A Comparative Study of Mayan Archaeology

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A Case Study of the Regional Spatial Differences in the Mayan Natural- and Urban Landscapes

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A Comparative Study of Mayan Archaeology: A Case Study of the Regional Spatial Differences in the Mayan Natural- and Urban Landscapes

Under lång tid har mayafolkets landskap, av arkeologer, ansetts vara homogent. Detta har bidragit till tolkningen att det förhållande som mayabefolkningen hade till sin urbana levnadsmiljö respektive omgivande topografi, likväl som förhållande till det kulturella livet har sett likadant ut oberoende av region. I realiteten är det naturliga landskapet i Mesoamerika heterogent, vilket då även resulterar i urbana och kulturella skillnader mellan regionerna.

I denna uppsats kommer undersökas och diskutereras de skillnader som finns mellan de olika mayakulturerna och hur detta kan ha påverkat jordbruket inom regionerna. Dessutom kommer regionerna jämföras med avseende på potentiella skillnader i kultur likväl som rumsliga skillnader i topografi och det urbana landskapet. Den klassiska tidsepoken (250-950 e.Kr.) kommer vara i fokus, men som referenspunkter och med grund i att olika städer uppstod vid olika epoker kommer även andra tidsperioder att behandlas i uppsatsen. Denna uppsats är baserad på litteratur studier och är en kvalitativ undersökning.

Nyckelord: Maya, Rumsliga-Mönster, Agrikultur, Naturligalandskapet, Stadslandskapet

Keywords: Maya, Spatial-Patterns, Agriculture, Natural-landscape, Urban-Landscape

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1. Introduction

For decades archaeologists have thought of the Mayan landscape as homogeneous and that the Mayans relationship with their urban- and natural landscape and that the Mayan culture was the same in every region, therefore it was uncommon to explore the subject on a regional scale. But the natural landscape in Mesoamerica is heterogeneous, meaning that every region is different.

This paper will explore the differences in the Mayan culture and cultivation of the land on a regional scale, doing so by comparing previous archaeological research. Comparing a few regions during the Classic Mayan time period (250-950 AD) to see if a pattern in the natural landscape, the urban landscape and in the Mayan culture emerges. The regions in question are the Lowlands: the wetland and tropical rainforest located on the Yucatán Peninsula, parts of Belize and Guatemala, the Highlands: the mountain region Sierra Madre de Chipas in Guatemala, and the Belizean and Yucatán Coast.

1.1. Who were the Maya?

The Mayan people do not belong to a vanished civilization, today the Mayan are a minority ethnic group living in Central America. However, the height of the Mayan civilization was between the years of 2000 BC and 1539 AD (see figure 1 for Maya Chronology).

The Mayans are mostly known for their unique Hieroglyphic script and for their unique way of constructing their cities. They were skilled in mathematics and cosmology and they used that knowledge for their calendar. But before all this the Maya derived from a hunter-gatherer society (Coe & Houston 2015: 10-11, 244, 259-260, 263).

The first established settlement that was developed in the Maya Civilization was during the beginning of the Pre-classic period (1000 BC- 250 AD). But before the Olmec and later the Mayans settled in the region larger mammals and hunter-gatherer societies roamed the area. Larger mammals from the Pleistocene era like the mastodon, bison, and horses started to disappear as a result of a warmer environment and probably due to over-exploitation by hunter-gatherer societies that lived in the area. Dietary supplements was needed as animals disappeared from Mesoamerica and the hunter-gatherer societies began eating more edible and domesticated plants like corn, squash, beans and including fruit such as plums, nance fruit, and zapote. Agriculture became a vital means to the survival during the archaic period (8000-2000 BC). The first settlements that was established the society, would soon become the Mayan civilization (Folan et al. 2000: 2; Cantillo et al. 2010: 1).

Maya rulers associated themselves with jaguars because they saw themselves as the predators of the natural world. “The predator symbolism with its message of control over the Maya world provides a link with the yearly-renewal agricultural fertility theme” (Longstaffe et al. 2001: 93).

The Maya Civilization and its many regions stretched over the modern day Yucatán Peninsula located in south-eastern Mexico, Belize, Guatemala, western parts of Honduras and El-Salvador. These regions consist of different environments and the Maya had to adapt to each region and they had to get creative to survive in certain areas (Beach et al. 1998: 87; Coe & Houston 2015: 14-22; Isendahl & Smith 2013: 135). What is unique about the Maya is that despite the environmental challenges they faced their urban societies often lasted longer than
other societies around the world, the reason for this was their sustainable urban lifestyle (Isendahl & Smith 2013: 133).

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Figure 1: Timetable of the Maya Chronology

1.2. Aim

The aim of this paper is to compare different studies and research papers to identify a pattern in Mayan landscape archaeology. What have archaeologists or researchers previously discovered about the Mayan culture, and has there been any changes in results with the technological advances such as carbon dating, radar imaging and remote sensing LiDAR? This paper will also discuss what we have learned about the Maya with the help of these technologies.

Whether the cause of their demise was natural causes such as environmental changes, or other factors involved, the way they consumed their resources can shed some light on how they conducted and lived their everyday life, and to indication to the cause led to their demise. One could draw conclusions that by comparing certain areas with a difference in location can also show how perhaps the Mayans used their resources differently based on where they lived.

The regions that this paper will compare are the coastal region, the Northern Lowland region, the Southern Lowland region, and the Highland Region. The reasons for the comparison of those regions are the landscape differences in each site and the fact that prior research about those areas exists.

1.3. Research Questions

The following research questions the author will attempt to answer are:
- What resources did the Maya have access to and used, and for what purpose?
- Being a society that mainly survived on the sustainability of agriculture, what was their relationship with animals?
- Were there agricultural and cultural differences between certain regions?

1.4. Source Materials and Method
The sources used are mainly from articles found in relevant databases. Furthermore books relevant to the subject. The sources were selected from a scientific database found by searching for specific keywords study topics such as: Maya cultivation and agriculture, Maya osteology among others. The researchers whose articles and essays with information most relevant to this paper are Heather McKillop, Timothy Beach, Nicholas Dunning, Wendy Ashmore, among others.

The primary method used for this paper was a comparative method done by compiling the research published by other archaeologists and researchers to see if a clear pattern appeared and/or if the research found contradicts the other.

1.5. Limitations

This paper will focus on the differences in the Maya Lowland, Highland, and coastal regions. That makes the limitations of the subject to Mesoamerica and further limitations to the Mayan culture, excluding the Aztec and the Olmec. Also excluding the Mayan sites found further north in Mexico and therefore limiting the focusing solely on the Mayan Lowlands and Highlands and the coast, these regions are located and limited to the Belize, Guatemala, and the Yucatán peninsula in Mexico. A further limitation is that the research is mainly focused on the Classic period (250-950 AD), though other time periods are mentioned for the sake of contrast and comparison.
2. Background: previous research and excavations

The history of Mayan civilization is one of the most researched subjects in Mesoamerican and South American archaeology. Archaeologists, anthropologists and historians were and are still fascinated with the Mayan civilization and the Mayan culture since the late 19th century when cartographers and geographers travelled to Central- and South America to map out the continent (Coe & Houston 2015: 7-9, 11-14; Grann 2017: 25-46). Science has advanced, research has progressed and new techniques have developed since then.

2.1. Excavation and Surveys

Researchers from the British Land Use Survey Team and geographers Stoddart and Craig discussed the importance of Mayan coastal Belizean sites in the 1950’s and the 1960’s. The two perspectives were discussed:

1. What were the Belize sites and the Mayans role in long-term trade?
2. How are the coastal populations tied to the economy of Maya centres located further inland?

These were the questions that provided a framework for future researchers (McKillop 1996: 50).

One of the larger challenges that archaeologists face when studying the Mayan coast is that the sea level has changed significantly over the past centuries. Archaeologists have to keep this in mind when analysing coastlines, riverbeds, and city locations.

Most research and opinions, prior to the 1960s, concerning Mayan agriculture, and Mayan living situations was viewed as an ecologically centric environment. The Maya, a complex civilisation survived in a tropical forest location limited to agriculture where they used ecologically oriented methods such as the slash-and-burn technique to cultivate the land. However, this was all proven to be wrong in the 1970s. Surveys showed that the Mayan Lowlands have a wide variety of environments. These surveys proved that the Mayans had to adjust and develop other ecologically sound techniques agricultural techniques depending on which region in the Lowlands or the Highlands they lived in (Beach et al. 1998: 87).

Mayan Agriculture was thought to be thriving on one technique and in one type of environment but in the 1970’s that was proven to be wrong. The Maya Lowlands consist of a large variety of environments. The Lowlands were then divided into regions based of the environmental and climate patterns in that said region. Beach et al. (1998) published a paper about the Maya Lowlands’ many adaptive regions and about the agricultural system that was probably used in that region. They based their research on surveys that they and other researchers had done of the Mayan Lowland regions over the past 20 years. They wrote about the many various and changeable environments in the Lowlands. With this collected information about the many regions other researchers and archaeologists could correctly study Mayan agriculture (Beach et al.1998: 87-96).

In the years 1982 and between 1988 and 1993 archaeologist Heather McKillop partnered up with the South Coastal Archaeology in Belize, or SCAB for short, and conducted surveys
and excavations at sites at Wild Cane Cay, Frenchman’s Cay, and Stingray Lagoon, to mention a few. The goals for the SCAB project were to investigate coastal economies and the relationship between said economy with coastal-inland exchange and trade, particularly long-distance trade in the Mayan civilization (McKillop 1995: 216; McKillop 1996: 49). The SCAB project documented that the sea level rose approximately 1 meter at the end of the Terminal Classic period (830-950 AD) due to the climate change causing a warmer environment. The 1-meter rise in the sea level submerged a significant amount of salt-production sites. The archaeologists and SCAB conducted offshore shovel tests systematically (every 10 meters) and discovered archaeological sediments. A significant amount of the Classic period sites (250-950 AD) were discovered to be below the water table just underneath Post Classic period sites (950-1530 AD) and those sites were in turn deeply buried under a mangrove (Rhizophora mangle) swamp. This indicates that the area with dry land during ancient times was the size of 20,000 m² (Square meters), which was twice the size of the dry land in modern times (McKillop 1995: 216-217; McKillop 1996: 56).

Archaeologists underwent several systematic underwater- and land-surveys in 2004 at Punta Ycacos Lagoon at the coast of Belize. Many Late Classic (circa 550-830 AD) Maya sites were immersed in water due to a sea-level rise, and are difficult to observe with the naked eye because red mangroves (Rhizophora mangle) cover the landscape. Archaeologist Heather McKillop worked of the evidence found during previous surveys done at four sites within the lagoon of the southern coast of Belize that revealed immersed terrestrial sites in near offshore islands (e.g. Wild Cane Cay) and at shallow waters near the shore of the mainland. One of the sites that were excavated in 1991 was located 310 meters offshore (McKillop 2005: 5631; McKillop 1995: 220-221). The underwater survey began in the eastern section of the lagoon where the depth of the water was at 1 meter. The land-based survey consisted of a team of snorkelers and a team of pedestrians that walked along the shore. They were tasked with searching for artefacts and documenting them using transit mapping and GIS (Geographical Information System). The sites they found were identified by the presence of pottery, used for salt-production, and each location was recorded (McKillop 2005: 5631-5632; McKillop 1995: 220-221). The 2004 survey discovered 41 new Mayan sites within the lagoon, 23 of these sites had wooden structures for salt-production buildings, which proves that the Maya had an entire infrastructure surrounding the production, distribution and storing of salt (McKillop 2005: 5631-5633; McKillop 1995: 220-221).

Excavations at Stingray Lagoon, Belize, unearthed a large fire hearth of charcoal, and fragmented bowls and jars used for boiling seawater to produce salt cakes or loose salt flakes. The excavation also unearthed a number of artefacts such as coral and peat (McKillop 2005: 5630; McKillop 1995: 220-221).

The Proyecto Arqueológico Chocolá project or PACH for short underwent extensive periods of fieldwork at the Chocolá site in 2003 to 2005. The purpose for PACH’s explorations and surveys was to find indications that the Mayan city of Chocolá partook in the cultivation and long-distance trade of the cocoa bean. Remnants of cocoa residue were discovered in ten vessels recovered at the site (Kaplan et.al. 2017: 526-527).

At surveys and excavations the years 1996 through 2000 archaeologists discovered the largest collections of Classic period (250-950 AD) Maya skeletons ever documented. The collection of skeletons, consisting of 600 well preserved individuals, was discovered at the Xcambó site on the Yucatan peninsula. One common denominator in the skeleton collection amongst each of the individuals was the presence of carious lesions on the teeth (Cantillo et al. 2010: 3).

An excavation was conducted in 1984 in the Río Azul region, Guatemala. Archaeologist unearthed a burial site, which they concluded belonged to a rich royal since the burial site was beneath a pyramid. The burial contained a number of ceramic pots, and each of them had different uses (Stuart 1988: 153-154).
2.2. Surveys: LiDAR and satellite imaging

Technological advances within a Landscape context such as; Geospatial imaging, LiDAR (Light detection and ranging), and radiocarbon dating has revolutionized the way archaeologists look at the past. The use of carbon dating advanced archaeology by allowing archaeologists to pinpoint when an artefact was initially made. LiDAR advanced landscape archaeology by allowing archaeologists to examine large areas without the need for excursion, which can be excessive and at times give unyielding results (Chase et al. 2012: 12916; Garrison et al. 2006: 130, 136-138, 151).

LiDAR was initially developed by NASA to study the surface of the planet Venus. However, other fields of study have found benefits from using LiDAR to further their research. The reason to why archaeologists use LiDAR is to observe the earth or landscape with an aircraft. LiDAR allows archaeologists to pierce the thick vegetation with the help of imaging radar, even though it had its issues, after a few experiments with the wavelengths and frequencies, archaeologist found a way to safely use radar imaging on earth’s surface without compromising the images (Adams et al. 1981: 1458; Garrison et al. 2006: 130, 136-138, 151).

Landscape archaeologists use these imaging methods to focus on outlining human-built landscapes (i.e. mounds, roads, agricultural terraces, etc.) and outlining natural landscape on a larger scale (Chase et al. 2012: 12917; Chase et al. 2010: 1-2; Garrison et al. 2006: 130, 136-138, 151).

2.3. Microanalysis

Microanalysis is an umbrella term for scientific methods that analyse organic material on a microscopic scale i.e. Radiocarbon dating, Dendrochronological, isotopic analysis etc.

Dendrochronology analysis is the method where one counts the tree-rings and limestone formation to measure the amount of rainfall during a year. This method has given insight on the rain seasons and more importantly the periods of drought, which maybe were one of the reasons why, the Mayan civilizations collapsed in some regions (Aeschlimann et al. 2003: 1731, 1733-1735; Andrews et al. 2003: 151-152).

Archaeologists have also used the radiocarbon dating method and were able to carbon date most of the artefacts, organic plants, and the remains of animals at the sites that were submerged in seawater to the Late Classic period to the Terminal Classic period (550-950 AD), due to the water preserving the sediments and artefacts in near pristine condition. They have also carbon-dated pollen samples found in the sedimentary rock and clay, and discovered pollen from maize, chilli and cocoa, to mention a few (McKillop 1995: 217-218; Beach & Dunning 1994: 52, 64).

Stable Isotopes analyses has been done by researchers for the purpose of reconstructing the human and animal dietary habits during ancient times and Longstaffe et al. (2001) conducted an analysis on the remains of dogs, deer and humans to better understand the relationship the Maya had with said animals (Longstaffe et al. 2001: 91).

The ceramic vessels discovered at the 1984 excavation at the Río Azul site were analysed and the results revealed that certain vessels and cylindrical pots in the burial site contained liquid when they were entombed. This was discovered after further examination of the vessels, which showed the liquid remnants in the form of ring lines on the interior walls. Archaeologists have been able to analyse the content of these ceramics by using High-performance liquid chromatography (HPLC) combined with atmospheric-pressure chemical-ionization mass spectrometry (APCI MS), this will later be known as “the Hurst method” (Hurst et al. 2002: 289; Kaplan et al. 2017: 526).
The chocolate drink that the Mayans drank was first documented around the time of the Spanish conquest (1539 AD). Other ingredients occasionally used in the chocolate drink, according to some historical records and modern day scientific analysis, were for example: maize, chilli, water, and honey. This goes to show, on a smaller scale, which natural resources the Mayans often used (Hurst et al. 2002: 289).

It was common for the rich elite to be buried with these drinks in large containers, and each can be identified by the hieroglyphs found engraved on the side of said container. The vessels for maize can be identified by a particular hieroglyph depicting the maize deity. Which can also be said about the hieroglyph on the cacao vessel, which depict the twin fish deities Kakaw (Grofe 2007: 1-3). The reason to why the Kakaw is depicted on the cacao vessels is connected to Mayan mythology; furthermore it s where the word cocoa is derives from. Some of the most important natural resources in the Mayan civilization, such as maize and cacao, emerge from the Mountain of Sustenance according to Mayan mythology. These resources played a large role in Mayan society and were often used as currency (Grofe 2007: 1-3; Stuart 1988: 153-154). The archaeologists were also able to determine what some of those vessels and pots had contained by using the Hurst method (HPLC+APCI MS) (Stuart 1988: 153-154; Hurst et al. 2002: 289; Kaplan et.al. 2017: 526).
3. Case studies

3.1. Introduction

The case studies main focus is on the regional differences in Maya culture and cultivation. The regions in focus are the Lowlands, the Highlands, the Coast, and the city of Cancuen. The reason Cancuen is mentioned is due to its strategic location on the edge of the Lowlands and Highlands and being a trade centre on the riverbed of the river Río la Pasión, the city was a powerful city because most of the trade items moving inland from the coast went through that city.

Figure 2: A map over the Mayan Civilization

During the Classic period (250-950 AD) the majority of the Mayan civilization resided in the central Lowlands, The southern Lowlands and the southern Highlands (McKillop 2005:
The main focus is on the Classic Period but Post Classic (950-1539 AD) will be mentioned because some of the cities and regions that flourished during that time were established earlier in the history of the Mayan civilization.

Mayan cities from the Classic period (250-950 AD) share the same basic structure of the temple-pyramids, palace compounds reserved for royals, rectangular plazas, larger buildings where the administrators worked and the elite lived, and “stelae” (sculpted stone slabs or monuments) with hieroglyphic text or art chiselled into the stone. These structures are found in the centre of the city and are known as “epicentres”. And epicentre is like a “civic-ceremonial core complex”. This epicentre or core complex is a collection of buildings and open spaces (plaza, or ball courts) and living quarters for the cities elite. These core complexes had an administrative, residential, ritual and public function all entwined together and linked by a network of paths and walkways.

The larger cities had subsidiary civic centres in certain neighbourhoods, with common housing or “residential household groups” clustering around said centres (Isendahl & Smith 2013: 135; Isendahl 2012: 1113-1114; Smith 2007: 25). The housing was constructed with limestone rocks and boulders carved into blocks, built in a quadrangular shaped platform as the housing foundation. This elevated the houses living surface from the ground, houses were then constructed on each side of the platform facing inwards making the platform a patio of sorts. This type of housing was built around the neighbourhood civic-centre (Isendahl 2012: 1114). These common structures also referred to as spatial patterns and Mayan cities, and other cities throughout Mesoamerica, share two common spatial patterns. The first spatial pattern being the epicentre which is a large district where public buildings, temples, and in some cases a ball court surrounding it, and residential zones and buildings are scattered and unorganized. The second spatial pattern is that the epicentre with its temples, and palace compounds and the other larger buildings surround a rectangular plaza, and the residential zones are built on the edge creating more planned city with less scattered structures (Smith 2007: 27). The city of Tikal was a city that used the first spatial pattern, and the Mayan city of Becan, Guatemala, is an example of the second spatial pattern: The city ditch and a wall surrounding its epicentre and the other buildings and features such as the plaza and common housing were coordinated around the epicentre (Smith 2007: 10, 27).

It is well known that the Mayans used to interpret the stars in the sky, and that the calendar that the Maya are known for is based of what the heavens told them (Coe & Houston 2015: 63-68). It has been theorized by archaeologists that the spatial order of the cities and the thought was put behind on how the cities were arranged (Ashmore & Sabloff 2002: 201-202). Ashmore and Sabloff (2002) wrote that the Mayan cities and the way buildings and open spaces are positioned is connected make a statement, one that is about the political order and a cosmological one, however it is difficult to observe archaeologically due to the fact that the sites are often distorted. Some of the cities that had a longer life span are often blurred or distorted due to the city being under many different political influences during its lifespan so the planning of the spatial order has changed over time. But some of the larger cities with longer lifespans with a more stable political history indicate that the city had little disruption in its elaborate yet consistent civic and spatial plan, and allowed stable growth. The cities with a shorter lifespan have civic centres and spatial plans that are easier to interpret because the cities probably have simple political histories with little interfering in their spatial growth.

But there is a form of clarity now that archaeologists have surveyed, examined and mapped out cities. Looking at the way a Mayan city grew does say a lot about the political situation in that particular city, because if there were periods of civic or political unrest or if there were longer periods of peace and stability were some factors that could change the pattern of a city growth (Ashmore & Sabloff 2002: 201).

One common denominator amongst all the cities and the different environment amongst the Maya are the “green cities” or “garden cities” they lived in. Due to the unique landscapes and due to the fact that they did not have animals of burden (e.g. Camelids, Equines, & Cattle) to aid them with the cultivation they got creative and combined the agricultural with
the urban. Isendahl (2012) refers to the Mayan cities as “Agro-Urban” and in the case of the Mayan civilization it became an empowered urban structure. This also meant that the food that was consumed in the city was mainly grown in the city (Isendahl 2012: 1123; Chase et al. 2010: 11).

Most Mayan cities often flourished for decades, and in some cases centuries. These cities had a “sustainable” urbanism where the populations were low or not living densely. These cities also had large portions carved out for agriculture and farming and not housing. The housing followed a cluster pattern; families often lived together in houses that were strategically organized neighbourhoods. There was also an apparent hierarchy regarding the living situations, and cities were almost always organized after a social-hierarchy. If chiefs resided in the city they lived in the centre, as did the higher-ups or the elite since the Mayan civilization belonged to a chieftdom and the elites in Mayan society were the equivalent to the European nobility. The elites were the ones who controlled water- and land-management and had a politically higher status. The lower the status you had in society the further away you lived from epicentre (Isendahl & Smith 2013: 133; Barthel & Isendahl 2013: 226-228, 230-231; Folan, Faust, Gunn & Lutz 2000: 3).

Water had a large role not only in Mayans everyday life but as well as in religious beliefs, and temples were often erected around or on top of a body of water. Caves that connected to the ocean had great importance and value, and numerous rituals were performed there in the name of water and the life that it brought housing and temples were often constructed near or over a body of water. The Mayans raised the ground floor so that the water could still flow underneath the structure (Ashmore & Brady 1999: 124-125, 132, 139). When it came to watering the crops not all Mayan regions had access to groundwater so they had to survive on rainwater. But surviving on rainwater was not sustainable in the long run, particularly under the threat of a longer period of heat waves and droughts. But the Mayans who lived in such regions came up with a creative solution: They constructed “Chultuns” that collected the rainwater and stored it. The ones in charge of water management held most of the power in Mayan societies (Galopin & Scarborough 1991: 658-661; Barthel & Isendahl 2013: 226-228, 230-231).

The access to groundwater was also a challenge for some cities in certain regions, in the north the groundwater flowed close to the surface and could easily be accessed by seasonal spring clusters or sinkholes that contain water. The groundwater was more difficult to access in the central part of the lowlands due to said water was too far and too deep below the surface. In coastal zones the groundwater was influenced by the tides of the ocean. The hydrology in each region demonstrates why certain agricultural techniques had to be implemented. The more difficult it was to access the groundwater, like in the central lowlands, the more rain a city had to collect. In the north, where rainfall was scarce, groundwater was essential for survival. Which also undoubtedly prompted which crop they grew (Beach et al.1998: 88-90). Pollen data analysis has also aided archaeologists in discovering what the Maya cultivated and where. For example maize was and still is and extremely important part of the Mayan cuisine and the archaeological and osteological evidence confirms it. Majority of human remains discovered shows that many individuals have carious lesions on their teeth, which is a common consequence of a high Carbohydrate diet. Carious lesions were also discovered on the remains of dogs, and the isotopic data proves that the dogs in the Mayan civilizations shared the same diet as the humans (Cantillo et al.2010: 1; Longstaffe et al.2001: 91). Another resource that holds a large cultural meaning to the Maya was the use of cacao in their everyday life and also in rituals. This can be examined in the large number of pots and smaller ceramic vessels with traces of cacao in them, often found in the context of burial sites (Stuart 1988: 153; Kaplan et al. 2017: 526). Other vegetables and fruits that the Mayans consumed daily were; beans, squash, nance, and spices such as chili peppers. Meat was not as common, but game such as deer, dogs, and peccary (a species of swine native to the American continent) and fish did occur but only in particular events for example at rituals (Cantillo et al. 2010: 1; Folan et al. 2000: 2; Coe &
Houston 2015: 11-30). However, the Mayans did not solely survive on a vegetarian diet. The common people only ate meat during fiestas, i.e. celebrations, and rituals; meanwhile the elite most likely ate meat everyday according to isotope analyses (Longstaffe et al.2001: 92).

It was extremely significant for the Maya to use sacrifice animals such as dogs and deer in rituals, and to use them for medicine and for trade. Art found in cities depicting the rituals indicate that the dogs were quite overweight and the isotopic analysis done on the dog remains indicate that the dogs diet was similar to the human diet. The dogs were fed maize to fatten them up for rituals, they were also scavengers, so if they were not raised for the specific ritualistic purposes it would have eaten what it could find, most likely the discarded food from the common households (Longstaffe et al. 2001: 91). Even though they were slaughtered for rituals, dogs still had a special place in Mayan society, much like dogs do in modern society. The Maya had nine words for dog and it was not uncommon for the elite to have dogs as pets. Dogs were also bred for hunting. Canine teeth are often found in burial sites, conclusions can be made that dog bones indicates ritualistic use and value (Longstaffe et al. 2001: 91-92).

Deers had a similar role as the dogs meaning they were also sacrificed at some rituals. However unlike the dogs they were not domesticated, the Mayans preferred to hunt the deer instead. Art on ceramics depicts how Mayans hunted the deer. Deer were either trapped in snares or nets, or they were killed by deadfall traps or hunted down and killed by dogs. The deer was also used symbolically, people who performed the rituals on deer often wore the head and hide of a deer. Other animals such as jaguars, monkeys and snakes had a symoblical ritualistic connection. The Maya saw themselves as predators, and chiefs often saw themselves as Jaguars, the apex predator (Longstaffe et al. 2001: 91-93).

Another animal that was most commonly domesticated was the Mexican turkey (Meleagris gallopavo). It is known that the Mexican turkey was domesticated in the post-classic period (950-1200 AD) of the Mayan civilization, it is often theorised that the Mayans hunted wild turkey as a food source. However, osteological evidence at certain excavations has proven that the animals were in fact domesticated. Mexican turkey husbandry was also a possibility due to the domestication of the bird. It meant that there was an easier accessed meat source available that didn’t involve hunting, it also meant that the Mayan people who lived inland had goods, such as turkey, obsidian and jade, to export to the coast, so trading was available both ways (Emery et al.2012: 1, 5-6).

3.2. Maya Lowlands

The Lowlands is a region with a diverse topography including wetlands, tropical forests and sub-tropical forests. The Mayan Lowlands is mainly the Yucatan Peninsulas platform. It is mainly limestone, a form of carbonate rock. There is also an elevated amount of acidic waters running through the Maya lowlands, combining these waters with the carbonate rocks creates a karst terrain, and in such it creates the lowland wetlands or swamps, this makes it difficult to obtain groundwater in certain regions (Beach et al. 1998: 88).

The regions lowlands regions that were closer to the highlands had an uneven disruption of the heavy rainfalls; some regions (closer to the Maya Mountains) got more water whilst some regions (closer to the centre of the Lowlands) barely got any rainfall whatsoever. But this all varied year-to-year according to dendrochronological data collected. The risk for losing ones crops was too great, so instead of hoping for any or enough rain to come every wet season, the Maya created contingency plans for collecting rainwater and distributing said water to the farmers. And thus began the political involvement in water management (Beach et al. 1998: 88; Beach et al. 2002: 271, 277-279). The Mayans came up with a solution where they constructed water reservoirs known as Chultuns. The one who was in charge of water management in these cities held most of the power. Every household had a smaller Chultun, however, they were primarily for washing, cleaning and cooking, the neighbourhoods still
relied on the cities main reservoirs in order to be able to water their crops (Gallopin & Scarborough 1991: 658-661; Barthel & Isendahl 2013: 226-228, 230-231).

Many regions in the Maya Lowlands that were not able to grow significant amount of crop or certain types of crop (e.g. cocoa) that was required for Maya religious rituals or other cultural or survival factors relied on other means for acquire it, such as commerce (Beach et al. 1998: 91-93; Beach et al. 1999: 651, 656; Barthel & Isendahl 2013: 226-228, 230-231). For example the Peten Lakes Region produced the thick “Maya Clay” that was collected, shaped and used for construction, tools used for cooking etc. Even though “Maya Clay” was found in other regions, it dominated the region in large quantities around the Peten lakes until a time when the Europeans would conquer Mesoamerica (circa 1511 AD) or collection of the clay would be put on hold for many years due to a drought that would become a destructive factor all over the Mayan regions. According to dendrochronological data there was a drought for a long period lasting for several years (Beach et al. 1998: 88).

Parts of the lowlands inland communities were isolated from the trade world but rivers or trade centres gave them the opportunity to acquire the commodities necessary for ritualistic purposes. Furthermore, the inland communities that were too distant or isolated for trade still had locally available alternatives for meat such as deers, dogs, peccary (Mesoamerican swine), and river turtles (McKillop 1995: 219). The deer population primarily lived in the Lowlands (Longstaffe et al. 2001: 91-92).

3.3. Maya Highlands

The Maya Highlands is a part of the *Sierra Madre de Chiapas* mountain range and the topography consists of a tropical pine tree and highland oak tree forests. Since the cities in the highland region are built on a mountain range they usually had a scattered spatial pattern. There is the organized epicentre in the centre of the city, however the residential neighbourhoods are scattered and unorganized (Smith 2007: 10, 27). Chultuns are very common in the highlands due the difficulty to access groundwater (Beach et al. 1998: 88-90).

Chocholá is a large city in Guatemala that was the Mayans main cocoa producers and exporters. Chocholá became the large city it was because of its cultivation and export of cocoa. The evidence found in 2014 during a Palaeobotanical project, where researchers discovered the cultivation of a species of trees that was typically used to provide the cocoa tree and the cocoa cultivation with shade. That evidence coupled with the 100 or more mounds found at the site supports the notion that Chocholás “gold mine” was cocoa (Kaplan et.al. 2017: 527; McKillop 2005: 5633-5634; McKillop 1996: 49).

Another product that was exported from the highlands was obsidian. Obsidian is a volcanic glass that’s naturally occurring after volcanic eruptions, and it was extremely valuable to the Mayans. The Maya fashioned many types of obsidian blades and in some cases figurines for the rich elite. The source of the obsidian discovered at both coastal and inland sites show that there were two different sources for the obsidian. The obsidian from *El Chayal* has been mostly found in sites further inland and the obsidian from *Ixpeque* has been mostly found at coastal cities, so a conclusion can be drawn that *El Chayal* obsidian was traded inland while *Ixpeque* was traded by using coastal routes. Both of these sites can be found in modern day Guatemala. Jade and gold were also found in the highlands and used to make jewellery, figurines and idols that were often placed in graves and used during rituals (McKillop 1996: 49-50; McKillop 2005: 5633-5634).

3.4. Maya Coast
The sea was important to the Mayans, not just because of the trading routes it provided, but also because of the exotic trading goods that the sea provided as well. The settlements and cities by the coast flourished due to the access to the sea. The sea provided the Maya with salt and fish. And they hunted Manatees for their bones that were used at rituals, stingrays and urchins whose spines were used for ritual purposes and also buried in human graves. The sea was a rich source of “Ritual Paraphernalia” for the Maya (McKillop 2005: 5633; McKillop 1995: 214-215).

Trade goods from Wild Cane Cay, near the coast of Belize, suggests that the island was a trading port for exotic goods and archaeological evidence suggest that the island was also a ritual meeting place. Archaeological evidence such as coastal shrines found in the island, suggests that Wild Cane Cay was a religious centre as well as a trade centre. The combination of a pilgrimage and the opportunity for trade allowed for a wide spectrum of the Maya society on the island (McKillop 1996: 50). Excavations conducted on the island unearthed a large variety of trade goods such as jade and obsidian cores that would have been transported to a city that had jade and obsidian workshops, archaeologists also discovered manatee bones that had been carved into small figurines, musical rasps, and fishing weights (McKillop 1996: 55, 58; McKillop 1985: 340, 342-344).

Humans need to consume a certain amount of salt to function, and the only source of salt most Mayans ever had was the salt they got from eating meat. So because of this the production of and trade of salt was an important commodity that was in great demand. There were two ways to retrieve the salt; the first most common and easiest method was the boiling method and was done by boiling seawater using ceramic vessels, bowls and jars over fires to produce salt cakes or salt flakes, the second method was done by solar evaporation. The boiling method was primarily done on the Belize coast during the Classic and Late Classic periods (300-830 AD). The solar evaporation method was solely done at the city Xcambó Located at the northern Yucatán coast; exclusively the Mayas elite consumed this salt, and it was largely produced during the Terminal Classic period (830-950 AD) and the Post Classic period (950-1400 AD) (McKillop 2005: 5630; McKillop 1995: 216; McKillop 1996: 58; Cantillo et al. 2010: 1).

One of the questions that archaeologists have tried to answer is: how did the Mayans transport these exotic goods? It has been theorized that the Maya travelled and transported products and travelled out to sea to fish in canoes. Canoes and their K’ak Naab’ paddles have been depicted in art at temples and on stelae. But there had never been any physical evidence, such as artefacts to prove that theory, until the 2004 survey at Punta Ycacos Lagoon where one such paddle was discovered at one of the 41 sites. Radiocarbon dating analysis revealed that the K’ak Naab’ paddle was from the Late Classic Period (550-830 AD) which is consistent with the theory, carbon dated salt-production artefacts and the carbon dated artefacts connected to trade from other Mayan sites (McKillop 2005: 5632-5633).

It is important to mention that the Mayan coastal cities and trade flourished in the Early Post-Classic period (950-1200 AD) but it was established during the Classic period (250-950 AD).

3.5. City of Cancuen

The city of Cancuen was a trade centre in the Mayan Late Classic period (830-950 AD). The city is strategically located on the edge of the Maya northern Lowlands and Highlands by the banks of Río la Pasión. Cancuen was found in the centre of these two geographical locations, in an area known as the Petén Basin and it controlled the longest and most lasting trading routes in Mesoamerica (Andrieu et al. 2014: 187). There is a substantial amount of archaeological and osteological evidence to support the fact. The cities architectural structure shows that the large epicentre housed the elite and every decision concerning the port went through there. The elite had a significant role in the political organization that focused on
commerce and the merchant-elite had a higher political status than the elite that handled water- and land-management. (Andrieu et al. 2014: 188-189).

*Río la Pasión* is connected to a web of other smaller rivers that extended their way through landscape. Those river routes were used to transport goods from the coast, such as: Salt, Manatee meat and bones, and salted fish, it possibly being the only source of Omega-3 that the Mayans consumed and it gave them access salt (from the southern Belize coast or northern Yucatan coast)(McKillop 1985: 337, 347).

Food was not the only thing transported, as large number of jade and obsidian artefacts has been found during excavations, most likely connected to the wealthy and/or elite citizens that resided within the city limits. Obsidian was a high valued commodity and important exotic trading goods and obsidian knives were often used in religious rituals due to that value. Excavations around the city and in grave sites have also unearthed figurines and various objects carved from manatee bones, bones from stingray and fish. Some of which have also been found in the area along with sea turtles most likely from Stingray Lagoon or Punta Ycacos Lagoon (Andrieu et al. 2014: 187-211; McKillop 1996: 55, 58; McKillop 1985: 340, 342-344).

There were jade and obsidian workshops in Cancuen. Obsidian and jade cores were transported to Cancuen where said stone core were exchanged with other goods, and the stone cores continued on to a workshop where they were made into something such as knives and traded further. The elite even managed the initial stages of the resources as they were directly supervising the city ports (Andrieu et al. 2014: 189).

The elite had more power in Cancuen compared to other places in Maya.
4. Analysis and Discussion

The Maya valued nature and everything that it had to offer. The economic organization in the Mayan civilization revolved around management of water and land. It was often the elite in Mayan society that had some sort of control on either land management or water management (Beach et al. 2007: 650).

The Mayan agriculture evolved differently depending on what region and it changed not only between locations but also throughout time. Agricultural increase and city expansion occurred with an increased population and in some cases agricultural expansion and increase was due to opportunity, in either trade or political gain (Beach et al. 1998: 87).

It is evident that the environmental variety in the spatial patterns of every region influenced adaptability in the ancient Mayans agricultural practice (Beach et al. 1998: 95-96). It can be speculated that the cause for the large variety of environments across the regions is due to the variation in the rainfall and the different soils reacting a certain way to the rain. Cities in areas that sloped had a unique agricultural style, and the land management in these cities were centred on slope management. These cities were built in a strategic way so that the rainwater could flow down into the cities crop (Beach et al. 1998: 90). Comparing the different regions with one another indicates a large variety and differences in the natural and urban landscape, which was previously missed by researchers because they looked at the bigger picture instead of focusing it on a particular region (Beach et al. 1998: 95-96). Agro-systems progressed and developed through trial and error. The system that is eventually chosen is proven to have a preservationist and an environmental strategy, which can decrease the risk for crop and subsistence shortages and decreases the risk for long-term damage to the landscape and environment. The success in one regions habitat did not always mean success in other regions; it meant catastrophically failure for most (Beach et al. 1998: 95-96) “The Classic Maya cities managed to thrive in a fragile tropical environment for many centuries” (Isendahl & Smith 2012: 133). Because of the varying environment and depending on the groundwater access, rituals concerning water also differed. So this resulted in a slight cultural difference for every region (Beach et al. 1998: 90).

When speaking of urbanism and agriculture in modern times we see those as separate entities and intangible counterparts, and the consequence is that historians and archaeologists often apply a modern way of thinking when trying to understand ancient cultural structure (Isendahl 2012: 1123). However, considering the environment that the Mayans lived in and the fact that they did not have domesticated animals, such as cattle, equines (donkeys & horses), or camelids (llamas & alpacas) or wheeled transportation to aid or assist them with their harvest, means that they had to come up with a creative solution for their urban landscape as well as their agricultural landscape (Chase et al. 2010: 11; Isendahl 2012: 1123). The Mayans did not build cities that were traditionally “urban”; their cities have been described as “garden cities” or “green cities”, combining the urban landscape with the agricultural landscape. It is then safe to say that the Mayans did not have a traditional way of looking at the urban and agricultural concepts (Isendahl 2012: 1112-1113).

Isendahl (2012) uses the term “Agro-urban” when describing the Mayan cities. Michael E. Smith (2002) wrote: “clearly cities in a functional sense, even if they appear not to be cities in a demographic sense”.

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However, the agricultural success in a lot of cities in the Mayan Lowlands resulted to more people migrate to these cities and regions. The pressure of overpopulation in these areas became the cataclysm that brought down the city (Beach *et al.* 1998: 95-96).

The Mayan civilization had a long history of political involvement in its economy and its settlements witnessed periods of growth and regression during its pre-classic period (1000 BC-250 AD), its Classic period (250- 1000 AD) and well into its post-classic period (1000-1500 AD). Every time a region or a city would regress, the Mayans would reorganize. In other cultures it is the person with the highest social and political status that is the one who runs and controls the food production, in the Mayan culture the person with the highest social and political status is the person who controls the water, more importantly the water reservoir. Having control of the water source in the city is to control the growth efficiency of the agricultural food production. The religious and political hierarchy is clearly represented in the spatial pattern, which shows that the central plazas and civic centres were carefully organized and planned as such, meanwhile the placement of the residential zones seems almost unplanned and were disorganized (Isendahl 2012: 1121-1123).

The Mayan people were known as farmers. Their primary source of food came from agriculture, but the secondary source of food was hunting, and the other option for acquiring exotic goods was via commerce. The city of Cancun is a trading centre, which was located in the Petén region, between the Highlands and Lowlands, connecting them both on the Río la Pasión, which in turn was connected to a web of smaller rivers, allowing imported and exported goods to swiftly travel about the Mayan Empire (Andrieu *et al.* 2014: 187). Cancuen may have been one of the most powerful cities of the Mayan civilisation particularly during the Late Classic period (550-830 AD).

There are many historical sources that specifically mention maize as an important staple food, and osteological evidence such as carious lesions support those sources. Carious lesions are a common consequence associated with high carbohydrate diet and consumption. Numerous human remains and dog remains dated back to the Classic period (250-950 AD) and Post Classic period (950- 1500 AD) Maya have carious lesions on their teeth. There is also isotopic evidence that supports that fact. The Mayans consumed Maize in various forms: for instance it could be baked into flatbreads such as tortilla or tamales or it could be made into beverages and be drunk (Cantillo *et al.*, 2010: 1). And by using the “Hurst method” (see background) archaeologists can tell that the beverages the Mayans drank contains the same ingredients (maize, chilli, cocoa, water) as the traditional *atole* beverage. *Atole* can be consumed as it is or it can be fermented, the alcoholic beverage is known as *Chicha* (Cantillo *et al.* 2010: 1; Hurst *et al.* 2002: 289; Kaplan *et al.* 2017: 526).

Other vegetables and fruits that the Mayans consumed daily were; beans, squash, nance, cocoa and spices such as chilli peppers. Meat was not as common but game such as deer, dogs, and peccary and fish did occur but only on particular incidents for example at rituals (Cantillo *et al.* 2010: 1; Folan *et al.* 2000: 2; Coe & Houston 2015; 230-232). It is well known that cocoa was highly important and played a huge role to the Mayan civilization culture throughout the Pre Classical to Post Classical Periods (1000 BC- 1500 AD) in cuisine, rituals and trade. It is also evident on the painted murals, hieroglyphic texts on ceramics and Stelae and carved on objects found in graves (Kaplan *et al.* 2017: 529). The city that largely produced cocoa was Chocolá located in the Highlands, which is now present-day Guatemala. The area lacked groundwater, however there were copious rainfalls during rain seasons, proven by Dendrochronological tests, which is beneficial for the cocoa which tree needs a lot of water to be able to grow. Furthermore several Chultun structures have been found during excavations. Another proof that Chocolá most likely cultivated most of the Mayans cocoa is the presence of a particular species of trees that provide shade (Kaplan *et al.* 2017: 529).

The Mayan population would have benefited from a more varied diet seen from an osteological viewpoint (Cantillo *et al.* 2010: 3).

The sea was important to the Mayans. Not just because of the trading routes it provided, but because of the exotic trading goods, for example: salt, manatee bones, stingray spines, and
urchin spines, seashells, and conch shells, sea turtles, and overall seafood such as fish. The sea was a rich source of “Ritual Paraphernalia” for the Maya (McKillop 2005: 5633; McKillop 1995: 214-215). Underwater excavations have also discovered that the Mayan civilisation production of salt was conducted at the coasts of Guatemala, the Yucatan peninsula (at the Mexican coast), but production was mainly conducted at Punta Ycacos Lagoon and Stingray Lagoon, located on the coast of Belize. The salt production was focused in the saline waters during the dry seasons when the water was elevated. The salt production was for 1) local (coastal) use and 2) trade via inland transport routes. The Belize produced salt was closer to the southern reaches of the Lowlands, rather than their usual source of salt which they got from consuming meat and the inland salt source known as Salinas de los Nueve Cerros, which in turn was extremely limited (McKillop 1995: 216, 219, 221; McKillop 1996: 58). The salt was produced at workstations where the salty liquid from the ocean was boiled in cylinder pots made of clay, and corn was sometimes added to make the grain finer. But as the climate changed and in turn the environment became warmer, humans had to abandon the lagoon to produce salt elsewhere (McKillop 1995: 216, 222).

Majority of the Mayan studies have focused on how the agriculture has developed, which in turn resulted in a theory that stated that the Mayan people were farmers and survived solely on the food grown in the cities (McKillop 1995: 214). Coastal and underwater excavations that archaeologists have conducted at coasts have proven that the Mayan people didn’t solely survive of grown food and animal husbandry, but also had a diet of seafood available to them through commerce (McKillop 2005: 5630-5634; McKillop 1995: 219; Coe & Houston 2015: 22-25, 41-43, 230-232). There are still a few isolated cases where coastal trades did not occur but the cities located in the Southern Lowlands and Southern Highlands did receive seafood and other trading goods from the coastal cities transported by canoes (McKillop 1995: 215).

Most economies in Mayan regions and cities during the Classic period (250-950 AD) were largely sustained by their basic need to survive within that region. This economy pattern varied in the lowland regions relative to the highland regions. Larger sites in the Maya lowlands for example such as Caracol in Belize or Tikal in Guatemala, and even Cancuen, had to account for the need of a military that greatly strained their resources (Andrieu et al. 2014: 189). A large number of cities and regions were politically divided due to conflicts near the end of the Mayan civilisation. These conflicts forced people to move into cities and it became increasingly difficult to sustain everyone. The conflicts coupled with the longer drought periods, the Mayan civilizations collapse became inevitable (Isendahl & Smith 2013: 135).

The Mayan civilization moved closer towards the coast of the northern Yucatan peninsula during the end of the Terminal Classic period (830- 950 AD) and nearly the entire civilization had shifted towards the coast in the Early Post Classic period (950-1200 AD), mainly due to environmental changes, regional conflicts and political clashes (Aeschlimann et al. 2003: 1731, 1733-1735; Andrews et al. 2003: 151-152). Coastal cities may have flourished during the early Post Classic period (950-1200 AD), but they were established during the Pre Classic (2000 BC-250 AD) and Classic period (250-950 AD) due to the seas importance in Mayan culture. Inland trade was more important during the Classic period, but coastal trade did not just appear out of nowhere, it developed and advanced during the Late Classical period (That is proven by the Radiocarbon dated artefacts at numerous inland sites and at coastal sites). The Classic period inland populations depended on the coastal trade for their rituals and other sources such as food, and other important objects were not as easily obtained. However, these cities did not always have access to either the sea so it is highly plausible that the Maya had inland trade centres to allow people from isolated areas to travel a short distance for exotic goods (McKillop 1996: 50).

The increase in population in certain cities can be reflected in the great expansion building projects done at Tikal in Guatemala, Calakmul and Coba, Mexico and Caracol, Belize to mention a few (Folan et al.2000: 3-4). The Mayan Collapse refers to the rapid
abandonment and depopulation of several sites and/or regions; this was possibly due to climate change and possibly due to conflicts. The cause varies from region to region. The Collapse of the Classic Mayan civilisation has often been viewed as a process that occurred in the southern Maya Lowlands (Andrews et al. 2003: 151-152). Furthermore, Paleoclimatologists and Landscape Archaeologists claim that the reason for the civilizations collapse was due to climate change. The claim that climate change was the reason why the Mayan population abandoned the larger cities was due to unnaturally long droughts around 810 AD, 860 AD, and 910 AD. These claims were based on the scientific evidence researchers gathered from dendrochronological tests, which they tested on various trees in certain areas and any area where limestone was present (Haug et al. 2003: 1731-2). What the data suggested was that during periods where dry seasons lasted longer turned into droughts. The dry periods put a strain on resources and more importantly food and since the Mayans lived in a culture with an Agro-urban landscape it is logical to think that people would leave or abandoned the larger cities in favour of the smaller areas where food growth was more productive (Haug et al. 2003: 1731-2; Isendahl 2012: 1112, 1123).
5. Results

The research yielded these results:

What resources did the Maya have access to and use and for what purpose?

The resources that the Mayan people had access to were mainly crop, such as maize, beans, squash and chilli. They also consumed fruit, berries and cocoa that were used in their everyday life and for ritualistic purposes. Their religion was shaped after their resources and their deities had a story directly linked to a certain crop and animal.

The settlements closer to the ocean tapped into the resources that the Caribbean Sea had to offer, such as manatees, sea urchins, stingrays and other sea creatures. The sea did not only provide a source for Omega-3, meat, and ritual paraphernalia, but was also the location for the salt production. Without the production, the only source of salt the Mayans could get was from the meat that they ate. The meat that they mostly consumed came from dogs, deer and peccary.

Areas in the Highlands were the Mayans main source of gems and mineral rocks such as obsidian and jade from Guatemala, and gold from the Sierra Madre mountain range.

Being a society that mainly survived on agriculture, what was their relationship with animals?

The Maya had a close connection with animals. However, they did not have animals of burden, because none existed in the region, which resulted in that most of their connections with animals were purely ritualistic, in some situations the animals role in the Mayan life was purely symbolic. Animals such as jaguars, snakes and monkeys had a symbolic role. The chiefs or leaders saw themselves as natural predators and often compared themselves to the jaguar, because the Mayans relished in the hunt.

Even though domestication was not very common amongst the Mayans it did occur, the two primary animals that were domesticated were dogs and turkey. Turkey was raised merely as a food source. The relationship between humans and dogs was a bit more complicated. They were raised for three reasons; (1) some were raised for hunting (2) the elite kept them as pets (3) they were raised and fed maize to prepare them for ritual slaughter, dogs were mostly scavengers so they were taken care of to certain extent.

The deer, like the dog, had an important ritualistic role in Mayan society, and hunting deer was a ritual, since the heads and skin of a deer was often worn during certain rituals. There was a predatory symbolism in that as well, the hunters in Mayan society are the predators and deer are their prey. Peccary, a swine was also hunted for food, however it was not common in every region so the Maya did not have a ritualistic connection to it.

Were there agricultural and cultural differences from region to region?

There was a difference in certain regions. The main distinction was in the diet, the available crop and the spatial structure in different environments. For example, Cocoa was mainly produced in the Maya Highlands, and obsidian, gold, and jade was obtained also obtained
there; the coast was the only source for sea and ocean paraphernalia, salt, and fish to consume; and the lowlands was the main source for Maya clay, vanilla, and certain types of meat.

The architectural and the spatial order is different in the highlands due to the mountains shaping the way one could construct the city, also the Maya needed to incorporate water reservoirs and water distribution systems. This resulted to slope management in the highlands. However, in the lowlands the cities had more structure and spatial planning, and even though some cities had the need for water reservoirs, others could survive on the groundwater.

The primary method the Maya used to obtain certain objects were by trade. During some cases for certain cities inland, trade centres were needed. Since the Mayans did not have animals of burden, or wheeled vehicles they had to rely on the ocean and rivers to transport the exotic trade goods, via canoe.
6. Summary

This essay is a comparative study of academic literature about the differences in the Mayan culture, differences in the natural landscape and the urban landscape, compared by different regions in the Classic Mayan time period (250-9650 AD). For a long time archaeologists have thought of the Mayan landscape to be homogenous, but the truth being that it is heterogeneous, and the only way to get a correct assessment about the Mayan civilization is to look at it regionally and not only at the bigger picture.

The regions in focus were the highlands, lowlands, the coast, and the city of Cancuen. The reason for bringing up Cancuen in the comparison is mainly to show an example of a Post Classic city in the Classic period. The city was located by the Pasión River, between the Maya Highlands and the Maya lowlands, acting as the trade centre for the Mayan civilization, and in doing so it was the most powerful city in its time. The city also had a Post Classic period political structure; where merchants had more power than politicians that were in charge of water management, land management or militia.

The highlands were in focus due to its unique spatial patterns and its importance in the export for obsidian, jade, gold and cocoa trade.

The lowlands were in focus due to its various and unique environments. Unlike the highlands part of the lowlands cities had access to groundwater and could cultivate larger areas and build larger cities. However, not every part of the lowland region was habitable for a long period of time. And certain areas did not have as much access to other resources as the coast and the highlands did.

The coast during the Classic period was mainly a source for sea paraphernalia and commodities. There existed settlements at the time but the cities didn't flourish until the Post Classic period, after the classic period collapse of the Mayan civilization had occurred.
7. Bibliography

7.1. Books


7.2. Articles


7.3. Figure:

Figure 1: Coe, M., & Houston, S., 2015. The Maya. Thames Hudson: 10

Figure 2: Burchell, S., 2015. Maya Civilization Location Map. https://commons.wikimedia.org/wiki/File:Maya_civilization_location_map_-_geography(1).svg Wikipedia. 28/5-2018