the ENCR's LAB strategy.

In addition to poaching, actions taken by herders to control predatory wildlife pose a substantial indiscriminate threat. While no individuals would admit to using poison, it is widely acknowledged that the practice remains common throughout the reserve. Carcasses are poisoned with either commercially available chemicals obtained in Kalait, or traditional plant-based compounds like *Yombo*[29]*.* These compounds are not only a leading driver of large mammal and vulture declines but are known to have harmful impacts on other plant and animal communities. Although concerted efforts by the government and local leaders have successfully made poisons more difficult to obtain, it remains challenging to identify and prosecute offenders. Further research is needed to better understand the types of poison and delivery methods most commonly used within the reserve to quantify its impacts and develop improved countermeasures.

[28] For an in-depth analysis of "legitimate" vs. "illegitimate crime" see "Environmental Anthropology ENCR Report" (Handley, 2022).

[29] English name unknown but used by women to darken the appearance of Henna.

6. Mining

The continued rapid expansion of artisanal mining along Wadi Sala poses an immediate, critical threat to the long-term sustainable management of the ENCR. While previous records provided to the consultant made mention of some mining activities in the western sector of the park, these grossly underestimate the size and significance of these operations. Mining is currently being carried out by 13[30] legally licensed groups, in full cooperation with local authorities in Fada.

While it was impossible to make an accurate estimate of the size and or extent of these operations, they currently cover an area of at least 30-45km^2 and are rapidly expanding. The expansion of these mines has been accompanied by a massive population boom, and several thousand people are now believed to be working and living in what was previously an uninhabited area of marginal pastoral value. While ownership of the mines remains unclear, it appears to be dominated by local Gorane and Zaghawa families. Most workers are migrants from southern Chad and Darfur, and no locals appear to be actively involved in the physical extraction process.

Mining is being conducted using the typical Darfur/Sudanese methodology and is being overseen by skilled Sudanese supervisors. The first round of processing is conducted by the artisanal miners themselves who are able to operate with a high degree of autonomy. Once the ore is crushed, it is mixed with water and mercury to create a slurry from which pure gold can be cheaply extracted. The resulting effluent and crushed ore (known as *Karta*) is then passed on to more industrial operations, who treat it using a concentrated cyanide solution in large open pools. Following the completion of both stages, contaminated tailings are discharged into the wider environment.

Both processes not only pose a direct risk to the health and wellbeing of miners (who operate without any safety equipment or oversight) but cause devastating environmental damage. Mercury and cyanide are extremely difficult to neutralise once they have entered the environment and cause irreversible damage to plant and animal communities. Given the underlying geological features of the area, and the fact that these mines are located along a key Wadi there is a high risk that these toxins could impact a far wider area both within and outside the ENCR. In addition to the threat posed to wildlife, multiple pastoralists interviewed in this study reported that their livestock had been killed both from exposure to poisons, and by falling into mine pits.

In addition to the unregulated disposal of toxic chemicals into the reserve, these mines create a number of additional direct and indirect threats to park management. Due to concerns that local groundwater supplies have become contaminated, all water for human consumption and mine use is trucked in from nearby water points in Sala Kebou and as far away as Kontor and Chili. This puts immense stress on the local water reserves used these pastoral communities and incentivises the construction of new bore holes. Population growth and the high relative cost of meat within the mines has further driven a significant increase in poaching across the ENCR's west. Markets within the mines are the only place bushmeat

[30] Ten have organised to form a larger cooperative, while three remain independently run and operated.

(primarily Dorcas but sometimes Moufflon) is regularly sold, and prices are competitive with sheep or goat meat. This is highly concerning giving that there is no evidence of commercial poaching anywhere else within the reserve, and that the sale of bushmeat is novel phenomenon in the Ennedi Region. While there is no evidence that migrants working in the mines are involved in this trade, the presence of large numbers of poor labourers equipped with motorbikes remains a significant concern for any reintroduction in the western sector. An additional concern is the large amount of waste being produced and disposed of in the general environment. While the mines constitute a significant market for small livestock, there is no evidence that it has led to any significant change in the local pastoral economy.

While the mines are legal and well known by Chadian authorities, it is extremely concerning that the ENCR has not actively attempted to assess and mitigate the impact of these mines. Although the Chadian Government is unlikely to support the closure of the mines, there is a mutual interest in assuring that these mines remain compliant with relevant environmental legislation. While the presence of the mines is a clear risk, their legality creates a rare opportunity for APN to engage their management directly and to work with the Chadian authorities to ensure that any environmental risks are minimised and mitigated. This is in addition to statutory obligations created by the presence of these mines within the UNESCO world heritage designated sector of the park.

7. Perceptions of APN

While perceptions of APN are generally positive, few pastoralists have a good understanding of what the organisation intends to achieve or why. Most communities are strongly in favour of further re-introduction and are appreciative of APN's other community projects and general economic contributions to the area. However, the existence of the ENCR as a functional protected area and APN's management authority is neither visible to, nor understood by any herders.

The re-introduction of Ostriches was very popular amongst all pastoral communities surveyed in this study and is seen as a particular point of pride by the people of Aloba. Despite a single significant incident of human-wildlife conflict[31], most herders do not believe that wildlife will compete with livestock. Instead, most believe that the re-introduction of wildlife will improve the availability of pasture by increasing rainfall. There is a deeply held belief[32] stipulating that God will always provide for wildlife and increase the availability of pasture in accordance with any increased demand. This belief was substantiated in the minds of the populace by what were perceived as higher levels of rainfall in and around Aloba following the reintroduction.

Perceptions of other community initiatives and research activities are more divided. While the environmental education program is highly successful, other sensitisation efforts attract substantial criticism. Herders argue that all communities are aware of existing environmental legislation, and that poachers knowingly violate rules, making basic sensitisation an unnecessary waste of time. They further complain that community initiatives are rarely in line

[31] The child of an influential Zaghawa elder was injured by an Ostrich, suffering the loss of several teeth.
[32] Likely of Islamic origin.

with local priorities, and do not reflect the advice given by the community during consultations[33].

Particularly in Aloba and Archeï the consultant encountered repeated complaints that the community is tired of hosting consultants and being the subject of repeated socio-environmental research. While the communities are very willing to discuss concrete issues relating to natural resource management, they attribute their reticence to APN's limited apparent ability to translate research into action. They say there is little to no evidence their voice is considered during management planning and remain confused by APN's role in a protected area that in their view has failed to materialise. While the situation was easier to the north, this is likely the result of fewer past studies having been carried out here rather than a fundamentally different disposition towards APN.

While opinions of the ecoguard program were positive[34], elders consistently expressed concerns about their efficacy. They repeatedly raised the issue that patrols do not adequately cover known poaching hot spots, and that LAB management does not coordinate closely with communal leaders. As discussed in section 7, elders are highly aware of who is poaching what and where but require additional support to effectively apply sanctions. Following several offers to improve coordination, many communities expressed concerns that APN's seeming unwillingness to meaningfully engage with existing leadership structures is evidence of disingenuity.

It is important to note that these issues exist in a context where APN has made little effort to induce behavioural change within the reserve. Although the absence of any practical difference between land management within and outside the ENCR creates confusion, any attempts to modify behaviours (e.g., by closing pastures as part of the reintroduction program) will likely exacerbate existing tensions and be met with hostility.

[33] Examples include slow progress towards the construction of a hand pump in Archeï.
[34] Mainly because it provides a valued source of fixed employment.

8. Recommendations

1) Ban cattle and the use of water trucks within the ENCR.

As discussed above, the emergence of commercial cattle herding in the southern sectors of the ENCR constitutes the most significant immediate threat to the character and sustainability of the Ennedi's pastoral system. Cattle herding is not only far more environmentally taxing than traditional forms of pastoralism, but its commercial nature incentivises a host of harmful practices including the use of water trucks.

Banning cattle would be a meaningful first step to make the boundaries of the ENCR meaningful both in the minds of its pastoral population, and in terms of nature conservation. Still in its early stages of adoption, it is crucial that APN act quickly before cattle become both more widespread and accepted by the wider population. While prohibitions on natural resource use are typically unpopular amongst the ENCR's pastoral populations, a ban on cattle would likely find widespread support amongst the general population and communal leadership. Cattle are currently perceived as a threat by most local pastoralists within the reserve, providing no economic benefits and threatening the use of some of their most prized pastures. The introduction of cattle further is linked to the emergence of new diseases with which herders are not familiar, putting strain on an already serious epidemiological situation.

However unlike in the case of water trucks, communities have so far taken few to no actions to counter the spread of cattle within the reserve. While most cattle are currently owned by highly connected wealthy Zaghawa outsiders, limited experimentation with cattle ownership has begun amongst local herders. This has resulted in a cautious reluctance to take any action against what they perceive may constitute a future business opportunity. This creates an imperative for APN to act before local communities develop a vested interest in their presence.

The most effective way to operationalise such a ban would be in direct partnership with local communal leadership structures. By developing an accord in partnership with all Chef de Canton with jurisdiction over the reserve APN would demonstrate genuine support for local institutions, while providing the first visible evidence of its ability to transform the ENCR into an actively managed reserve. Such an action must be supplemented by a targeted sensitisation program, directly tailored to frame the challenges posed by capital in terms that directly relevant to pastoral livelihoods (e.g., long-term pastoral sustainability) rather than in abstract environmental terms.

In addition, APN should take immediate steps to identify cattle ownership structures and current distribution to ensure that any forthcoming accords are sensitive to potential triggers of intercommunal conflict. While the communal leadership structures have demonstrated their ability to enforce similar rulings, their reluctance to act against the issue may suggest the presence of political factors as of yet unknown to park management. These must be identified, and a thorough risk mitigation plan develop in conjunction with the communities in question. APN must further ensure that any enforcement mechanisms are nested within broadly accepted frameworks of customary justice and punishment. To ensure compliance,

this should be complimented with the improved demarcation of the southern park boundary, which as of present remains physically and practically invisible.

A ban on water truck usage would likely receive broad support from all key communities within the reserve and could effectively be rolled into a single management decision. Water trucks were universally identified by respondents as a direct threat to the sustainability of their livelihoods in addition to their negative impacts on APN's conservation objectives. While communities have already acted against water trucks, APN must identify key obstacles to the successful implementation of these decisions. This would not only help management develop and implement future regulations but would demonstrate a genuine commitment to support decisions autonomously made by communities when it comes to the management of their resources. Autonomy is a crucial issue for local communities, and such an action would go a long way to build trust in APN's objectives and methodology.

2) Prioritise the development of a workable land-use plan.

As discussed above, the existence of the ENCR as a distinct entity with and APN's ability to formulate and implement regulations is not currently evident anywhere within the reserve. While interventions to support sustainable initiatives are appreciated and have achieved significant outcomes, no visible attempt has been made to *regulate* land-use within the reserve. This not only critically undermines progress towards APN's long-term management objectives and compliance with organisational SOP's but reinforces the widely held belief that APN management either operates with ulterior motives or is no different to other NGOs operating in the area. This lack of distinction not only leaves APN liable to any negative sentiment held towards humanitarian intervention at large but undermines APN's ability to meaningfully modify land-use in pursuit of improved conservation outcomes.

The development of a draft land use plan is not only crucial for the operationalisation of park management but will support all community engagement activities by providing concrete details for negotiation and better insight into APN's long-term intentions for the reserve. In order to develop such a land-use plan, priority should be placed on the identification and establishment of a suitable framework for eventual negotiations. During this process real efforts must be made to ensure that all communities have the opportunity to express their needs and aspirations for long-term natural resource management.

While ENCR management has access to sufficient raw data to begin the land-use plan development, current land cover mapping is insufficient. Targeted land cover mapping exercises should be conducted to provide an accurate overview of the ENCR's diverse physical landscapes. Participative mapping should then be used to identify how land cover influences land-use.

Direct efforts should be made to include communities in all stages of this process. This would not only further build trust but would help park management understand potential issues and further refine its strategic vision.

3) Conduct a thorough study of mining within the reserve to develop an actionable intervention plan to reduce associated environmental hazards.

One of the most critical threats to the long-term establishment of the ENCR as a functional reserve has been the growth of major mining operations in Wadi Sala. Although the legality of these mines provides a rare opportunity for meaningful positive engagement, internal reporting on the phenomenon is woefully inadequate. No meaningful studies have been made to measure the extent of mining operations nor to quantify their impacts, and no effort has been made to minimise any of their harmful effects. This not only poses a direct threat to the ecological integrity of the reserve, but fundamentally undermines perceptions of APN as a legitimate conservation agency in the view of the public. In addition, it may violate statutory obligations held by APN as custodian of a UNESCO World Heritage Site. If no efforts are made to manage the impact of mining within the reserve, this will likely result in the categorisation of the reserve as a World Heritage Site in Danger and come at significant reputational cost for the organisation. This would be in addition to the likely irreversible ecological destruction created by the mining process itself.

While mining is an endemic threat to protected areas across Africa, the legality of the Wadi Sala mines creates a powerful opportunity for action. While it means the Chadian Government is unlikely to support their closure, it allows APN to engage with miners and their operators in an open manner. As in Sudan, miners, mine owners and herders in Wadi Sala are acutely aware of the risks they pose to their health and their environment. With a vested interest in activities that promote sustainable mine management there is a high degree of openness to programs that would efficiently reduce environmental hazards. Following a survey of the site, APN should engage operators directly to see how targeted technical support could reduce environmental impacts without incentivising further mine expansion. This could include the construction of more effective tailings dams, the introduction of basic waste collection/management facilities, and the sensitisation to reduce risky behaviour.

This must be coupled with direct government engagement both in Fada and at the ministerial level. APN should push for the issuing of further mine licenses to be suspended pending the development of a workable risk reduction framework. By identifying and engaging relevant technical authorities APN should further pursue the investigation of existing environmental impact and mitigation strategies submitted as part of the licensing process. Together with operators and local communal leadership, a suitable monitoring framework must be introduced. This must be reinforced with strategic partnerships that will allow APN to collect evidence on and support the prosecution of relevant violations under Chadian law.

Recognising the current threat posed by these mines, APN must further review any re-introduction plans in the western sector of the park and actively begin sensitising miners to reduce the risk of future poaching/human-wildlife conflict.

4) Implement a conservation sensitive framework for water point installation.

While the construction of new water points is routinely celebrated by communities across the ENCR, the disorganised framework within which this occurs poses a risk to the potential of the ENCR as an effectively managed reserved. There currently is very little coordination

between the various NGOs who are active in the space, and with APN. This means APN rarely has a complete picture of water resources within the reserve and is unable to actively influence the selection of new sites. While no NGOs actively seek to cause environmental harm, standard environmental risk assessments neglect many key concerns crucial to APNs long-term vision for the ENCR including how water point placement and subsequent changes in pastoral mobility will affect wildlife.

While all NGOs in the space appear highly supportive of improved coordination, this is unlikely to occur without a concerted effort by APN. Park management should identify all actors within the space, and work collaboratively to develop a voluntary set of environmental standards. If integrated into the site selection and construction process this would allow APN to proactively bring future developments in line with a sustainable land-use plan, and further improve community outreach. These efforts should be coupled with a renewed focus on the repair of existing water points. This would reduce the need and incitive for the construction of new water points and stabilise pastoral movements.

5) Develop targeted actions to support improved animal health outcomes.

Severe deficits in veterinary care provision were identified by all respondents surveyed in this study as one of the primary barriers to socio-economic development and sources of hardship within the reserve. APN's failure to deliver what are perceived by communities as genuine and feasible projects is the primary source of negative sentiment towards the organisation and significantly undermine all other proposed interventions.

By partnering with existing veterinary care providers and or directly implementing activities such as vaccination campaigns APN would not only gain confidence and trust but would create critical opportunities to conduct a meaningful census of current livestock populations and monitor future change. This data is necessary to develop detailed plans to improve the sustainability of the ENCR's pastoral system, and the benefits it provides to local communities.

While improved veterinary care would reduce mortality and lead to an increase in livestock populations over the medium term, the potential rewards far outweigh the risk of such an intervention. In the absence of sufficient data there is no hard evidence that a moderate increase in stock numbers would be inherently unsustainable, were a nuanced land management plan be put into place. While the need for restrictions on resource use within the ENCR is clear, any substantial efforts are likely to be ineffective without a genuine attempt to compensate herders for real or perceived losses. With no real coercive capacity, APN must work within the appropriate local framework which emphasises a flexible conciliatory approach to natural resource management.

As observed in other areas of the Sahel, APN retains other options to maintain stock at a sustainable without simply relying on epidemiological mortality. Support to local livestock markets coupled with targeted sensitisation could incentivise higher rates of sale. This would allow herders to increase their profits while maintaining herd size within a sustainable band. Were mortality rates to stabilise, this would allow further allow herders to practice more effective financial planning, a factor strongly correlated with improved socio-economic

welfare. By packaging future restrictions and compliance[35] in a development focused framework that directly responds to needs articulated at the community level, APN could achieve remarkable results for both the ENCR's environment and its people.

6) Increase APN presence and engagement in Kalait and Tina.

The key economic importance of Kalait and Tina coupled with the presence of several influential Chef de Cantons in both locations creates a strong imperative for improved engagement here. By engaging focal points in these areas, APN would not only support its broader community engagement focused agenda but could more accurately track and proactively respond to key threats from beyond the reserve.

7) Suspend anthropological research until a clear strategic direction is developed.

As noted in this – and all preceding – studies, communities across northern Chad are extremely prone to research fatigue. While best efforts were made to avoid visiting communities that had been recently surveyed, it quickly became apparent that future research risks causing real damage to perceptions of APN within the reserve, and the ability to efficiently collect accurate anthropological data. The number one concern raised by all communities was that they see no clear connection between research and APN's activities in the field. They feel that their insights are ignored, and suspect that park management lacks a clear vision.

Given these risks, and the large quantity of data already at the disposal of park management, this study formally recommends the suspension of all anthropological research until engagement can be refocused on clear practical interventions. These interventions must be visible, and discussions must provide a sense of genuine ownership to the communities they intend to serve.

Work carried out during this study strongly supports the conclusion that many key questions held by management could be answered by relying on the expertise of local staff, and improved communication between departments.

[35] With regulations as stipulated in any eventual land use plan.

9. Annex I: Regional details

a. Zone North

Tebi/Berkeï	
General overview:	Tebi is a large exclusively Gorane community mainly populated by the Makala clan. The community is highly sedentarised and practices no clearly defined pattern of seasonal mobility. Tebi is an important local administrative center and is managed by a highly effective local council consisting of the Prefet, Chef de Canton, four Chef de Quartier, and a mayor. General environmental conditions in Wadi Tebi and Barkeï are good, with little to no evidence of degradation.
Camel pasture:	Camels stay relatively close to Tebi all year round (<2h walking). No pronounced seasonal pattern in movements, but strong preference for the following pastures to the southeast: ***Ederié, Kécheniga, Kouritromont, Béré, Oko*** and ***Warta***. Some groups periodically use ***Hardjala*** to the north, and ***Kebété*** to the west. General perception that the condition of camel pastures is very good, does not limit livestock populations and can sustain substantially more camels.

	Contingency plan for prolonged periods of very low rainfall is it shift camel herds to Barkeï and then towards the plateau.
Camel water:	All camels are watered in Tebi town throughout the dry season. Water situation generally adequate, and the town possesses two forages, several traditional wells and water tower currently under construction by PREPAS. During the wet season camels are watered at ephemeral water sources, or to a lesser degree in town. Some pressure from communities to the east (Barkeï, Warta and Kourdi) who come to Tebi when local water sources are insufficient or when camels owned there need to move near to Tebi.
Goat/Sheep pasture:	Goats and sheep are kept near family compounds within Wadi Tebi year-round, with no specific preference for specific pastures. May opportunistically travel with camels during the rainy season depending on family circumstances. General perception that local pastures near home compounds in Wadi Tebi are good and can sustain much larger livestock population.
Goat/Sheep water:	All water taken at Tebi, see camel water above.
Domestic water:	General perception that while adequate, the domestic water situation is precarious. This is due to significant recent population increase, growing livestock numbers, and periodic pressure from peripheral communities to the east who rely on Tebi's forages as backup water sources. While the community believes the PREPAS water tower will meet address these issues in the short term, they are actively pursuing the construction of additional forages.
Animal health:	Animal health situation is generally poor, but better than in the south. Main diseases affecting camels are scabies (*La Galle*) and anaemia. Unlike in Archeï an Plaines d'Aloba worms are not a major issue here, primarily affecting young camels. The key barriers to the effective treatment of livestock are the accessibility of medicine, and lack of veterinary expertise. The community complains that effective medicines are not available locally (Fada) and must be obtained in Kalait or Abéché which entails prohibitive travel times. In response the community has begun pooling funds to bring veterinary specialists and medicine from Abéché. This has been highly effective, and the community shows a much higher awareness of one health principles than other communities surveyed for this report (transmission risk factors, the implementation of quarantine regimes, the importance of completing full treatment cycles etc.)
Poaching:	Very limited perception of poaching as a key concern. Dorcas's gazelles remain common in and around Tebi, and in most pastures

	between Tebi and the plateau along the road to Fada. People are proud they still have gazelles in their area but blame the extinction of Oryx and Addax on the war.
Economic network:	The main markets for small goods are Fada and Mourdidjona. Camels are typically brought on foot be sold in Kalait, or Libya. Small livestock is commonly brought by truck for sale in the mines of Kilinje (Libya) or are brought on foot to Fada. Very limited non-pastoral economy restricted to remittances from and opportunistic trade with Libya.
Other key observations:	None.

Canton de Taola (Kourdi, Warta)	
General overview:	Kourdi is a large sprawling, exclusively Gorane community effectively contiguous with Warta. Kourdi functions as the seat of the Canton of Taola and is an important link between the Mourdi Depression and the plateau. Communities here practice a pronounced pattern of short-range seasonal transhumance moving between the Kourdi area in the dry season and the plateau during the rainy season. While these communities are largely sedentary, many families follow their herds onto the plateau for much of the rainy season.
Camel pasture:	***Kourdi*** sits on an important pasture area that extends to include ***Keché***, ***Bré***, ***Keliné***, and ***Aharsi***. These pastures along the southern extreme of the Mourdi Depression are only used during the dry season. Immediately following the onset of the rains camels are moved up into the plateau where they remain until the following dry season. Community members were able to name more than 20 specific pasture areas within the plateau, and indicated that families disperse widely, at times moving also as far south as Fada.
Camel water:	During the dry season camels are watered at the traditional wells in Kourdi and Warta. When these are damaged or run dry, many families divert to the forages in Tebi.
Goat/Sheep pasture:	Goats and sheep are moved along with camels and follow the same pattern of movement described above.
Goat/Sheep water:	Same as for camels as described above.

Domestic water:	All domestic water is taken from traditional wells. These traditional wells are not permanent and have a high failure rate. Both Kourdi and Warta are currently exploring opportunities for the construction of a permanent project well or forage.
Animal health:	The animal health situation here is similar to Tebi, with the main problems being scabies, and anaemia. Veterinary medicine is not locally available, and a local committee has been active bringing vets in from Abéché as in the case of Tebi. Comparatively less awareness of animal health issues and treatment options than Tebi.
Poaching:	Local community leaders are extremely passionate about remnant wildlife populations in their area. No evidence of commercial poaching but acknowledge than known members of the community routinely kill moufflon and Dorcas gazelle. Actively solicit support from APN to bring poachers to justice and request improved cooperation with the APN LAB team.
Economic network:	The main market for small goods is Fada. Camels are typically sold in Kalait or brought on foot to Libya. Small livestock are sold either in Fada or trucked to Kilinje. The local economy is totally dominated by pastoralism and remittances from Libya.
Other key observations:	Several members of the community expressed a desire to permanently settle in the plateau which they say would allow them to access more reliable pasture year-round. This appears to be part of a larger trend which has seen the establishment of numerous semi-permanent compounds in areas of the plateau to the south and southeast of Kourdi. Domestic water appears to the main obstacle for further colonisation of the plateau. Although livestock can be watered year-round on the plateau, natural water sources are small and widely dispersed making them unreliable and or excessively highly labour intensive for domestic use. Community shows above average desire for improved education and commercial opportunities. The community was extremely open, showed little research fatigue and a genuine desire to deepen their working relationship with APN.

Oro

General overview:	No men were encountered during the visit to Oro, and observations are thus limited to observation, responses from nearby communities and brief interviews with women on-site. While the women were unable to name the specific pastures used by the community, local land-use seems to follow a similar pronounced seasonal pattern as Kourdi. All men had departed for the plateau where they appear to remain for the duration of the rainy season.
Camel pasture:	During the dry season camels use pastures in and around Oro, at the southern fringes of the Mourdi Depression (names unknown). At the onset of the rainy season all herds are moved to the south and southeast onto the plateau where they use a wide area of different pastures.
Camel water:	During the dry season camels are watered at the traditional wells present within the community. During the rainy season water is obtained from seasonal water points on the plateau.
Goat/Sheep pasture:	Same as camels, see above.
Goat/Sheep water:	Same as camels, see above.
Domestic water:	Domestic water drawn exclusively from traditional wells present within the village. Status and sufficiency of these water sources unclear.
Animal health:	Animal health situation appears to be similar to Kourdi.
Poaching:	The consultant was unable to obtain specific info on local poaching dynamics.
Economic network:	Appear to be same as for Kourdi; small goods obtained in Fada, while camels sold in Kalait/Libya and small livestock sold in Fada/Libya.
Other key observations:	None.

Micherou	
General overview:	No men were encountered during the visit to Micherou, and observations are thus limited to observation, responses from nearby communities and brief interviews with women on-site. While the women were unable to name the specific pastures used by the community, local land-use seems to follow a similar pronounced seasonal pattern as Kourdi. All men had departed for the plateau where they appear to remain for the duration of the rainy season.

Camel pasture:	During the dry season camels use pastures in and around Micherou at the southern fringes of the Mourdi Depression (names unknown). At the onset of the rainy season all herds are moved to the south and southeast onto the plateau where they use a wide area of different pastures.
Camel water:	During the dry season camels are watered at the traditional wells present within the community. During the rainy season water is obtained from seasonal water points on the plateau.
Goat/Sheep pasture:	Same as camels, see above.
Goat/Sheep water:	Same as camels, see above.
Domestic water:	Domestic water drawn exclusively from traditional wells present within the village. Status and sufficiency of these water sources unclear.
Animal health:	Animal health situation appears to be similar to Kourdi.
Poaching:	The consultant was unable to obtain specific info on local poaching dynamics.
Economic network:	Appear to be same as for Kourdi; small goods obtained in Fada, while camels sold in Kalait/Libya and small livestock sold in Fada/Libya.
Other key observations:	None.

Mourdidjona	
General overview:	Moudidjona is a large community that serves as the administrative focal point for north-eastern Ennedi. While the population is exclusively Gorane, there is a pronounced sense of local identity, with most residents self-identifying as “Mourdian”. The population is contiguous with that of Bao Katchoude, and while largely sedentary, practices the most pronounced form of seasonal transhumance seen in the ENCR.
Camel pasture:	During the dry season most camels are grazed in peripheral pastures between the village and the plateau. Immediately following the onset of rains, the vast majority of camels move to the ***Erdi Massif*** between 95 and 350km to the north. Here herders disperse over a relatively vast area before returning to Mourdidjona once natural water sources in Erdi have been exhausted. Smaller numbers of camels are moved into the plateau (mainly to ***Aouli***) during the rainy season along with mobile family camps and small livestock.
Camel water:	During the dry season camels are watered at the village forage and the numerous shallow wells located in the area. During the rainy

	season camels use natural water sources in the Erdi Massif and Ennedi Plateau.
Goat/Sheep pasture:	Small livestock are kept in pastures around the village during the dry season, before being moved to the southeast into the plateau during the rainy season. Very few to no sheep/goats are moved to Erdi.
Goat/Sheep water:	During the dry season sheep and goats are watered at the forage and shallow wells in the village, before shifting to naturally available water on the plateau throughout the rainy season.
Domestic water:	Domestic water is taken from the village forage and a number of shallow wells around the community. Mourdidjona was the only community visited during this study that expressed satisfaction with current water availability.
Animal health:	The animal health situation here seems better than average, with the most common disease for camels being scabies. Unlike in many areas of the plateau, worms are not a major issue for camel populations. The most common causes of death amongst sheep/goats are Tuberculosis and worms. There is very little access to veterinary medicine among the community, which again cited logistics as a bigger constraint than price. Traditional medicines remain the most common treatment for many illnesses include scabies and TB.
Poaching:	While Mourdidjona is the closest community to known Libyan criminal groups extensively engaged in poaching, pressure in the immediate vicinity of the village is low. Residents and communal leaders in Mourdidjona have extensive contact with aforementioned syndicates and appear enforcing informal agreements that effectively limit hunting from non-locals. As elsewhere in Ennedi, poaching is opportunistically carried out by known individuals within the community. However, the presence of numerous Dorcas gazelles in the area indicates that this occurs at a limited scale.
Economic network:	Interestingly, the community of Mourdidjona appears to have few ties to Kalait and Fada, with most trade either being conducted in Tiné, and al-Kufrah (Libya) and Abéché. Due to its extreme remoteness, commercial exchanges are limited. Most camels are sold in Libya, with several large caravans leaving the Erdi Massif at the end of the rainy season. Due to close ties with the population of al-Kufrah, Mourdidjona is able to Arab dominated trade routes closed to most Tubu/Gorane traffic. Secondary exchange occurs mainly with Tiné, which is the primary destination for sheep/goats, and the main supply point for generic goods and food items. Limited exchange occurs with Kalait.

Other key observations:	Communal leaders in Mourdidjona repeatedly expressed concerns that the plateau had become crowded and unsafe, as an explanation for their continued reliance on long-range transhumance. This sentiment was not heard in any other community and is remarkable as by all accounts there is no shortage of grazing and or water in areas of the plateau to the southeast. The community was very open and easy to work with.

b. Zone East

Bao Katchoude	
General overview:	Due to logistical constraints, it was impossible to visit Bao Katchoude directly, but indirect information was collected from leaders in Mourdidjona and other secondary sources. Bao Katchoude (BK) has extensive ties to Mourdidjona and appears to function largely as a continuous social network. While it is unclear to what extent the population has become sedentarised, pastoralists in the area appear to practice similar patterns of long-distance seasonal transhumance as in Mourdidjona.
Camel pasture:	While exact pasture areas are unclear, most camels graze within 4h walking distance from BK throughout the dry season. Upon the onset of the rainy season, most camels are moved west into the plateau while come continue north to the Erdi massif.
Camel water:	Camels are watered in BK during the dry season but use natural water points during the wet season.
Goat/Sheep pasture:	As in Mourdidjona, sheep and goats graze in and around the village during the dry season but are moved some distance west into the massif with the onset of the rains. Here they appear to move in close proximity to most camel herds. Very small numbers of small livestock move north to the Erdi massif.
Goat/Sheep water:	Same as camels, see above.
Domestic water:	Due to logistical restraints, it was impossible to make an assessment of the domestic water situation.
Animal health:	Situation largely analogous to Mourdidjona, see above.
Poaching:	Situation largely analogous to Moudidjona, see above.
Economic network:	Situation largely analogous to Mourdidjona, see above.
Other key observations:	None.

c. Zone West

Wadi N'dou

General overview:	Wadi N'dou is a small Gorane community, with a large population of well-integrated Teda who migrated here from Tibesti during the great droughts of the 1980's. While formally semi-nomadic, the community has become almost entirely sedentary in the past decade in order to better capitalise on other business opportunities including trade with Libya.
Camel pasture:	Most camels graze in ***Wadi Sala*** and ***Bakié*** year-round, as pasture in and around Wadi N'dou is of poor quality. While camels and small livestock will periodically graze in the area late in the wet season, there is no strong seasonal pattern in livestock movements. Wadi N'dou was one of the only communities where leaders indicated that pasture availability was not sufficient for their livestock and expressed an interest in supplementary feed.
Camel water:	Camels are watered in ***Wadi N'dou*** year-round, but many will use naturally available water when and where possible. While water availability remains a constraint, the installation of a solar pump has improved the situation.
Goat/Sheep pasture:	Sheep and goats are kept in the village periphery for most of the year but will move further away towards Sala and Bakié during the late dry season and early in the rainy season.
Goat/Sheep water:	Goats and sheep are watered at Wadi N'dou year-round but will make use of naturally available water where and when possible.
Domestic water:	Domestic water is taken at Wadi N'dou well, and this appears to be adequate for community use.
Animal health:	The animal health situation is very poor and has declined dramatically in the past three years. This is attributed both to poor rainfall and insufficient fodder availability. The main diseases for camels are worms (worst during rainy season), "*Jézéré*", and "*Boulou*" an unknown condition that effects the mouth, ears and skin. For small ruminants the main cause of fatality is pleuropneumonia. Knowledge of veterinary care is poor, and veterinary medicines are very difficult to obtain locally. While the community has repeatedly tried to order medicine from Abéché, they are hindered by a lack of knowledge. Community prefers government intervention, as they trust state veterinary service more than their own judgement in animal health matters.
Poaching:	While the community members admit that poaching (primarily of Moufflon) occurs in the community they are adamant that cases of poaching are isolated. They believe local natural resource management frameworks are highly effective, and that the catastrophic declines seen amongst wildlife in the 20th century were the result of the suspension of cultural guidelines during the conflict years.

	While all members of the community are aware that it is illegal to target predators with poison, this still occurs. However, the community does act and prosecute cases where the evidence is clearly available. Community views reintroduction very positively.
Economic network:	The main market is Kalait, where large purchases and sales are completed, followed by Fada. Camels are sold on to Tiné based traders, but members of the community very rarely go to Tiné or any other markets themselves.
Other key observation:	While the local availability of pasture is very bad, they attribute this to poor rainfall rather than overgrazing.

Kontor	
General overview:	Kontor is a small Gorane majority community, with. Similar population structure as Wadi N'dou. The community is Teda majority, but say there has been little to no further migration from Teda areas in the past 20 years. The community is largely sedentary, and profits from trade with Libya and mining activities in Wadi Sala.
Camel pasture:	Camels graze in ***Wadi Sala***, ***Chili***, ***Jijig*** and ***Matraké*** year-round. There is little seasonal pattern in livestock movements, but camels move further from the community during the wet season while they are able to access surface water.
Camel water:	The preferred water points are the local wells at ***Kontor***, but camels will use surface water in ***Wadi Sala*** when possible. Community members occasionally use the wells and forages located in Sala when the camels have moved far from Kontor during the late rainy season. This strong secondary preference for water points in Sala is due to the inadequate availability of water in Kontor. While there is some indication that net water availability has declined, shortfalls are primarily driven by the rapid growth in local livestock populations.
Goat/Sheep pasture:	Small numbers of small ruminants are kept around ***Kontor*** year-round, but due to the very poor quality of local pastures most must graze in ***Sala*** for the duration of the dry season.
Goat/Sheep water:	Same as camel water, see above.
Domestic water:	Domestic water is obtained locally in Kontor and appears to be of adequate quantity and quality. However, at least one of the wells commonly runs and the community is actively soliciting support for the construction of a new deep project well for mixed domestic/animal use.

Animal health:	The animal health situation is very poor and as in the case of Wadi N'dou has declined in the past 3 years. The main disease for camels is worms, and lung disease for small ruminants. The community was unable to provide further insight and complained they do not understand the animal health situation or how to best address it.
Poaching:	Poaching is not locally common but appears to have a more commercial dimension than in other areas of the plateau. Individual community members will opportunistically hunt Moufflon and Dorcas Gazelles for sale to miners at Wadi Sala. While predators appear to be targeted by poison, the community is aware this is illegal and was reluctant to provide further details.
Economic network	The main market is Kalait, followed by Fada.
Other key observations:	None.

Weï	
General overview:	Weï is a small relatively prosperous, sedentary Gorane community situated along a key trade route to Libya.
Camel pasture:	Local pastures around Weï are poor, and camels only graze locally for a brief period towards the end of the rainy season. Most of the year camels graze to the south in ***Wadi Sala***, and in unnamed pastures further west. While camels graze closer to Weï during the late rainy season, there is no pronounced seasonal dynamic.
Camel water:	Weï has several good water points, and camels take water here if possible. If the rains have been particularly bad, and camels must graze far to the south of Wadi Sala, they will use forages there.
Goat/Sheep pasture:	Goats graze near ***Weï*** for most of the year, only moving towards ***Sala*** following prolonged periods of exceptionally poor rainfall. Due to the poor quality of local pastures, sheep graze between Sala and Kontor most of the year, only moving near Weï for a brief period late in the wet season. It is notable that the population of Weï has a very large number of small ruminants, likely a result of prosperity derived from trade with Libya.
Goat/Sheep water:	Goats and sheep will take water in Weï if possible, but sheep in particular must often take water in Kontor or at Sala.
Domestic water:	All domestic water is taken in Weï, and following the construction of several motorised pumps by wealthy individuals in the community the water situation is very good.
Animal health:	While the animal health situation is similar to other communities in the western ENCR, it seems somewhat better here than in Wadi N'dou or Kontor. The most prevalent issue is scabies, but unlike in

	communities to the south and east the situation has not reached epidemic levels in the past three years. Knowledge of veterinary health amongst the community is poor, and the main barrier to effective treatment is logistics rather than cost.
Poaching:	The community maintains that large numbers of Moufflon can still be found in the surrounding area, and that these are rarely poached. While they recognise that poaching is illegal, they believe it is not a substantial issue, and remains limited to certain individuals. Predators are indiscriminately killed with poison, or deliberately tracked down and shot following instances of livestock death. While other information suggests that the local community has some involvement in the trade of bushmeat to the Sala mines, it was impossible to verify this.
Economic network:	The main market is Kalait, followed by Fada which is primarily used for small purchases. Small livestock are commonly sold to either the mines at Wadi Sala or to Libya, rather than Fada as is the case for most communities in the area. While some camels are sold directly to Libya, most are still sold to Kalait.
Other key observations:	None.

Wadi Sala/Sala Kebou	
General overview:	Wadi Sala is an important area of pasture used by most communities in the western ENCR and is home to multiple small Gorane villages spread over a wide area. In recent years the area has seen substantial pressure from mining groups who are now active across a huge area of Wadi Sala to the west of Sala Kebou. These mines employ thousands of primarily southern and Sudanese migrants and appear to be growing rapidly.
Camel pasture:	Due to the early onset of the rainy season, it was impossible to meet with herders as all had gone to distant pasture areas. Based on second hand sources, most camels graze across a wide area along Wadi Sala, and down south towards Chili. While there is no strong seasonal dynamic, camels remain far from the main settlements for the duration of the rainy season.
Camel water:	Most camel water is taken at one of the many wells and forages located throughout Wadi Sala for much of the year but use surface water during the rainy season.

Goat/Sheep pasture:	Same as for camels, see above.
Goat/Sheep water:	Same as for camels, see above.
Domestic water:	Domestic water is taken at one of the numerous wells and forages spread throughout the wadi, and the water situation is deemed adequate.
Animal health:	Due to the absence of herders, it was impossible to conduct an accurate assessment of the animal health situation. However, it is likely analogous to the situation in Weï, Kontor, Wadi N'dou and other communities that heavily use pastures in and around Sala.
Poaching:	The mines of Sala are one of the few places in Ennedi West where bushmeat (Moufflon and Dorcas) is routinely sold. While multiple sources confirmed that all bushmeat supplied to the market is obtained from local poachers, the origin remains unclear. While this poses a clear threat to remnant wildlife populations, it does not appear to constitute a major source of protein or income.
Economic network:	The growth of the Sala mines has fuelled the development of a major market in Sala, which rivals Fada for size and scope. As a result, most basic transactions are conducted here including the purchase of essential goods and the sale of small livestock. Trade in camels is conducted with Libya and Kalait, while veterinary medicine is always obtained in Kalait.
Other key observations:	The expansion of mining is a key concern, and is analysed in greater depth in section XX.

Wargalla	
General overview:	Wargalla is a very small Gorane community at the extreme southwest of the reserve. While most people are sedentary, a relatively large number of families move their compounds to the southeast during the rainy season.
Camel pasture:	Due to the poor quality of local pastures, most camels graze to the southeast around ***Amher*** and ***Chili*** year-round, only returning to Wargalla for a brief period at the end of the rainy season. While pastures in this area are poor, they say this is not an issue due to their vast size.
Camel water:	Camels take water from the wells in Wargalla throughout the dry season but use surface water for as long as possible during the rainy season.
Goat/Sheep pasture:	While a small number of goats remain near the village year-round, most goats and sheep graze in ***Chili*** as local pastures are considered very poor. Small livestock will graze near Wargalla in the early dry season.
Goat/Sheep water:	Same as camels, see above.

Domestic water:	Domestic water is taken at the local deep project wells.
Animal health:	While no detailed information was obtained, the main health concerns are worms and scabies for camels, and unspecified lung disease for small ruminants.
Poaching:	The community confirmed the presence of large numbers of Dorcas Gazelles to the west of Wargalla (outside the boundaries of the ENCR and towards the Ouadi Rimé-Ouadi Hachim Wildlife Reserve) but coordinates closely with anti-poaching authorities in Faya. Poaching in the community is relatively rare, and almost exclusively targets areas outside the ENCR.
Economic network:	The main markets are Kalait followed by Fada. The community often sells small livestock to the mines and occasionally uses the market in Sala.
Other key observations:	Located at the fringe of the ENCR, the community in Wargalla has much greater contact with dynamics originating outside the reserve including Arab transhumance from Wadi Fira. One of very communities to express a desire for improved education. The GPS coordinates for Wargalla on the ENCR mapping system appear wrong. Unclear if the community has moved, or if this is due to a data entry error.

Bachike	
General overview:	Bachike is a small Gorane community. As most men had already left for more distant rainy season pastures, an in-depth analysis was not possible at the time of study.
Camel pasture:	Camels most commonly graze to the west of Bachike in ***Chili***, ***Wadi Sala***, ***Gâ***, and ***Deli***. These pastures are used year-round, with a slight preference to move further from Bachike during the rainy season. Camels graze in the vicinity of Bachike during the end of the rainy season/early dry season.
Camel water:	Camels take water in ***Bachike*** for most of the year, occasionally taking water from the forages in ***Chili*** and ***Sala***. During the rainy season camels use surface water, and do not return to Bachike.
Goat/Sheep pasture:	Goats and sheep graze in and around Bachike for most of the year, with a preference for ***Érémé***, ***Deli***, and ***Atebakouri***. There is no strong seasonal pattern, but few small livestock are found in the vicinity of the village between June and August.
Goat/Sheep water:	Same as camels, see above.
Domestic water:	All domestic water is taken from the traditional wells at Bachike. A solar forage exists but was broken at the time of study. The domestic

	water situation is generally adequate but can become insufficient during periods of peak pressure between March and May.
Animal health:	The animal health situation is very poor and has worsened dramatically in the past three years. While the interviewees were unable to provide specifies, the situation seems analogous to Wadi N'dou.
Poaching:	While the respondents were unwilling to elaborate on poaching, they state it is not a key issue and that the area still hosts a very large population of Moufflon. This was substantiated by the observation of three Moufflon by the research team very near to Bachike. Moufflon behaviour indicated that the population does not face strong hunting pressure.
Economic network:	The main market is Kalait followed by Fada.
Other key observations:	None.

d. Zone Archeï and Zone Plaines de Aloba

Wadi Nohi	
General overview:	Wadi Nohi is a large mostly Borogate (Zaghawa) village with substantial Gorane minority. Most people had already departed for distant pastures around Taïma and Diré. Had the worst animal health situation of all sites surveyed in this study and was one of the few areas to indicate that the quality and quantity of local pasture is insufficient.
Camel pasture:	During the dry season, camels graze throughout ***Wadi Nohi***, if possible, but the local pasture quality was assessed as low and respondents indicated that in most years it was necessary to move further away to ***Taïma*** and ***Diré***. In good years camels will move towards Taïma and Diré only during the rainy season when it is not necessary to return to Wadi Nohi for water. During good years herders from ***Archeï*** and ***Chilyo*** graze in Wadi Nohi. Complained that these pastures are very far and put undue stress on livestock.
Camel water:	If possible, camels are watered at the local forage and well throughout the dry season but may need to take water at Taïma or Diré if animal health or pasture is poor.
Goat/Sheep pasture:	Small livestock are generally grazed in and around ***Wadi Nohi*** year-round, but herds may move towards ***Taïma*** if the rains have been poor.

	Long-distance travel to Taïma is particularly stressful for small livestock and is avoided if possible.
Goat/Sheep water:	Small livestock are watered at local water points year-round.
Domestic water:	The domestic water situation is bad and varies with the number of animals being watered on-site. Local water supplies seem highly unreliable, contingent on rainfall history and the functioning of the local forage which is frequently out of service.
Animal health:	All respondents indicated that the animal health situation was extremely bad, and that losses had recently reached near unprecedented levels. The situation is comparatively worse amongst small livestock who are suffering major outbreaks of tuberculosis and an unknown liver disease. This has led to local losses of upwards of 200 heads of sheep in one month. The situation is slightly better amongst camels who are mainly affected by scabies and worms. The animal health situation was identified as a greater need than water. Appropriate veterinary medicine is not easily available, and local herders have limited knowledge of how to treat common diseases effectively. The animal health situation has worsened dramatically in the past three years, a fact the community attributed to poor pasture and rainfall.
Poaching:	Respondents were unwilling or unable to give specific details on the poaching situation in Wadi Nohi, but no wildlife was observed and moufflon are reportedly uncommon.
Economic network:	The main market used by the community is Fada
Other key observations:	The quality of the pasture in and around Wadi Nohi appears very unreliable, unclear if this is purely due to environmental factors or because it is sparingly grazed.

Chilyo	
General overview:	Chilyo is a small community with a mixed Borogate (Zaghawa) and Gorane population.
Camel pasture:	Like in Wadi Nohi, people in Chilyo complained that local pastures were inadequate for their camels, and that most must be taken to ***Diré*** and ***Aloba*** which are approximately a two day journey each way. Local pastures around Chilyo are only used during years with above average rainfall. There is little seasonal variation in camel grazing, but more camels graze locally during the rainy season.

Camel water:	Camels are usually watered at ***Chilyo forage***, or at one of the three shallow hand drawn wells located in the village. During periods of high stress camels grazing in ***Diré*** or ***Aloba*** will use forages there, but this is generally avoided. Main reason to avoid other forage use is cost.
Goat/Sheep pasture:	Most goats and sheep are grazed in and around Chilyo for as long as possible. Due to the poor condition of local pastures, sheep may be moved towards Archeï or Nohi. Only possible to graze sheep in Diré or Aloba if owners are willing to pay for forage water. During the rainy season goats and sheep mostly return to the Chilyo area.
Goat/Sheep water:	Most goats and sheep are watered at Chilyo if at all possible. During the rainy season they use natural water points or the local forage. If sheep are brought to Diré or Aloba they will use the forages there.
Domestic water:	Most domestic water is sourced from the three hand drawn wells located in the community. While domestic water is occasionally taken from the forage, this water is considered to be of lower quality.
Animal health:	The animal health situation is very poor and is analogous to the situation in Wadi Nohi described above.
Poaching:	The consultant was not able to obtain any specific information about poaching, but wildlife populations in the area appear heavily depleted.
Economic network:	The main markets for small goods and goats/sheep is Fada, while camels are either sold in Kalait or to travelling Sudanese traders who bring camels directly to Tiné.
Other key observations:	Like in Wadi Nohi, the community in Chilyo expressed serious concerns about the state of pastures both in and around their home area and to the south in Diré. They say there has been a dramatic increase in the number of livestock grazing there, driven primarily by commercial herders based in Am-Djarass. However, they say while this reduces the time before grass is depleted, it has not caused any permanent degradation and rainfall remains the key variable in pasture quality.

Bourdougole	
General overview:	Small community, most herders absent and so limited interviews possible.
Camel pasture:	Most camels in Bourdougole graze in pastures to the north of ***Taïma*** and in ***Sumbourou*** throughout the dry season but will return to the Bourdougole area during the rainy season. During the rainy season Bourdougole offers very good pasture, and hosts many herders from Archeï, Oroue, Wadi Nohi, and villages on the plateau like Biti. No specific comments were made on the quality or availability of pasture currently used by the community.

Camel water:	Camels are watered at the Bourdougole year-round. Although the community has three forages, two are non-functional and one is privately owned and only accessible at high cost. As a result, all water is taken from the deep project well and the 2-3 traditional wells located in the community. The community indicated that they are heavily water stressed, and that the main determinant of water choice was price.
Goat/Sheep pasture:	Goats are grazed in and around ***Bourdougole*** year-round, but sheep are only able to graze in the local area during the wet season. For the duration of the dry season, they move towards ***Erésoma*** and ***Taïma***.
Goat/Sheep water:	Same as for camels, see above.
Domestic water:	All domestic water is taken at the deep project and shallow wells located in the community.
Animal health:	The herders present were unable to give a detailed overview of the animal health situation, but the main ailments appear to be worms and scabies for camels and tuberculosis for small livestock. Main determinant in access to veterinary medicine is logistics, rather than price due to the long distances and high labour intensity of moving camels back and forth to pastures in Taïma.
Poaching:	No specific information was obtained on poaching, but the community responded favourably to the idea of Addax reintroduction in the area.
Economic network:	The main market for small goods is Fada, followed by Edie (Archeï). Fada is the main destination for small livestock, while camels are generally sold in Kalait.
Other key observations:	None.

Hanoko	
General overview:	Small quartier, populated almost exclusively by Borogate (Zaghawa) of the Kotela clan. Limited seasonality in livestock movements. Interviews were interrupted by an angry community member who is currently involved in a dispute with APN over injuries inflected upon his son by one of the Ostriches reintroduced at Aloba.
Camel pasture:	While Hanoko has good pasture, most camels graze in and around ***Koulougadina***, ***Bagera***, ***Toukou*** and ***Taïma*** for much of the year. There appears to be little seasonal difference, and camels rarely graze near Hanoko. During the rainy season many camels remain in and around pastures between Hanoko and Aloba.
Camel water:	Camels are watered at Hanoko forage throughout the dry season and use natural water points during the rainy season. In addition to local

	herds, Hanoko forage is frequently used by camels from Aloba, Diré, and Nohi. They say single forage is not sufficient as the number of animals using the area has dramatically increased, leading to long wait times.
Goat/Sheep pasture:	Goats and sheep are grazed in and around Hanoko year-round, with little to know seasonal variation other than that the onset of rains allows small livestock to move slightly further distances.
Goat/Sheep water:	All small livestock take water from Hanoko forage.
Domestic water:	Domestic water is taken both from Hanoko forage and small traditional wells located near the village. As these shallow wells have fallen into disrepair, many complain of health issues associated with forage water which is perceived as in many places to cause liver problems.
Animal health:	It was impossible to collect information on the animal health situation due to the interruption of interviews.
Poaching:	It was impossible to collect information on the poaching situation due to the interruption of interviews.
Economic network:	The main market is Fada, where most small goods are obtained, and sheep/goats are sold. Secondary purchases are made in Edie, while camels are sold in Kalait or to traveling Tiné based traders,
Other key observations:	Hanoko forage is administrated by a village committee, with all members of the community paying negotiated contributions for upkeep and maintenance. The community is currently in the process of seeking funding to repair the site's solar panels, which they say is preferable to the diesel generator. The interviews were interrupted by an irate member of the community whose son had recently been injured by an ostrich. The case is known to APN, and while could potentially cause long-term issues if not handled carefully did not appear to cause serious concern amongst others present.

Aloba	
General overview:	Aloba is an important community, both due to its size and its proximity to key Ostrich reintroduction sites. Relationships with APN were unusually close, and the community has a lot of experience with tourism. Aloba experienced far better rainfall than most other areas during the 2022 rainy season, and this was widely correlated with the Ostrich reintroduction which is perceived very favourably.

	The community is largely sedentary, and pastoral dynamics show moderate seasonal differences.
Camel pasture:	During the dry season most camels graze in ***Tegedi***, ***Kenoué*** and to the southwest towards ***Taïma*** and ***Diré***. Most pastures are within one day's walking distance. They return to the ***Aloba*** area with the onset of the rains and remain in near pastures <2h walking until February-April. As they have large herds, many in the area will go as far as Hanoko or Chili if needed. However, as the community in Aloba has access to many good pastures they seem reluctant to travel any farther than 2h, and appear to typically stay in a much closer radius than most other communities.
Camel water:	Camels are mainly watered in Aloba throughout the year and use Chibi as a backup water source. If camels are far away, the community in Aloba appears to show a higher-than-average willingness to pay for forage use, and will routinely do so in Diré, Taïma or Hanoko.
Goat/Sheep pasture:	Goats and sheep are grazed in the Aloba area year-round. While there is little seasonal variation, some sheep are moved to camel pastures in the southwest if there has been poor rainfall or if local pasture has become depleted.
Goat/Sheep water:	Same as for camels, see above.
Domestic water:	Domestic water is taken at the Aloba water points.
Animal health:	The animal health situation is poor, and relatively consistent with other communities in the area. Animal health interventions were the primary demands made by the community and appear focused on worms and scabies. The situation appears somewhat worse amongst sheep/goats than camels. As elsewhere in the area, access to veterinary medicine and animal health knowledge are larger barriers than price. The community appears to show limited willingness to undertake the necessary trips to Kalait to obtain effective medicine, preferring to wait for government campaigns.
Poaching:	The community in Aloba did not provide any specific information about current poaching trends but acknowledged it had been a historical issue. They are strongly in favour of reintroductions, repeating the belief that bringing back wildlife would improve rainfall and pasture quality. They are proud that the ostrich reintroduction occurred in their area, saying it brought both better rainfall and prestige. All elders interviewed went out of their way to assure the community would welcome and protect any future reintroductions.
Economic network:	The main markets used by Aloba is Kalait, followed by Fada and Am-Djarass. Kalait is the primary point of sale for camels and is visited by

	most families 3-4 times per year. Routine purchases are made in Fada or Am-Djarass, while Tiné is occasionally visited when herders seek to sell large quantities or particularily high grade camels.
Other key observations:	Although responses indicating that rainfall and pasture conditions have been good, pastures in and around Aloba showed far more visual signs of depletion and heavy grazing than any other area covered in this study. People in

Chibi	
General overview:	Chibi is a relatively large community and serves as an important local hub due to the presence of mobile phone coverage. The population is highly mixed, with Gorane being slightly more numerous than Borogate (Zaghawa). The community is home to a small but significant Bilia (Zaghawa) minority. The community is highly sedentary, and few households move to the southwest in the rainy season.
Camel pasture:	Most camels graze in ***Attigué*** and remain within 2h walking distance from Chibi year-round. Secondary pastures include areas in and around ***Aloba***, with many moving their camels towards ***Taïma*** in the rainy season. While camels are generally further away during the rainy season, there is no strongly pronounced seasonal variation in pasture usage. Local pastures are poor and are only used by small livestock during the rainy season.
Camel water:	All camels are watered at local wells and the forage at ***Chibi*** year-round, with a reduction in use during the rainy season where livestock use natural water points if possible. While water availability is generally adequate, they complain it often takes excessive amounts of time. In addition to the local community, people from ***Sini***, ***Aloba*** and ***Gouligouli*** also routinely take water at Chibi.
Goat/Sheep pasture:	Most small livestock graze in and around ***Kava*** roughly 4h walking from Chibi during the dry season. Other pastures used include those to the south of ***Aloba*** and towards ***Bachikélé***. Small livestock brought back to the Chibi area during the rainy season.
Goat/Sheep water:	See camel water above.
Domestic water:	Domestic water is taken at Chibi, with a preference for the project wells as the forage yields water of lower quality.

Animal health:	The animal health situation here is similar to other areas in the Aloba region, with worms being the primary cause of camel mortality, followed by scabies. Tuberculosis is the most common issue amongst small livestock. The main barrier to medical treatment is local unavailability and a lack of veterinary knowledge.
Poaching:	The local community was not willing to discuss poaching in depth, but state that it is a relatively isolated phenomenon.
Economic network:	The main markets used by Chibi are Edie (Archeï) and Fada for small goods, while most major transactions take place in Kalait. Camels are either brought directly to Tiné for export to Sudan or sold to traders in Kalait while small livestock are usually sold in Fada.
Other key observations:	Many people from Chibi have gone to the mines in Kilinje (Libya) and Tibesti. Most only stay for a few months or 1-2 years, and upon their return invest heavily in livestock. While this has led to an increase in livestock numbers and general wealth, it has not had any major social impacts and is seen as a positive trend.

Bachikélé	
General overview:	Bachikélé is a relatively large, wealthy Borogate/Bideyat (Zaghawa) community notable for the presence of the Guelta de Bachikélé.
Camel pasture:	Most camels from Bachikélé graze near the Guelta throughout the dry season, primarily at Shigera, Joua, and Kour. These pastures range from grass to tree dominated areas, with more forested areas being most valuable during the dry season. During the rainy season many move further to the north towards Aloba, but most stay near the Guelta. While they say finding pasture near the Guelta has become increasingly difficult as livestock and human populations have increased, it has not reached the point of shortage, nor has it caused any substantive behavioural changes.
Camel water:	The vast majority of camels are watered in the ***Guelta*** year-round, with some using other wells like ***Taïma*** and ***Monou*** only when they periodically utilise further pastures during the dry season. The Guelta appears to be heavily used even during the rainy season, unlike most other water points within the RNCE.
Goat/Sheep pasture:	Goats and sheep graze near the Guelta year-round with limited seasonal variability. The pasture with the largest concentration of small livestock is ***Joua***, but many remain in and around the village of ***Bachikélé***.
Goat/Sheep water:	All small livestock take water from the ***Guelta*** year-round.
Domestic water:	Domestic water is taken from the Guelta. Although the water situation remains good, all respondents indicated that water quality

	and availability has declined. While this has not impacted livestock, they say it has become difficult to obtain clean drinking water in many of the points that were previously reliable, and that this has had negative impacts on public health.
Animal health:	The animal health situation is comparatively good in Bachikélé, a fact attributed by the community to the presence of the Guelta. However, worms appear to have reached epidemic proportions in the past three years and continue to cause substantial losses. As in all other communities, scabies, and pleuropneumonia. Again, the main barrier to veterinary care seems to be access and technical expertise rather than price. In the absence of water shortages, veterinary health is the main concern of the population.
Poaching:	Areas around Bachikélé have been heavily poached in the past, but there is no indication that poaching is currently widespread or common in the area. Most blame the local extinction of wildlife on the Chadian-Libyan conflict, and the associated suspension of customary wildlife management practices.
Economic network:	The main is Kalait, where small goods are obtained, and small livestock are sold. Secondary trade occurs with Am-Djarass, and to a lesser extend Fada which appears to be rarely visited by the community. Camels are sold either in Kalait, to traveling exporters or directly Tiné.
Other key observations:	Residents showed high levels of pride in local land-management institutions, indicating how the effective management of forested areas allows year-round grazing near the Guelta even in years where rainfall is very poor. Bachikélé was one of two communities surveyed in this study that expressed an interest in education. While education remained a lower priority than animal health, this is notable as most communities appear complete disinterested in any interventions focused on education. This is likely the result of favourable economic conditions, increased contact with outsiders and close contact to Am-Djarass.

Diré	
General overview:	Diré is situated a vast expanse of important pastures widely used by most communities between Toukou, Aloba and Monou. Has relatively small permanent population, and collectively refers to many individual areas (e.g., Gourbatoré) which may or may not be identified by name by non-local users of pasture or water.

	Sits at key point between the plateau and communities to the south such as Wiba and Am-Djarass. Vast majority of the population is Zaghawa of mixed Borogate, Bideyat and Bilia ancestry. Very few Gorane use the Diré water points.
Camel pasture:	Diré is surrounded by a vast area of pasture that is generally referred to by outsiders are ***Diré***. As few herders were present at the time of visit the only specific area identified by name was Egemekeï, but most herders appear to graze within 2h walking distance from the various water points year-round. This also applies to non-local herders who commonly use pastures in and around Diré during the dry season. Most nonlocal herders from within the ENCR use pastures to the north and east of Diré, while herders from outside the reserve prefer to stay to the south and east. The pasture in and around Diré is considered very good, and there appears to be no significant evidence of overgrazing.
Camel water:	All camel water is taken at one of the seven water points collectively known as Diré. These water points are spread across a relatively large area and are owned and staffed by wealthy Zaghawa individuals, many with strong ties to Am-Djarass and higher levels of the Chadian Government. The water situation is adequate, but all herders complained that they must pay to take water at forage use. A further issue is that prices do not appear fixed and depend highly on the personal relationships and origin of individual herders using the forages. As all forages are open to public (paid) use and there is little difference in water quality, the main factor in choosing an individual water point is comfort. Many water points are staffed by young Zaghawa from Am-Djarass and Tiné, creating what many Borogate users termed a hostile or uncomfortable environment.
Goat/Sheep pasture:	Goat and sheep use similar pastures as camels and can be found grazing throughout the wider Diré area, staying closer to the forages throughout the year. There appeared no strong seasonal trend, for local shoats, but those belonging to other communities will return to their home pastures with the onset of the rainy season.
Goat/Sheep water:	Generally same as camel water (see above), however pastures around Diré are a key target for wealthy herders using water trucks. While this has been banned by all local communities, several trucks were observed on site. These trucks are not used for camels but allow small livestock and cattle to access more distant pastures.
Domestic water:	The domestic water situation in Diré is very bad, and water obtained from local forages is considered to be unsuitable for long-term human use. While most water is still obtained at the forages, wealthy

	families routinely collect domestic water in from Guelta de Bachikélé using private vehicles.
Animal health:	The animal health situation is poor, and generally the same as in other communities to the south of Aloba. The key exception is amongst cattle, where a number of unknown diseases continue to cause very high rates of mortality. Members of the local community were not able to effectively explain these illnesses but say locally available medicines are not effective. The consultant was unable to speak to professional herders accompanying cattle, but these would likely have a better knowledge of the situation.
Poaching:	Heavily populated and some distance from the plateau, Diré hosts very few wild animals. However, while the Diré community is not heavily engaged in poaching, poison is commonly used to deter predators.
Economic network:	The main markets are Kalait, Tiné, and Am-Djarass in declining order of significance. Fada is very rarely used.
Other key observations:	Diré is notable for the presence of very large numbers of cattle. These mainly belong to wealthy herders based in Am-Djarass and other areas south of the ENCR. Large herds of cattle have only been present in the area for the past 2-3 years and are closely associated with the water truck phenomenon. All are managed by hired herders of mix non-Zaghawa/Gorane origin. Due to very high water and fodder requirements, cows graze near the forages year-round, unless they are able to access water from the water trucks.

Toukou	
General overview:	Toukou is a small Bideyat community. As most herders had already left the area following the early arrival of rains, it was impossible to make an in-depth assessment of the area. The community appears to be relatively less sedentary than others in the area, with many families moving towards Taïma for the duration of the rainy season.
Camel pasture:	Pastures around Toukou were highly depleted at the time of assessment, and most camels were grazing far to the south and west towards ***Taïma*** and ***Chili***. Due to the marginal quality of local pastures, they are only used during the rainy season.

Camel water:	If possible, camels are watered year-round at the local wells. However, water availability is an issue in Toukou and well are frequently damaged or unable to provide sufficient water. In this case herders either pay for forage use (usually in Taïma or Diré) or use natural water sources where possible.
Goat/Sheep pasture:	Goats and sheep graze locally for much of the year but are often forced to move towards Taïma late in the dry season once Toukou's pastures become depleted. Small livestock move further away during the rainy season if their owners move their compounds to follow the rains.
Goat/Sheep water:	Same as camel water, see above.
Domestic water:	Domestic water is taken locally at Toukou's wells. The water quality and availability is often insufficient for domestic use.
Animal health:	The animal health situation has been very poor the past three years, but the interviewees were unable to provide any further information. The animal health situation is likely analogous to other communities in the area (see Diré).
Poaching:	No specific information on poaching was obtained as the interviewees were unwilling or unable to elaborate on the issue.
Economic network:	The main market is Kalait, but members of the community frequently travel to Fada to sell small livestock. Am-Djarass is rarely used, but many herders will travel to Tiné to sell higher grade camels.
Other key observations:	None.

10. Annex II: Questionnaire

INTERVIEW GUIDE
Background
1. General: Age, clan, profession (herder, camel owner etc.), What was your previous profession? where do you live?
2. Origin: Where were you born? How long did you live there? When did you move? Why? How do conditions compare here to your place of origin?
3. Movements: Do you stay here permanently? What kind of movements do you practice (regular/variable)? During what seasons do you move? Why? Where to? Do you always move to the same place? Who decides where you move?
4. Have these movements changed? Why?
5. What is your general economic and family situation? Has this changed?
Pasture and water
6. What water points do you use? During which season? Why? Does it differ by livestock? Has this changed over time?

7. Which pastures do you use? During which seasons? Why? Does it differ by livestock? Has it changed over time? How are these water points owned or managed? Is management effective?
8. How would you rate the water supply in this area? How would you rate the water supply in the different pastures you use?
9. Has water supply changed over time? Are these changes site specific or general? Why?
10. Are you able to access enough water? Are you able to access the water points you prefer? If not, why?
11. What steps to people do people take during drought? Are these effective?
12. How would you rate the quality of pasture in this area? How do you rate the quality of other pastures you use? Does it differ by season? Does it differ by livestock? How are these pastures owned and managed? Is management effective?
13. Has the quality of pasture changed over time? Are these changes site specific or general? Why?
14. Are you able to access enough quality pasture? Are you able to access the grazing areas you would prefer? If not, why?
15. How are the water points and pastures you use administered? Is this administration adequate?
16. How could the quality, access or administration of water and pasture be improved?
17. What is the greatest threat to you being able to access these water points and pastures in the future?
18. How would you like APN to intervene?
19. What are the key factors in choosing a water point or pasture? Labour Location Costs Ownership Reliability Disease Quality
20. Are there any water points and pastures people no longer use? Why? Could this situation be remedied? Would you like this decision to be remedied?
Livestock
What livestock do you keep? Why? What are the advantages and disadvantages in keeping camels, cows, sheep, and goats? Are you able to keep the livestock you want?
21. What are the most important factors limiting livestock populations? Labour Water supply Pasture Disease Management issues Competition from other herds

22. What is the animal health situation? What steps do you take to protect the health of your herds? What is the greatest threat to animal health here? Has this threat changed over time? What actions would you like to see come from outside of the community? Are there seasonal differences in disease prevalence? Why do you think these exist?
23. What is the labour situation? What is the greatest threat to the labour situation? What steps does the community take to address this? Are these steps effective? Has this situation changed over time?
24. What is the main value of livestock to you? Direct income? Subsistence use? Insurance? Wealth generation/prestige?
25. When do you sell livestock? Why? Where? Does this impact your decision on when and where to move?
26. What are the current prices for different livestock? Have these changed? What drives changes? How do these changes impact your behaviour?
27. Are livestock as productive as before? What factors influence productivity? What steps do you take to improve productivity? Are changes in productivity the same amongst different livestock?
28. How have overall livestock numbers changed? What is driving these changes?
29. Do you think the current number of livestock is sustainable? Why/why not? What would improve the sustainability?
30. Do herds owned by people from outside the region utilise this area? Has this changed? Does this cause issues for the local community?
31. How are livestock sold? To whom? What is the best way to make money from livestock? Is being a herder as profitable as before? Why?
Management
32. How are pastoral systems managed? Is this management adequate? What could be improved?
33. What are the key causes of conflict? What are key conflict resolution mechanisms? Are these effective? How have they changed over time?
34. Is conflict an important factor when determining where to graze and water your livestock?
35. What are the main social issues facing your community? How have these changed? How are these related to pastoralism?
36. How are these issues being addressed? How should they be addressed?
37. What do you know about African Parks? What is your opinion of African Parks? How could African Parks do better?
38. How would you like to interact with African Parks? What framework would be best for community consultations?
39. What would a successful relationship with African Parks look like to you?
40. What interventions by NGOs and the government have you seen? Are these effective? Why?
41. How are mobile water trucks managed? What problems do they cause?
Conservation
42. Is conservation important to you? Why? What aspects or ecological features are most important to you?

43. How has the environment changed in recent years? Are these changes negative or positive? Have these changes impacted your activities?
44. Is the reintroduction of wildlife a good thing? If so which species? Why? Where should re-introduction be prioritised?
45. Do people here hunt wildlife? Which species? What for?
46. Do you believe hunting should be punishable? What punishments do you believe are appropriate?
47. What values do you see in wildlife other than for meat?
48. Are there any specific plant species that are important to you? What are they used for? Are they declining or increasing? Why do you think that is?
49. Are Ennedi's historical sites important to you? What is their importance? Do you think it is important to protect them? Why?
50. Do you think there should be more tourism in Ennedi? Why? How would you like tourism to be managed?
51. Do you think the management of wildlife and historical sites will be good or bad for herders? Why?