Morphophonology of Joola Eegimaa

A DISSERTATION

SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL

OF THE UNIVERSITY OF MINNESOTA

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHYLOSOPHY

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August 2012

Acknowledgements

There is an Eegimaa proverb which goes: "*no matter how deep a river is, it has a bottom*." The wisdom behind this proverb is that everything has an end and with a persistent belief on yourself and an unshakable determination, you can always overcome the difficulties ahead of you and fulfil your dreams. The road to completion of this research has been not only long, but also thorny. At times, I even considered quitting and going back home to be among the people I love and care so much and who, in their hearts, have even more love and care to offer. However, my conscience spoke much louder than my despair and its message was crystal clear: '*you gave up everything you had in Senegal and came to this great country for a PhD degree. No matter the nature of the obstacles standing in your way, you cannot give up. You would be failing not just yourself, but also so many people who set so much hope and expectation on you. You have to complete your PhD. You can do it and you have to do it. You owe it to yourself and to your beloved people, especially your sister* ***Miho Patani***'. I am glad I listened to my conscience.

It was a true blessing having Professors Jeanette K. Gundel and Anna Lubowicz as my advisers. I was introduced to Anna Lubowicz at a time when my prospect of ever starting this dissertation cannot be any bleaker. I was desperately looking for a phonologist to supervise my research and Professor Gundel who made my case her own, introduced me to Anna Lubowicz. That was when my academic career took a turn for the better and I will, forever, be indebted to both of them.

I am also grateful to Daniel Karvonen for his comments and advise when I was working on my MA thesis and for accepting to join my dissertation committee. Thanks are also due and are hereby rendered to Professor Benjamin Munson and Professor Mark Snyder, the other two members of the committee. The comments I received from this committee during my preliminary oral examination were very fruitful and gave me new and clear ideas on how to proceed in the research.

I owe a special debt of gratitude to my department, the Institute of linguistics, the National Science Foundation, the office of International Student and Scholar Services (ISSS) and to Professor Polly E. Szatrowski for their financial support. The cooperative known as the Minnesota Graduate Club will always have a special place in my heart for providing international graduate students with affordable accommodation.

It is impossible to list all the Eegimaa speakers with whom I worked, collecting the data upon which this dissertation has drawn and I would like to apologize in advance for the omissions. However, there are some informants I just cannot afford to omit because they have invested such a tremendous amount of time and energy in this research that they should be publically acknowledged. These are: Louis Eketuba Bassene, Rene Bassene, Aput Bassene, Ousmane A. Bassene, Noel Bassene, Maxim Manga, Kembugun Manga, Moni Sambou, Binta Sambou, and Marie Tendeng.

Finally, I would like to express my gratitude to my instructors at Gaston Berger University in Senegal, especially to Ibrahima Ndiaye, Abdoulaye Barry and Maweja

Mbaya for introducing me to the Linguistics discipline. My relatives have always been there for me, in all my endeavors. I am appreciative of their support, love and prayers.

May the blessings of God rest upon all of you!

Dedication

To the memory of my father, Abdou Karim Bassene and my mother Aïssatou Bassene.

To my brothers and sisters, my aunt Binta Bassene, my friend Ephrem Gutemberg Manga, and especially, to my sister Miho Patani.

Abstract

This dissertation explores the morphophonology of Joola Eegimaa (Eegimaa hereafter), an endangered West Atlantic language spoken in the southern region of Senegal. Previous researches on this language focus on the morphosyntax (Bassene 2007 and Tendeng 2007) and the semantics, specifically the semantic motivation of Eegimaa noun class system (Sagna 2008). This study is the first work devoted to the morphophonology of Eegimaa and therefore contributes significantly to the documentation of this language.

This study provides a detailed description of Eegimaa morphology and phonology, and presents three case studies of such processes as reduplication, nasal assimilation and vowel harmony which are all very common in this language. The morphological analysis proposed in this study offers a detailed account of Eegimaa nominal classification and concord system as well as the rules for word formation in this language. This dissertation also provides valuable information regarding the Eegimaa phoneme inventory, the various processes affecting phonemes, and offers significant insights into the syllable structure of Eegimaa. The results of the experimental studies I conducted have revealed that vowel length is not a phonological feature in Eegimaa and that vowel sequences are always parsed into nuclei of separate syllables. I also argue, based on the results of the experiments and the behavior of 'prenasalized' consonants and geminates that in Eegimaa, these sounds should also be treated as a sequence of two segments instead of one.

Eegimaa reduplication is very complex and shows a dual behavior of consonants in the reduplicant coda. Voiceless singleton consonants and glides are deleted when they occur in the reduplicant coda whereas voiced consonants and liquids completely assimilate to the onset of the base. I attribute this dual behavior of consonants to a difference in moraicity, with voiceless singleton consonants and glides being nonmoraic and voiced singleton consonants and liquids being moraic; a claim supported by the acoustic study I conducted. Eegimaa nasal consonants also exhibit a dual behavior. When a nasal is followed by a voiced obstruent, it assimilates to the place of articulation of the obstruent. However, when a nasal is followed by a voiceless obstruent or an approximant, complete nasal assimilation occurs. I strongly argue that the two types of nasal assimilation processes are attributable to the Nasal-Consonant (NC) requirements in this language. Indeed, Eegimaa only allows NC sequences consisting of a nasal and a homorganic voiced obstruent and therefore, whenever a nasal is followed by a voiced obstruent, it assimilates to the place of the obstruent and when the nasal is followed by a voiceless obstruent or an approximant, complete assimilation occurs since the sequences nasal-voiceless obstruent (NC̥) and nasal-approximant (NC̞) are not allowed.

The analysis of Eegimaa morphophonological processes is undertaken within the framework of Optimality Theory. However, it should be pointed out that the data upon which this dissertation draws do not favor any specific type of analysis.

Therefore, throughout this dissertation, I adopt an approach which combines both descriptive and theoretical analyses and in many cases, these analyses are supplemented by experimental studies.

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List of abbreviations

AF	affix
[approx]	approximant
ART	article
ATR	Advanced Tongue Root
BCT	Body-Coda Theory
BR	base reduplicant
C	consonant/coda
CM	class marker
CLP	classifier phrase
CV	consonant vowel
CAUS	causative
con	connective
COND	condition
[cons]	[consonantal]
[cont]	[continuant]
[cor]	[coronal]
DEF	definite
DEM	demonstrative
DEP	dependency
DER	derivational affix

DIM	dimunitive
DIST	distal
[dor]	[dorsal]
EXCL	exclusive
F	feature
FST	Flat Structure Theory
FUT	future
GEM	geminate
HAB	habitual
IMPERF	imperfective
INCL	inclusive
INDEF	indefinite
IDENT	identity
IDWD-LAR	Identity Word- Laryngeal
INTRANS	intransitive
IO	input output
[lat]	[lateral]
LAR	laryngeal
MED	medial
[prenas]	[prenasal]
MDT	Morhpological Doubling Theory
ms	millisecond

MT	Moraic Theory
N	noun/nasal/neucleus
[nas]	[nasal]
N/A	not applicable
NC	nasal consonant sequence
NEG	negation
NGP	Natural Generative Phonology
NP	noun phrase
NPA	Nasal Place Assimilation
NUM	number
O	Onset
OBJ	object
ORT	Onset-Rhyme Theory
P	preposition
PASS	passive
PERF	perfective
PL	plural
1.PL	first person plural
2.PL	second person plural
3.PL	third person plural
POSS	possessive
PROG	progressive

PROX	proximal
RED	reduplicant
SG	singular
1.SG	first person singular
2.SG	second person singular
3.SG	third person singular
[son]	[sonorant]
[strid]	[strident]
[syll]	[syllabic]
SR	subject relative
SM	subject marker
SUBJ	subject
UR	underlying representation
TAM	tense, aspect and modality
TRANS	transitive
V	verb/vowel
[voi]	[voice]
VP	verb phrase

List of symbols

+	presence of the designated feature
-	absence of the designated feature / morpheme boundary
˳	voiceless
ˬ	voiced
˕	approximation
₌	continuity
⊃	better than
σ	syllable

0. Introduction

0.1 Motivation

Eegimaa is an agglutinative language which heavily relies on morpheme combination for derivational (both syntactic and morphological) as well as inflectional purposes. However, the coming together of morphemes very often results in various sound changes. Most of the existing research on Eegimaa is mainly devoted to morphosyntax and semantics, especially the semantics of noun classifiers. Initially, I considered writing a paper in which I would offer a systematic and detailed description of the processes responsible for the sound changes in Eegimaa. But the amount of data collected, the many wrinkles displayed by these data as well as the results gotten after analyzing the data convinced me that if I opted to present my analysis in a paper format, I would have no other choice but to trim off a lot of information and seriously compress the analysis in order to remain within the space constraints often set by publishers. I wanted to produce a single document which contains a comprehensive discussion of the sound changes found in Eegimaa and I could not sacrifice such an amount of information in order to meet some length requirement. Partly for this reason, I decided that a dissertation would be a better fit for this project. Another reason which motivated this project is that Eegimaa is an endangered language. Therefore, this dissertation is intended to be part of the documentation effort undertaken by scholars who are native speakers of this language and also by a group of linguists from the Summer Institute of Linguistics (SIL).

0.2 Objective

A phenomenon often reported in phonology is the discrepancy in terms of the sequences of consonants a language may allow in various positions in a word. A language may allow at the word edges sequences which are not permitted word internally. Eegimaa, for instance, does not allow any combinations of consonants word-initially and restricts word final consonant sequences to voiceless geminate stops. Word medial consonant sequences are restricted to nasal-voiced obstruent sequences and geminates; the only two consonant sequences which occur in Eegimaa. Consequently, whenever the combination of morphemes would yield a sequence which the language does not permit, various processes are systematically employed to ensure that such a sequence does not surface. The objective of this dissertation is to provide a detailed and unified account of the most common sound changes found in Eegimaa. I will strongly argue that most of these sound changes are driven by the constraints on syllable structure and possible sound combinations.

I am mindful of the fact that an accurate description of these sound changes is tightly dependent on a thorough description of the phonology and the morphology of this language. This dissertation therefore proposes a detailed analysis of both the sound system and the morphological system of Eegimaa. The analysis of the sound changes is mainly undertaken within the framework of Optimality Theory (OT), a theory which differs from traditional Generative Phonology in that, instead of relying on rules and rule ordering to explain linguistic phenomena, it relies on constraints and their ranking. However, in each case, the OT analysis is preceded by a detailed descriptive analysis of the phenomenon being discussed.

0.3 Data and data collection

This study is based on data from various field researches conducted in 2003 and 2004 (for different projects), and in the summer of 2010. Supplementary data were collected in 2011. My informants are from five villages (Seleky, Enampor, Banjal, Etama, Elubalir), but the majority of them are from Seleky and Enampor. The data consist of words, phrases, sentences, folkstories and natural[1] conversations, all of which were recorded using digital audio and sometimes video equipment. The advantage of having data of various types is that they enable the researcher, in this case myself, to see the various forms of such linguistic elements as the phonemes and the morphemes. For instance the use of phrases and sentence in this research clearly informed me about the concord system so characteristic of Eegimaa and this concord gave me a better idea about the class markers involved and, consequently, allowed me to have an accurate inventory of the class markers in the language. The use of both folkstories and natural conversations, in addition to providing the context for observing the various realizations of phonemes and morphemes, also constitutes valuable sources of natural, spontaneous production of linguistic elements.

The data were discussed with other Eegimaa people who have linguistic training. In doing so, my objective was to enhance the level of accuracy in the description. I also consulted the few existing works on this language and also any work which I thought could shed more light on my analysis.

[1] By natural conversation, I mean a conversation in which participants exchange freely on topics of their choice, as opposed to a structured conversation in which participants discuss a specific topic and turn taking follows a well established order.

0.4 Contribution

This dissertation provides significant contributions to both the study of Eegimaa and also to some of the phonology debates. Starting with the study of Eegimaa, this dissertation contributes to the documentation of this language which, as mentioned earlier, is endangered. The novel data collected and presented in this dissertation not only give detailed illustration of the phenomena discussed in this research, but also provide one additional record of Eegimaa and therefore add to the recent documentation effort undertaken by linguists, most of whom are natives of Eegimaa.

This dissertation is also the first research study devoted to the morphophonology of Eegimaa. It is the first research study to apply OT to the description of some of the processes found in Eegimaa and the first work to use Moraic Theory to explain the various processes affecting Eegimaa consonants in coda position. The detailed discussion of Eegimaa morphology provides further insights into the word structure and the rules by which words are formed in Eegimaa. This dissertation also offers significant insights into the syllable structure of Eegimaa and provides detailed analysis of the segmental inventory of the language, including segmental length, prenasalization and gemination. This research equally offers a detailed account of the most common morphophonological processes found in Eegimaa, among these reduplication and all the many sound changes which occur in the reduplication process, nasal assimilation and vowel harmony. Although these three processes are singled out for case studies, the dissertation also contains discussions of other processes such as stem final voicing, lateralization and vowel deletion.

This work differs from previous studies on Eegimaa on many issues. I provide data which challenge some of the findings of those studies. Some of the previous studies argue for the existence of vowel length which, according to those studies, is distinctive. The results of the experiments I conducted do not support those claims. I also provide evidence against the height harmony claimed by some of the previous studies and I propose a backness harmony instead. In the debate concerning the vowel-zero alternation so common in Eegimaa, I propose a diacritic feature analysis which provides a straightforward account for this alternation.

Another significant contribution of this dissertation is that it offers a unified explication of the sound changes in Eegimaa. The analysis of the various sound changes shows that all these changes follow from the syllable structure and the constraints on possible sound sequences in Eegimaa. This language has many restrictions on the types of admissible sounds sequences and various repair mechanisms among which deletion, assimilation and harmony are utilized to ensure that the sequences of sounds /syllables found at the surface level are well-formed.

This research provides further support to the idea that the moraic status of codas is language specific, as is the contribution of moraic codas to the overall duration of syllables. I also show how moraicity and sonority can interact to account for the same phenomena.

0.5 An outline of the chapters

This dissertation contains six chapters. Chapter 1 gives an overview of Eegimaa. It is further structured into nine sections. Sections 1.1 through section 1.5 offer ethnographic information regarding the Eegimaa people. These sections respectively present the people, their origin, their lifestyle, their spirituality and their struggle against colonialism. Section 1.6 gives a classification of Eegimaa; and section 1.7 is an overview of previous studies on Eegimaa. Section 1.8 provides typological information and section 1.9 offers sociolinguistic information about this language.

Chapter 2 focuses on the morphology of Eegimaa. It includes four sections. Section 2.1, provides a detailed discussion of the noun class markers; section 2.2 discusses the nominal dependents and also the concord system of Eegimaa. Section 2.3 deals with the verbal inflection morphemes, and section 2.4 with the processes employed in Eegimaa to derive new words.

Chapter 3 deals with the phonology of Eegimaa. It contains five sections. Section 3.1 describes the vowel system of Eegimaa. In this section, I first present an inventory of the vowel phonemes of Eegimaa, discuss the phonemic status of the [+ATR] feature and the status of length vis-à-vis vowels, and then weigh in on the controversial topic regarding whether there is a 'disjunctive' phoneme in Eegimaa. Section 3.2 deals with the consonant system. After presenting an inventory of the singleton consonants, and discussing the prenasalized consonants, I discuss the geminate consonants. Section 3.3 is devoted to the structure of Eegimaa syllables whilst section 3.4 and section 3.5 deal, respectively, with the allophonic and morphophonological processes.

Chapter 4 is a study of the reduplication process in Eegimaa. In this chapter, I discuss the two types (partial and complete) of reduplication and then, using both OT and the Moraic Theory, I analyze the sound changes which occur when morphemes are repeated. This chapter contains six sections. Section 4.1 presents the various functions of the reduplication process in Eegimaa. It also surveys a few other languages and shows the functions reduplication serves in these languages. Section 4.2 examines the size and position of the reduplicant (the copy) in Eegimaa. As we will see in the survey provided in §4.1, languages differ in term of how much of the base they copy. Some languages copy the whole base, whereas other languages copy just one or couple of segments and the copy can be prefixed, suffixed and even infixed to the base. In section 4.2, I will show how much of the base can be copied in Eegimaa and where that copy is placed. Sections 4.3 and 4.4 respectively discuss the types of reduplication found in Eegimaa and the problem posed by the reduplication processes and which will be accounted for in this chapter. In the following section (4.5), I present all my claims regarding the various phenomena observed in the reduplication processes and in section 4.6, I present my analysis.

Chapter 5 provides a detailed description of nasal assimilation in Eegimaa. I go through both place assimilation and complete assimilation and discuss the constraints responsible for each. This chapter includes four sections. In section 5.1, I provide a descriptive account of nasal assimilation. This section also includes a survey of nasal assimilation processes in other African languages. In section 5.2, nasal assimilation is analyzed from OT lenses. I show that nasal assimilation in Eegimaa is not just motivated by the coda condition and in the following section (5.3) I propose three alternative constraints (NPA, *NC̥, *NC̞) to account for the assimilation processes affecting nasals sounds in Eegimaa. Section 5.4 compares nasal assimilation in Eegimaa to nasal assimilation in Jóola Fogny, a language closely related to Eegimaa

Chapter 6 examines vowel harmony and the constraints which account for ATR harmony as well as backness harmony. In the first section (6.1), I provide a brief overview of the three common types of vowel harmony systems (*stem-controlled*, *dominant-recessive, affix-controlled*) found among languages. In section 6.2, I discuss ATR vowel harmony in Eegimaa, and in section 6.3, I discuss backness harmony which is also very common in Eegimaa. In the last section (6.4), I provide an OT analysis of both types of vowel harmony.

1. Social and Linguistic Overview

1.1 The people

The Eegimaa people belong to a tribe known as Joola, a term which derives from the Mandinka[2] word *Joolaa* which consists of the morphemes *joo* 'retaliate' and the agentive marker -*laa* (Thomas 1959). The term therefore describes a group of people often thought of to be very defensive. The Joola people live in the southern part of Senegal, mainly in the region of Ziguinchor. They are also found in Gambia and in the republic of Guinea-Bissau. Unlike most Senegalese societies which are structured around social strata, the Joola society is egalitarian. The main economic activity of the Joola people is farming, especially the production of peanuts and such cereals as rice, millet, and maize. However, the Joola people do not constitute a homogeneous group. There are significant cultural and also linguistic differences among the various subgroups, which also speak language varieties which are not always mutually intelligible. The Joola people are well aware of these intra group differences and therefore, when asked about their ethnicity, they will certainly respond that they are Joola but will also specify the specific subgroup within the Joola tribe to which they belong. Among these subgroups are Fogny, Kasa, Bayot, Caron and Eegimaa. The Eegimaa people live in the former kingdom of Mof Avvi[3] [mɔf ɐvvi], southwest of the district of Ziguinchor. The term Eegimaa is actually a

2 The Mandinka language is a member of the Mande group. It is mainly spoken in Senegal, Gambia and Guinea-Bissau.

3 The word Mof means 'land' and Ávvi means 'king'. Put together, the compound word Mof Ávvi means 'the land of the king'. The kingdom consists of ten village which are: Badiatte [baɟ:at], Essil [ɛs:il], Kemebeul [gə:βəl], Enampor [ɛnap:ɔr], Seleky [seleɣɨ̤], Elubalir [ɛlʊβalir], Batinger Bolong [bətɨ̤ŋer bɔlɔŋ], Etama [ɛt:ama], Bandial [baɲɟal] and Batinger [bətɨ̤ŋer]

whole sentence. It consists of the verb *eeg* ‘tell’, the object pronoun *-i* ‘you’ and the demonstrative *maa* ‘this’. Put together, the term Eegimaa means ‘this is what I am going to tell you’. The Eegimaa people are referred to as such because the term occurs very often in their speech and is used in conversation as a discourse marker to seek the attention of the interlocutor.

1.2 Origin of the Eegimaa people

As in most societies with no written tradition, the history of the Eegimaa people is passed down from one generation to another through storytelling. According to those stories, the Eegimaa people came from a place called Gabu, in the northeast of the republic of Guinea-Bissau. In Gabu, the Eegimaa people experienced a series of serious economic hardships. The lack of sufficient arable land coupled with poor crop yields and overpopulation resulted in famines. The migration from Gabu was therefore motivated by a quest for arable land. The quest for land first led the Eegimaa people to a place known as Burofay, south of Ziguinchor city. However, life in Burofay was not any better from the life the Eegimaa people were living in Gabu since they continued to experience the same hardships. One day, a hunter named *Ɉɪmɛŋgɛrɛ* left Burofay and headed west in search for game. After a long walk, he discovered a spring (which still bears his name) in a place known today as Baɟokotoŋ and which, according to some of my informants, is part of Baɟɟat village. There, he also found land which he deemed fit for farming and not far from that land, a river. From his initial hunting plans, Ɉɪmɛŋgɛrɛ set himself a new mission which was exploratory. He carried his exploration farther west and all along he discovered more arable land. His exploration mission ended in what is known today as Seleky. After a minute exploration of the huge land in Seleky, he decided to go back to Burofay to inform his people. There, people were really concerned about him since he was missing for many days and they even started to consider that he might not be alive. When he arrived, a meeting was convened during which he provided a detailed account of his discovery and suggested moving to the newly discovered land. To check the information he just provided, two other hunters were designated to accompany him back to the new land. Upon confirmation, the migration began.

Three families were believed to have moved from Burofay to settle in Mof Ávvi and these are Bassene [basɛn], Batendeng [batɛndɛŋ] and Ɉíban [ɟiβɐn]. The Bassene family settled in Essil, Batendeng settled in kemebeul and Seleky and the Ɉíban settled in Enampor[4]. The king and his entourage, all of whom belong to the Ɉíban family, were the last to move from Burofay (Palmeri 1995). They first settled in Enampor before a rift divided the royal family into two families: the Ɉimanga family which stayed in Enampor, and the Sagna family which moved to Essil. Ever since, the royalty is shared by these two families which take turns on the throne.

Mof Ávvi originally consisted of the four villages mentioned above. The other six villages of present day Mof Ávvi were later founded by people who fled their original villages. The inhabitants of Elubalir originally lived in Seleky where they

[4] According to some of our informants, the people who left Burofay actually settled in the first three villages and Enampor which is pronounced ɛnap:ɔr ('gather together') was created later by people from different origins.

were frequently in conflict with a neighboring group named Baimban. Each time they fought, Elubalir was victorious. However, Elubalir was never pleased with the fact that their fights always ended quickly because they were much stronger than Baimban. During their last fight, Elubalir decided to donate one family to Baimban in order to balance the fight. That family is known as Elubujuber, meaning 'Elubalir people who just joined Baimban'. Once on their new side, people from Elubujuber explained to Baimban all the strategies Elubalir was using. Their last fight did not last long either, but this time was in favor of Baimban. To put an end to the fighting once and for all, Baimban decided to chase them out of the village. People from Banjal, Etama, Batighere Bolonghe, and Batighere Bulan also used to live in Seleky. Their notoriety forced the rest of Seleky to team up and to fight them out of the village. Baɟɟat was also founded by people from Essil who were later joined by foreigners from Bayot, and Ejamat.

1.3 Social life

As with other Joola groups, in the Eegimaa group, farming and fishing are the main economic activities. These activities are performed with rudimentary means and the product is primarily destined for consumption. Parental authority is well respected and raising a child is not just the responsibility of the parents but of the whole community. The society sets certain expectations for all its members and various institutions exist to convey and enforce the social values. For boys, one such institution is the initiation ceremony known as *buxut*, which marks the passage from childhood to adulthood. In theory, this initiation ceremony takes place once every twenty four years. But, in practice, it takes even longer and until a man is initiated, he is always considered a child, regardless of his age. Girls also have their institutions, including *bɐllega* which is organized more frequently than *buxut*.

Land is of crucial importance in the society. When a girl is engaged, before the marriage, the paternal family will convene and during that meeting, the land of the father is divided between all his children. After the marriage, the husband will come and claim the land of his wife. The reason why women are given land when they get married is that, not so long ago, feeding children was a responsibility of both the husband and the wife. The husband was responsible for feeding the children for six months and the wife for the next six months. There were two ceremonies which marked the transfer of responsibilities. *Garʊmɔ*, which was organized in May, marked the transfer of charges from the mother to the father and from then on, the husband was responsible for feeding the children untill November. Another ceremony called *uttɐs* was organized to shift responsibilities to the wife. Now, why did women take charge from November untill May, which is the period which includes the harvest season and the fruit season and also the period when many young people are out of the kingdom in pursuit of such activities as fishing, school and other types of training, , whereas men are in charge during the farming season which is the hardest time? The reason is that when a father's land is shared among his children, sons and daughters do not have the same proportion. Boys always have a more important share than girls. There too, the reasoning behind such an inequality is that the woman's original family concedes two losses. First, a woman's children, although they are very connected to the mother's original family, are still the children of the husband and his family. Second, the woman is using the land from one family to feed children from another family. Therefore, a compensation known as *gammɔɛn* was established and it requires the family of the husband to pay the family of the wife for each child. For each boy, a female cow is paid to the mother's family and for each girl, a male cow is paid. However, this compensation cannot be claimed during the child's lifetime, and if he or she dies without having any children, it cannot be claimed either. Today, *gammɔɛn* is disappearing and the shared responsibility described above is no longer practiced, the husband being entirely responsible for feeding the children.

Social life in the Eegimaa community is also characterized by a division of labor between the men and the women. Physically demanding work is expected to be accomplished by men. For instance in farming, men are responsible for plowing the land and women for sowing and harvesting. After harvesting, it is the responsibility of the men to carry the crop from the field and to store it. Even in the fishing activity, some techniques are used by women while others are practiced by men.

1.4 Religion

The majority of Eegimaa people still follow the traditional African faith known as *Animism*. This faith, as practiced by Eegimaa people, recognizes the existence of a supreme entity, God, usually referred to in Eegimaa as *Ala émit* 'the owner of the sky'. However, the distance between God and human being is believed to be mediated by other divine creatures called *Siɸaŋ* 'shrines'. Shrines play a crucial role in the social organization. They exist in different kinds and in varying power. Some belong to individual people, whereas others belong to a family, a neighborhood, a village or the entire kingdom. The king is the one responsible for the kingdom shrine. He is regarded as a sacred being and his shrine is believed to be responsible for the rain and the harmony in the whole kingdom. People pray though these shrines and regularly offer them libations.

Followers of this faith believe in the co-existence of two worlds. There is the visible world which is the one where we are living and the invisible world inhabited by spirits. The soul is believed to live on after the person dies and it is in the invisible world where the souls of people who are deceased (ʊfʊɣa) live. However, this invisible world is not invisible to everybody. Some people are believed to have supernatural power which allows them to interact with those in the invisible world. The nature of life the soul is going to live depends on the life the person lived in this world. A righteous life in this world guaranties a happy life for the soul, whereas a sinful life will lead to suffering in the other world.

1.5 The resistance to French imperialism

In Senegal, Casamance was the last territory to be subdued to the French colonial authority. The area was originally part of the Portuguese colony of Guinea. It was in 1888 that the Portuguese conceded Casamance to the French. However, the French faced harsh resistance from the local tribes and especially the Joola who were always defiant to the French authority. Joola people have always cherished freedom and will not trade it for anything. This strong attachment to freedom even explains the fact that, although Joola people lived in kingdoms and still maintain these institutions, the king in the Joola communities has never had political power and therefore cannot force anyone to do anything. He has obligations towards his people and the community also has obligations towards him. The treatment he is going to receive from his people is dependent on how responsible he is in meeting his responsibilities.

The hostility of the Joola people towards the French imperialists was such that sometimes the mere presence of the French was a sufficient cause for conflict. The tax which the French levied on their colonies was not welcome by the Joola who viewed the payment of the tax as an act of submission to the colonial authority and therefore, they always refused to pay. Their defiance to the colonial authority finally gave way to provocation when they started targeting the Mandinka and Manjak merchants sent off to sell products belonging to the French. These were very often attacked and their merchandise seized (Roche 1985).

In Mof Ávvi, the open conflict against the French colonial authority began in December 1886 with an incident I call *Aɟɟaluβaj incident*, in reference to one of the people involved, who was well-known in the resistance to the French imperialism. The incident took place in Seleky. A merchant from the Mandinka tribe left Ziguinchor and went to sell clothes in Seleky. There, he met Aɟɟalubaj and a couple of other people who decided to seize the clothes and then sent him back. The merchant went to complain to the French colonial brigade in Ziguinchor. The French sent a group of soldiers, accompanied by the merchant, to Seleky to arrest the assailants. They went by boat since that was the only way they could access Seleky. The inhabitants of Seleky got news that the soldiers were coming and decided to go and wait for them near the river side. The soldiers, who were not expecting any conflict, suffered heavy casualties and had to retreat. Among the people killed in that war was Lieutenant Truche, the French administrator in Sedhiou (Roche 1985). The next day, Seleky was under heavy bombardment. A treaty was signed and Seleky was assessed a fine which they never paid. The village was subsequently bombed numerous times.

The resistance against French colonization in Seleky is often linked to a man named Baañ Bassene, mostly known under the name of Djignabo (ɟiɣɐβɐ in Eegimaa). In the county of Ziguinchor, a high school was named after him in recognition of his role in the struggle against colonialism. He was believed to be the spearhead of the resistance. In reality, Djignabo was a priest responsible for the initiation shrine. He might have participated in the struggle but the version, widely told, that he was killed in combat, is questionable. My informant got this version of the story from one of the very people who killed Djignabo, Tete Diedhiou, a member of the French colonial expedition force in Ziguinchor. On May 17th 1906, a group of French soldiers under the command of Lieutenant Lauqué settled in Seleky. In the village, the news about the French presence began to spread. During the night, Djignabo and a few others decided to check out the information. They were not armed. When they arrived at the place where the French soldiers settled, they saw the tent where Lieutenant Lauqué and other French soldiers were sleeping, being guarded by a few soldiers of Senegalese origin, among them Tete Diedhiou. While Djignabo and his companions were approaching the tent, the guard ordered them to stop but they did not comply. One of the guards fired at Djignabo who was heading to the tent. He died a couple hundred meters away from the place where he was shot. The stubbornness and the rebellious behavior of people from Seleky motivated the creation of a command unit in Kemebeul. The objective of this unit was to ensure absolute compliance and deference to the colonial authority. The defiance never ended and was even generalized throughout the kingdom. In Essil, the king Siβe Sondo was intractable with the French. He was jailed many times for his refusal to use his influence as a king to get people to pay tax (Roche 1985).

1.6 Classification of the language

Jóola Eegimaa, sometimes referred to as Jóola Banjal, belongs to the Jóola group, a member of the Northern sub-branch of West Atlantic which is one of the major branches of the Niger-Congo language family. Eegimaa is spoken in Ziguinchor, in the south of Senegal, and is a member of the Bak group, together with such languages as Bainuk, Balanta, Mankañ, Manjak and Pepel (Sapir 1971). The term '*Bak'* which is used to refer to these languages is actually a class marker. The languages referred to as such are characterized by the fact that the noun classifier which denotes 'plural humans' is either 'bak' or 'buk'. The Jóola languages are further classified by Barry (1987) into three groups: Central Jóola, Southern Jóola and Western Jóola. Eegimaa, Jóola Fogny, and Gussilaay are included in the Western group.

1.7 Previous studies of Eegimaa

Eegimaa has not yet received enough attention from the linguistic community. The study of this language is very recent and does not include many works. The first published work on this language is Sambou's 'Approche phonologique du Joola Eegimaa' (1989). Sambou provides a short but valuable description of the sound system of Eegimaa. His work also provides useful insight into some of the phonological processes displayed by this language. The second published work comes from Berndt (2004). She proposes a phonological writing system for Eegimaa.

Bassene (2007) discusses the morphosyntax of Eegimaa. The work offers a detailed description of the various morphosyntactic operations and also contains a short section on the phonology of Eegimaa.

Tendeng (2007) also proposes a study mainly focused on the morphosyntax of Eegimaa which she referred to as 'Gusiilay'. In previous research (Tendeng 1984), she uses the term 'Endungo' to refer to Eegimaa. Staring with the term 'Gusiilay', it should be noted that there is one variety of Joola spoken in the township of Thionk Essil which is called 'Gusiilay' and among the Joola people, mention of this term refers to that variety. As for 'Endungo', it has a very pejorative connotation and Eegimaa people would not refer to themselves as such. Joola people who speak the Bayot language are designated by Eegimaa people as 'essiŋ', a term which many of them are not confortable with, since it is also negatively charged. In response to what they consider an offence, they also call Eegimaa people 'Endungo'.

Sagna (2008) provides a detailed discussion of the semantics of noun classes in Eegimaa, as spoken in Essil which is his native village. His work also includes sections on the phonology and syntax.

1.8 Typological information

Languages have been traditionally classified as agglutinative, fusional and isolating, depending on their morphological structures (Payne 1997)[5]. Agglutinative languages are those in which different morphemes, each conveying a unique meaning, are combined to form words. In fusional languages, a single morpheme can provide more than one piece of syntactic information, whereas in isolating languages, words are believed to consist of single morphemes. Eegimaa is an agglutinative language. Below are examples in which various morphemes are joined to form words.

(62) Morpheme combination in Eegimaa word formation

a.	ɛ-ʈɛβ	b. ɛ-sa-ɛn
	CM-carry	CM-burn-CAUS
	'to carry'	'to set something on fire'
a.	ʊ-ʈɛj-ɛn-a	d. a-ʈɛβ-ɛn-ɛn-a-ɪl
	CM-run-CAUS-AGENT	CM-carry-CAUS-PAST-AGENT-POSS
	'drivers'	'their former promoter'

[5] Comrie (1989) proposes a classification system in which languages are referred to as either Synthetic or Polysynthetic, depending on how many morphemes a single word can contain. Comrie's proposal offers a response to the concern many linguists raised about the fact that some languages often described as isolating are not strictly so.

Languages are also classified in terms of their sentence structures and in this respect, Eegimaa is described as Subject-Verb-Object (SVO) type of language.

(63) Word order in Eegimaa

(ɪnɟɛ) nɪ-ssaf-ɪ

(S) SM-V-OBJ

'I greet you'

Eegimaa is also a *pro-drop* language, meaning that the subject pronoun can be omitted since there is always a prefix (subject agreement marker) attached to the verb to provide information about the subject. See Bassene (2007) for a comprehensive discussion of Eegimaa syntax.

As in many Senegalese languages, in Eegimaa, articles and other nominal modifiers come after the the noun. The examples in (3) and (4) show, respectively, the position of demonstratives and adjectives in Eegimaa and two other Senegalese languages which are Seereer-Siin and Wolof[6].

(64) Position of demonstratives in Eegimaa, Seereer-Siin and Wolof

b. Eegimaa	b. Seereer-Siin	c. Wolof
e-sux jɛ[7]	saax lena	reew mii
CM-country DEM	country DEM	country DEM
'this country'	'this country'	'this country'

[6] The Seereer-Siin and Wolof examples are from Niang (1997).

[7] Pronounced *esu jɛ*, with a deletion of the final consonant of the Word *esux*.

(65) Position of the adjective in Eegimaa, Seereer-Siin and Wolof

a. Eegimaa

   ø-an ø-aare a-arɔ

   CM-person woman SR-pretty

   'a pretty woman'

b. Seereer-Siin

   teo a mos

   woman SR pretty

   'a pretty woman'

c. Wolof

   Jigeen ju rafet

   woman SR pretty

   'a pretty woman'

In all three languages, adjectives behave like verbs in the sense that they take most of the morphemes used with verbs, as evidenced by the use of the subject relative in (4a-c) above. Welmers (1974) observes that many languages within the Niger-Congo family have a very small set of 'pure' adjectives and that most of the words used in these languages to convey adjectival concepts are either verb-like or hardly distinguishable from nouns. This observation ignited a heated debate on whether or not there is an adjectival class in these languages. Mclaughlin (2004) suggests that Wolof adjectives be considered as a subclass of verbs. Hyman (2003) points out that in most Bantu languages, adjectives have the same morphological structure as nouns and, therefore, uses the terms 'adjectival nouns' to refer to these adjectives. Eegimaa adjectives display both nominal and verbal morphology. I refer you to §2.2.1 for further discussion on Eegimaa adjectives.

1.9 Sociolinguistic background

Eegimaa, like all Senegalese languages is a spoken language with no written tradition. Children acquire it through the interaction with their parents and other members of the society, French being the only medium of instruction right from primary school all the way to university. The estimates put the number of Eegimaa speakers at 7000 (Bassene 2007). Eegimaa is classified as an endangered language. It should be noted that, although the situation is not yet desperate, it is becoming worrisome considering the steady spread of both Wolof and French in the Eegimaa speaking area. Eegimaa children are becoming more and more bilingual with Wolof being the preferred language of interaction among teenagers. Most Eegimaa children born in the cities do not speak the language and this is due to the attitude of certain parents who set themselves a false choice between speaking Wolof and French to their children and therefore giving them more chance for both social and economic promotion and speaking to them a minority language which does not have many advantages associated with it. Wolof is the dominant Senegalese language with at least 90% speakers. It has the status of a national language. French, on the other hand, is the official language, meaning the language of education and administration and it is spoken by about 15% of the Senegalese population (Cisse: 2005). A child living in a city and who is going to school cannot not speak both

Wolof and French and therefore the choice mentioned above does not need to be and speaking Eegimaa to the children can only be advantageous to them in the sense that it allows them to retain their ethnic identity.

These two languages are expanding throughout the kingdom (Mof Áwi) and have become the preferred languages of communication of the youth. In the past, knowledge of Wolof was evidence of one having lived in town for some time. Today, one does not need to live in town to learn Wolof since it is spoken everywhere in the kingdom and someone who does not speak Wolof is considered as being behind the time. The elders who used to be furiously against the use of Wolof have not only cooled down, but are also using it. The vast majority of Eegimaa people born in the city have no idea about their language since many parents have just stopped speaking Eegimaa to their children.

No community is readily willing to abandon its language in favor of another. Language is the way to preserve linguistic, cultural and ethnic identity. It also reinforces solidarity among members of the same speech community (Batibo: 2005). Now, why are Eegimaa people losing interest in their own language and become so impressively loyal to Wolof and French? The current situation of Eegimaa can be accounted for by a combination of factors. It should be noted that the southern region of Senegal (Casamance) has been suffering from twenty four years of a civil war spearheaded by Joola people. This unfortunate situation was really hard for all Senegalese, but harder for Joola people themselves. Therefore, some Joola people, in order to hide their ethnic identity, opted not to speak any Joola languages whatsoever.

Like most Senegalese languages, Eegimaa is just a spoken language used in spoken communication and in traditional ceremonies such as initiation and libation. The crucial way to maintain the stability of a language is to have it codified with native speakers gaining education in their language. This involves not just the creation of a writing system but also a full description of the language with the creation of textbooks and all required pedagogical materials. As I mentioned earlier, there is a writing system recently proposed by the Société Internationale de Linguistique (SIL). Yet, more work needs to be done before the language could be introduced in school. Some Eegimaa people stopped, long ago, speaking their language to their children on the grounds that it is more profitable for the children to learn Wolof and French, which are keys to both social and economic promotion, than a language which has no prestige. This low opinion some Eegimaa people have of their own language contributes in downgrading the language and in expanding both Wolof and French.

The Wolof ethnic group is the dominant group in Senegal and constitutes more than 43 % of the Senegalese population (Cisse: 2005). As mentioned earlier, the Wolof language is spoken by more than 90% of the Senegal people. Therefore, knowledge of the Wolof language is perceived by Eegimaa people as an indispensable way to integrate the dominant group and also as a means to communicate with a larger community. People who do not know either Wolof or French are somewhat marginalized with very limited access to paid jobs.

The current situation of Eegimaa clearly shows that if no serious action is taken to codify the language so that Eegimaa people could gain education in their own language, this language will die out within two generations or so. The number of Eegimaa children who do not speak their language is high and the vast majority of young people (between 10 and 18 years old) are at least bilingual.

2. Morphology

2.0 Introduction

The subfield of linguistics which studies the structure of words and how different meaningful units (morphemes) are combined to form words is what is referred to as morphology (Aronoff and Fudeman2004, Katamba and Stonham 2006). Within morphology, two branches are often distinguished. Inflectional morphology studies the use of morphemes to designate grammatical relations such as plurality and agreement. Inflectional morphemes do not change the grammatical category of the words to which they are attached but they yield various forms of the same words. Derivational morphology on the other hand focuses on the ways new words come into existence. One of the main characteristics of Eegimaa is its noun classification system. Most words in Eegimaa consist of a classifier and a root. The classifier is prefixed to the root to signal the semantic category to which the referent belongs. This chapter explores the noun classification system, the morphological makeup of nominal dependents, the verbal inflection markers as well as the noun formation processes in Eegimaa.

2.1 Class markers

Let me clarify right from the outset what I mean by 'class' because this word has often been used with different meanings in the description of languages displaying a noun classification system. The word 'class' is sometimes used to refer to the lexical or semantic category to which a word belongs. In this sense, a word can be classified as a noun, pronoun, verb, particle, conjunction, adjective, adverb, and adposition. Nouns are further classified depending on whether they refer to something concrete or abstract, human or nonhuman, feminine, masculine or neuter, animate or inanimate, and also depending on whether the noun refers to a location or the size of some entity.

However, in another usage, the term 'class' refers to an affix which attaches to a word to provide information about the category to which the word belongs. In this dissertation, the term 'class' will be consistently used to refer to the lexical and semantic categories of words and the terms 'classifier' or 'class marker' will be reserved to those affixes which serve to indicate class membership.

2.1.1 Methodology

In investigating the various classes into which Eegimaa words and their referents fall and the morphemes which serve to indicate those classes, two approaches were used.

2.1.1.1 Semantic approach

Words can be grouped into different classes based on the type of information they convey and this is exactly what the semantic approach is concerned with. For instance, prototypical nouns are believed to convey information related to such entities as humans, animals, things and places and verbs express actions and states (Payne 1997). Adjectives convey property and quality meaning but in many languages within the Niger-Congo phylum, adjectives very often express states.

Adverbs provide information about the time, place, manner and the degree to which some event took place. Let us consider the four sets of words in (5).

(66) Eegimaa major word classes

Set 1		Set 2	
a. an	'person'	a. ɛmɔʝ	'to dive'
b. assɛx	'queen'	b. ɛjaβ	'to take, to marry'
c. ɛttam	'earth'	c. ɛʃaf	'to warn'
d. ɛŋɔʃ	'hat'	d. ɛmaŋ	'to love'

Set 3		Set 4	
a. ɛɣa	'be thirsty'	nɐr	'laudly'
b. eɟɟux	'be red'	naniŋ	'last time'
c. eʈuen	'be white'	nɔ	'then'
d. ɛkkʊr	'be clean'	caβ	'quickly'

From the semantic perspective, the four sets of words above appertain to four different classes: nouns, verbs, adjectives and adverbs respectively. Givón (1979) introduces another criterion also intended to help tease out these four major classes. This approach is referred to as *the time-stability criteria*. As the name suggests, the time-stability criterion is concerned with how stable the concept expressed by a word remains over time. Prototypical nouns are said to denote more time-stable concepts such as 'rock', 'sky', 'tree', 'cat', 'human', etc. Verbs are believed to denote rapid changing concepts or events whilst adjectives are somewhere between noun and verbs.

(67) Time-stability scale

NOUNS ------------------------ADJECTIVES-----------------------VERBS

MOST TIME-STABLE INTERMEDIATE LESS TIME-STABLE

Note that adverbs cannot be determined in terms of time-stability. The reason is that cross-linguistically, adverbs are often derived from other word classes and therefore usually retain the semantics properties of their bases. The concept of time-stability should be thought of as a relative one in the sense that words included in the same class may refer to concepts of different duration. For instance, in (5), the first set of words consists of nouns and therefore of the most time-stable concepts. However, the earth and humans do not have the same longevity. Similarly, with respect to verbs, you can love someone for the rest of your life but you certainly cannot dive for the same amount of time. And with respect to adjectives, some adjectives describe longer-lasting states than others. For instance color adjectives such as *eɟɟuk* 'be red' and *etuen* 'be white' describe properties (states) which lasts longer than the physiological state denoted by the word *ɛga* 'be thirsty'.

Words can also be classified in terms of the semantic domains they fall into and this approach has been highly valued in determining Eegimaa word classes. Let us further examine the words included in the first set in (5). These words can also be classified into two groups, using the semantic feature [human]. The words *an* and *assɛk* have the value [+human] while *ettam* and *ɛŋɔʃ* have the feature [-human]. Below are additional data on both classes.

(68) Human vs. nonhuman nouns

human		**nonhuman**	
a. aɲɲɪl	'a child'	mɔf	'sand, land'
b. aɸaɲɔr	'brother-in-law'	galɐndiŋ	'big hat'
c. avvʊɣʊl	'a bride'	mʊxʊmba	'piglets'
d. allɛlʊ	'sister-in-law'	ʊrɛʝ	'folktales'
e. aɔnda	'burier'	mɪsɪs	'salt'
f. aaɲa	'cultivator'	mʊʊ	'salted water'
g. asɔm	'paternal aunt'	bassɛs	'broken rice'
h. ammɪɣɛl	'prisoners'	ɟuɲundu	'small nose'

The words in the rightmost column can be further classified into different categories using such features as [count], [mass], [diminutive], and [augmentative], as shown in (8).

(69) Count / mass and diminutive vs. augmentative nouns

count		**mass**	
a. gɐlɐndiŋ	'big hat'	mɪsɪs	'salt'
b. ɟuɲundu	'small nose'	mʊʊ	'salted water'
c. mʊxʊmba	'piglets'	bassɛs	'broken rice'
d. ʊrɛʝ	'folktales'	mɔf	'sand, land'

diminutive		**augmentative**	
a. ɟuɲundu	'small nose'	gɐlɐndiŋ	'big hat'
b. mʊxʊmba	'piglets'		

Interestingly, the features [diminutive] and [augmentative] can be assigned to the same entity to convey information relative to its size.

(70) More on the contrast between [diminutive] and [augmentative] features

	Diminutive		**augmentative**	
a.	ɟuɲundu	‘small nose’	buɲundu	‘big nose’
b.	ɟilɐndiŋ	‘small hat’	gɐlɐndiŋ	‘big hat’
c.	ɟʊxʊmba	‘piglet’	gaxʊmba	‘big pig’
d.	ɟiβisa	‘small bombolong’	gɐβisa	‘big bombolong’
e.	ɟiɲɲɐb[8]	‘small elephant’	gɐɲɲɐb	‘big elephant’
f.	ɟulus	‘small bump’	fulus	‘big bump’

Eegimaa words are also classified on the basis of such features as [abstract], [concrete] and [number]. Note that the number feature includes a [singular] value paired with a [plural] value.

(71) Abstract / concrete and singular / plural nouns

	abstract		**concrete**	
a.	bɐluʝa	‘extreme laziness’	gafaȶ	‘fence’
b.	baɸax	‘indicipline’	gaɲɛn	‘hand’
c.	basɛn	‘generosity’	ɛȶʊxʊn	‘tortoise’
d.	maagɛn	‘truth’	ɛmmɛlɛ	‘spear’

[8] In Eegimaa, the word for ‘elephant’ is *eɲɲix* or *eɲɲɐβ*, depending on whether the elephant is viewed just as an ordinary elephant or as a totem. If it is viewed as a totem, the word *eɲɲɐβ* is used. Otherwise, it is the word *eɲɲix* which is used. Bassene people are believed to have elephants as totems.

singular		plural	
a. gafas	'shrimp'	ʊfas	'shrimps'
b. gappʊ	'bird'	ʊppʊ	'birds'
c. ɛʈʊxʊn	'tortoise'	sʊʈʊxʊn	'tortoises'
d. ɛmmɛlɛ	'spear'	sɪmmɛlɛ	'spears'

Verbs and nouns are also assigned to different classes based on their semantic features. Verbs are [+V], whereas nouns have [+N] feature. In (7) below, verbs and their corresponding nouns are distinguished primarily on the basis of these two features.

(72) Verb / noun

verb		noun	
a. ɛffɪm	'to trust'	gaffɪm	'trust'
b. ɛmaŋ	'to love'	gamaŋ	'love'
c. ɛsɛn	'to give'	basɛn	'generosity'
d. ɛakkɛn	'to try hard'	baakken	'courage'

Note that in addition to the [+N] feature which all derived nouns have, they all also refer to intangible concepts and therefore are also specified for the feature [+abstract].

We have just been through some of the semantic methods used to categorize words, with a special emphasis on the semantic feature theory which is the methods adopted in the classification of Eegimaa words. Now let us turn to the approach used to identify those morphemes in Eegimaa which signal the class membership of words.

2.1.1.2 Morphosyntactic approach

The morphosyntactic tests commonly used to work out the inventory of class markers in a language are the *structuralist* and the *distributional (or syntactic)* tests. The structuralist approach focuses on the morphological makeup of words and consists in finding morphological paradigms and their semantic associates. Let us examine the words in the leftmost column in (7) repeated below as (12) for easy reference.

(73) Human

a. a-ɲɲɪl 'child'

b. a-ɸaɲɔr 'brother-in-law'

c. a-vvʊɣʊl 'bride'

d. a-llɛlʊ 'sister-in-law'

e. a-ɔnda 'burier'

f. a-aɲa 'cultivator'

g. a-sɔm 'paternal aunt'

h. a-mmɪɣɛl 'prisoner'

Each of the words in (12) can be analyzed as consisting of a base and a prefix. For instance in (12a) the prefix is *a-* and -ɲɲɪl is the base. Note that *-ɲɲɪl* is also the root of the noun meaning that it cannot be further divided into meaningful linguistic units. In (12b), the base is -*ɸaɲɔr* which consists of the root -*ɸaɲ*- and the derivational suffix -*ɔr*.

All the words in (12) refer to humans and they all start with the morpheme *a*-. So, an initial hypothesis would be that in Eegimaa the prefix *a*- is exactly what is providing the information about the class membership of these words. Let us test the validity of this hypothesis with more words. It should be noted that when a prefix contains any of the vowels [ɪ, ʊ, a, ɛ][9] these vowels will change respectively to [i, u, ɐ, e] when the stem contains any one of the vowels [i, u e, o, ɐ]. The phenomenon is known as vowel harmony and is discussed in chapter 6.

(74) Human vs. Nonhuman class markers

	set 1		set 2	
a.	a-llara	'worker'	ʊ-llax	'rich people'
b.	a-ttɪ	'same-sex sibling'	ʊ-kkuʝa	'wrestlers'
c.	a-kkɔɲa	'shepherd'	ʊ-ɸur	'sons'
d.	a-ssanʊm	'rich person'	u-vvi	'kings'

	set 3		set 4	
a.	ɛ-βɛtɛxʊ	'hawk'	bʊ-βax	'baobab'
b.	ɛ-xumba	'pig'	bʊ-βukkuʈ	'tamarind tree'
c.	ɛ-bbaj	'spear'	bɪ-llɛmʊɲa	'lemon tree'
d.	ɛ-xɔɲ	'whistle'	bɪ-βɛʝ	'mangrove'

[9] Eegimaa does not have a prefix containing the vowel [ɔ] and if it had, this vowel would change to [o].

Sets 1 and 2 also consist of words which refer to humans. However, words in both sets do not begin with the same morpheme. But, this does not challenge our hypothesis at all since the two sets have different values for [number] feature and in fact, the plural forms of all nouns in set 1 take the morpheme ʋ- and the singular counterparts of the words in set 2 begin with *a*-. In other terms, the morpheme *ʋ*- is the plural counterpart of a-. In set 3, the words denote either animals or instruments and begin with the morpheme *ɛ*- which is also the prefix found at the beginning of verbs and adjectives (see (5) and (11)). The words in set 4 denote trees and some of them begin with the morpheme *bʋ*- whilst the others take the prefix *bɪ*-. Note that this difference is phonologically conditioned with bʋ- being attached to nouns in which the first vowel of the root is a back vowel whilst *bɪ*- is prefixed to nouns in which the first vowel of the root is a front vowel. In all recorded data, nouns beginning with the prefix *a*- always refer to human beings and therefore, this prefix has been established as the singular human class marker.

The structuralist test has been crucial in identifying the Eegimaa class markers. It has been supplemented by the distributional test which is concerned with the distribution of these morphemes in utterances. In most Niger-Congo languages with noun classification systems, class markers participate in a special agreement relationship often referred to as *concord*. Concord is different from agreement as we know it in English and many other Indo-European languages. For instance in the English sentence in (14) below, the subject NP (she) and the VP (is engaged) agree in terms of the features [person] and [number].

(75) Agreement in English

She is engaged to a handsome boy.

In a concord relationship, there is a morphological element in the first noun of the clause/sentence which is also attached to all words referring to that noun. (15) is an Eegimaa version of the English sentence in (14).

(76) Concord in Eegimaa

a-bbʊsɛl **a-**ʝʊɣɔ-ɛ **a-**ɸaɲ-ɔl

CM-prince CM-handsome-PERF CM-engage-3SG.OBJ

She is engaged to a handsome prince.

The word which triggers concord is often referred to as the *regent* (Sapir 1965). In (15), **a**-*bbʊsɛl* is the regent and its class marker is prefixed to all the subsequent words. A study of the distribution of class markers across clauses/sentences has made it possible to record the various forms (or allomorphs) of each. Let us consider examples (16a-d).

(77) Supplementary examples of concord in Eegimaa

a. **ø**-an **a**-llʊxɔr-ɛ

CM-person CM-poised-PERF

A poised person

b. **bɪ**-llɛmʊɲa **b**a**β**u **bu**-ffɐnum-e

CM-lemon tree CM.DEF.ART CM-old-PERF

The lemon tree is old.

c. **sɪ**-βe **sʊ**-ɲʊɣɛȶ **s**aʊ**s**ʊa bi bu-βɐndor

CM-cow CM-black CM.DEM for CM-libation

The black cows over there are for libation.

d. **f**-al **fɪ**-ccɛ **fu**-βuli nɪ miɲɟinaw?

CM-ocean CM-det CM-different P atlantic ocean

An ocean different from the Atlantic?

The examples in (16) show various forms of four class markers. The occurrence of each form can be predicted. In Eegimaa, the vowel of the class marker is deleted when the noun begins with a vowel and the motivation for this deletion is that the language does not allow tautosyllabicity (see §3.5.6). This explains why the class marker *a*- sometimes surfaces as *ø*- (empty category), whereas class markers with CV- shape surface as C-. In establishing the inventory of Eegimaa class markers, I adopt a method which takes into account not only the structure and the distribution of these morphemes, but also the semantics of the nouns to which they attach. Below is a set of criteria I followed.

a. When two prefixes have different forms and attach to nouns denoting entities of different categories, these prefixes are listed as different class markers.
b. When two prefixes have different forms and attach to the same noun to signal a difference in number, lexical category or a nuance in size, they are listed as separate class markers.

c. Prefixes which attach to nouns referring to entities which belong to the same category are listed as different class markers if their occurrence cannot be predicted via phonological rules. If their occurrence is predictable, then they are recorded as variants of the same class marker.

d. Prefixes which attach to nouns referring to entities of different categories are listed only once.

(78) Inventory of noun classes

nº	CM	FUNCTIONS
1	ø- ~ a-	Human (singular)
2	bʊg-	Human (plural of CM1)
3	ɛ-	Plural of CM1, generic marker, singular (non human), infinitive marker, also marks mass nouns
4	sɪ- ~ sʊ-	Plural of CM3 and CM17, mass nouns
5	bɪ- ~ bʊ-	Singular, augmentative, trees
6	fɪ- ~ fʊ-	Singular of CM7, augmentative marker, mass noun marker
7	gʊ-	Plural of CM6 and CM9
8	ʊ-	Plural of CM1 and CM9
9	ga-	Singular of CM7 and CM8, augmentative marker
10	ɟɪ- ~ ɟʊ-	Singular diminutive of CM11
11	mɪ- ~ mʊ-	Plural of CM10, mass nouns
12	ɲɪ- ~ ɲʊ-	Abstract nouns
13	ba-	Abstract nouns, collective nouns
14	fa-	Collective noun, mass nouns
15	ma-	Abstract nouns
16	ɟa-	Irregular infinitive, mass nouns
17	j-	Singular of CM4
18	w-	Mass nouns, plural
19	tɪ-	Place nouns
20	nɪ-	Temporal adverb marker

2.1.2. Discussion

2.1.2.1 Human class markers

In Eegimaa, there is one class marker reserved exclusively for nouns denoting humans and that class marker is a-. This morpheme marks singular human nouns and has one alternate, *ø*-, which is only found in a handful of words. In their plural forms, human nouns take one of the four classifiers illustrated in right-hand column (18).

(79) Human plural markers

a.	a-ɲɲɪl	'child'	ʊ- ɲɲɪl	'children'
b.	a-ɸaɲɔr	'brother-in-law'	ʊ -ɸaɲɔr	'brothers-in-law'
c.	a-vvʊɣʊl	'bride'	ʊ -vvʊɣʊl	'brides'
d.	a-mmɪɣɛl	'prisoner'	ʊ -mmɪɣɛl	'prisoners'
e.	a-sɔm	'paternal aunt'	gʊ-sɔm	'paternal aunts'
f.	a-ttɪ	'same-sex sibling'	gʊ-ttɪ	'same-sex siblings'
g.	a-llɛlʊ	'sister-in-law'	gʊ-llɛlʊ	'sisters-in-law'
h.	a-ppal	'friend'	gʊ-ppal	'friends'
i.	ø-an	'person'	bʊɣ-an	'persons'
j.	ø-ɟɟaaj	'mother'	sɪ-ɟɟaaj	'mothers'
k.	ø-ppaaj	'father'	sɪ-ppaaj	'father'
l.	ø-aarɛ	'woman'	w-aar	'wives'
m.	ø-ɐine	'man'	w-ɐin	'husbands'

The vast majority of Eegimaa human nouns take the prefix *ʊ-* in their plural forms. The prefixes *gʊ-* and *sɪ-* are found in just a handful of human-denoting nouns. As for *w-* and *bʊg-*, they are the least common markers for humans. Indeed, the class marker *bʊg-* is only found in the word *bʊɣ-an*[10] and *w-* is found in the words listed in (18l) and (18m). The morpheme *ɛ-* also serves as plural marker for human nouns referring to ethnic membership.

(80) *ɛ-* as human plural marker

a.	ɐ-ɟɟola	'Joola person'	e-ɟɟola	'Joola persons'
b.	a-ɔlɔf	'Wolof person'	ɛ-ɔlɔf	'Wolof persons'
c.	a-mandɪŋ[11]	'Mandinka person'	ɛ-mandɪŋ	'Mandinka persons'
d.	ɐ-lullum	'White person'	e-lullum	'White persons'

Note that when a word like *ɛ-ɟɟola* is used without numeral modification, it has a generic meaning, which is one of the functions the class marker *ɛ-* serves.

2.1.2.2 Nonhuman class markers

Various markers are used for nonhuman nouns. In this section, I will deal only with nouns which refer to concrete and countable entities. Abstract and mass class markers will be discussed in separate sections.

[10] After a vowel, the phonemes b, d, ɟ, g/ are pronounced [β, r, ʝ, ɣ], respectively and /p, t, c, k/ are respectively pronounced [ɸ, ȶ, ʃ, x]
[11] The word *a-mandɪŋ* also refers to someone who follows the Islamic faith.

Many names of animals take the prefix *ɛ-* in their singular forms and *sɪ- ~ sʊ-* for plural. The prefix *fɪ- ~ fʊ-* and its plural correspondent *gʊ-* also attaches to animal nouns.

(81) Animal nouns

a.	e-ɲɲix	'elephant'	si-ɲɲix	'elephants'
b.	ɛ-ʄʄamɛn	'goat'	sɪ-ʄʄamɛn	'goats'
c.	ɛ-ɉɔβa	'dog'	sʊ-ɉɔβa	'dogs'
d.	e-munduŋo	'hyena'	su-munduŋo	'hyenas'
e.	fi-leɸ	'type of cow'	gu-leɸ	'type of cow'
f.	fɪ-rɪʃɔn	'guinea-fowl'	gʊ-rɪʃɔn	'guinea-fowl'
g.	fʊ-ppaʈa	'duck'	gʊ-ppaʈa	'duck'
h.	fʊ-bbarʊm	'sheep'	gʊ-bbarʊm	'sheep'

The morphemes *ɛ-* and *fɪ- ~ fʊ-* also mark nouns referring to instruments. Another morpheme also found attached to names of instruments is *ga-* which pluralizes as *ʊ-*.

(82) Instrument nouns

a.	ɛ-bbaj	'spear'	sɪ-bbaj	'spears'
b.	ɛ-saβar	'drum'	sɪ-saβar	'drums'
c.	e-indum	'type of drum'	si-indum	'types of drum'
d.	e-ffɐŋum	'key'	si-ffɐŋum	'keys'
e.	fi-nnir	'ax'	gu-nnir	'axes'

f.	fɪ-ȶɛŋ	fishing instrument	gʊ- tɛŋ	fishing instruments
g.	fʊ-ŋŋaʝɛn	‘bow’	gʊ-ŋŋaʝɛn	‘bows’
h.	fʊ-ʊx	‘pistle’	gʊ-ʊx	‘pistles’
i.	ga-ȶɛɣɛl	‘basket’	ʊ-ȶɛɣɛl	‘baskets’
j.	ga-βɛʊn	‘calabash’	ʊ-βɛʊn	‘calabashes’
k.	ga-nɛɣɛn	‘door’	ʊ-nɛɣɛn	‘doors’
l.	ga-ppɛx	‘mat’	ʊ-ppɛx	‘mats’

The prefixes *ɛ-* and *fɪ- ~ fʊ-* also serve as indicators of nouns designating fruits and vegetables.

(83) Fruit nouns

a.	e-iȶ	‘palm nut’	si-iȶ	‘palm nuts’
b.	ɛ-ggʊβ	‘corn’	sɪ-ggʊβ	‘corn’
c.	ɛ-xan	fruit of kapok tree	sɪ-xan	fruits of kapok tree
d.	ɛ-ɣʊndax	‘barassus fruit’	sɪ-ɣʊndax	‘barassus fruits’
e.	fɪ-lɛllɛɲɟa	‘orange’	gʊ-lɛllɛɲɟa	‘oranges’
f.	fu-kkɐʝu	‘cashew apple’	gu-kkɐʝu	‘cashew apples’
g.	fʊ-maŋgʊ	‘mango’	gʊ-maŋgʊ	‘mangoes’
h.	fɪ-llɛmʊɲa	‘lemon’	gʊ-llɛmʊɲa	‘lemons’
i.	fʊ-ssafaj	‘pumpkin’	gʊ-ssafaj	‘pumpkins’

We saw in (13) that the class marker *bɪ- ~ bʊ-* attaches to nouns referring to trees. Examples (22e-h) can take this marker and its plural correspondent to refer to the trees which produce those fruits. The plant which produces pumpkins is *ga-tuk*, which is actually a generic name since it is used to refer to a variety of plants.

Also note that most body parts take *fɪ- ~ fʊ-* or *ga-* in singular and select the prefixes *gʊ-* or *ʊ-* for plural.

(84) Body part nouns

a.	fɪ-ssix	'finger'	gʊ-ssix	'fingers'
b.	fɪ-bbɛɲ	'lip'	gʊ-bbɛɲ	'lips'
c.	fɪ-ɪl	'breath'	gʊ-ɪl	'breaths'
d.	fʊ-xɔw	'head'	gʊ-xɔw	'heads'
e.	fʊ-βɔŋ	'thigh'	gʊ-βɔŋ	'thighs'
f.	fu-ɟɟul	'knee'	gu-ɟɟul	'knees'
g.	ga-ɲɛn	'hand'	gʊ-ɲɛn	'hands'
h.	ga-nnʊ	'ear'	gʊ-nnʊ	'ears'
i.	ga-sɛn	'skull'	ʊ-sɛn	'skulls'
j.	ga-ccaʃ	'flank'	ʊ-ccaʃ	'flanks'

2.1.2.3 Diminutives

Diminutive nouns are formed by attaching the prefixed *ɟɪ- ~ ɟʊ-* for singular and *mɪ- ~ mʊ-* for plural to the noun stem, as shown in (24).

(85) Diminutive marking

	Generic noun		Singular diminutive		Plural diminutive	
a.	e-βe	'cow'	ɟi-βe	'small cow'	mi-βe	'small cows'

b. fɪ-ppɪl ‘stick’ ɟɪ-ppɪl ‘small stick’ mɪ-ppɪl ‘small sticks’

c. fʊ-paʈa ‘duck’ ɟɪ-paʈa ‘duckling’ mʊ-ppaʈa ‘ducklings’

d. ɛ- ʝɔβa ‘dog’ ɟʊ-ʝɔβa ‘puppy’ mʊ-ʝɔβa ‘puppies’

e. e-ccoɸ ‘mouse’ ɟu-ccoɸ ‘small mouse’ mu-ccoɸ ‘small mice’

f. a-sɔm ‘aunt’ ɟʊ-sɔm ‘worthless aunt’ mʊ-sɔm ‘worthless aunts’

The singular diminutive marker is also used with mass nouns to indicate a small quantity of the specified entity.

(86) Diminutive marking in mass nouns

a. ɟɪ-sɪs ‘small amount of salt

b. ɟi-ʃir ‘small quantity of myrrh’

c. ɟʊ-nʊx ‘small quantity of wine’

d. ɟʊ-sɔlɛn ‘small quantity of sauce’

It should be noted that in Eegimaa, the names of certain entities inherently take the diminutive marker.

(87) Inherently dimunitive nouns

a. ɟɪ-iβa ‘knife’

b. ɟɪ-fikk ‘type of toy’

c. ɟɪ-lɛllɛɲʝʊl ‘swallow’

d. ɟɪ-ttaʝa ‘sparrow’

e. ɟɪ-saŋgarɪŋga[12] ‘small mouse’

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[12] The word *saŋgarɪŋga* refers to a variety of mice, very small, usually found in the ricefield.

While Eegimaa has only one singular diminutive marker, there are various singular augmentative markers.

2.1.2.4 Augmentatives

The prefix *ga-* is the most common augmentative marker. However, *ba-* and *fʊ-* are also used to express augmentative meaning. Example (27) gives an augmentative version of the words in (24), whereas (28) provides cases whereby *ba-* and *fʊ-* function as augmentative markers.

(88) Augmentative marking with *ga-*

	Generic noun		Singular augmentative		Plural augmentative	
a.	ɛ-βe	'cow'	ga-βe	'big cow'	ʊ-βe	'big cows'
b.	fɪ-ppɪl	'stick'	ga-ppɪl	'big stick'	ʊ-ppɪl	'big sticks'
c.	fʊ-ppaƫa	'duck'	ga-paƫa	'big duck'	ʊ-ppaƫa	'big ducks
d.	ɛ- ʝɔβa	'dog'	ga-ʝɔβa	'big dog'	ʊ-ʝɔβa	'big dogs'
e.	ɛ-ccoɸ	'mouse'	ga-ccoɸ	'big mouse'	ʊ-ccoɸ	'big mice'
f.	a-sɔm	'aunt'	ga-sɔm	'fat/stupid aunt'	ʊ-sɔm	'fat/stupid aunts'

(89) Augmentative marking with *ba-* and *fʊ-*

a.	e-rus	'air'	fu-rus	'wind'	gu-rus	'winds'
b.	e-lus	'bump'	fu-lus	'big bump'	gu-lus	'big bumps'
c.	fa-ƫama	''navel	ba-ƫama	'big navel'	gʊ-ƫama	'big navels'
d.	e-ɲundu	'big nose'	bu-ɲundu	'big nose'	u-ɲundu	'big noses'

When diminutive and augmentative markers are used with human nominal stems, the resulting nouns have a pejorative meaning, as shown in (24f) and (27f).

Many Eegimaa nouns which convey augmentative meaning inherently have one of the augmentative markers discussed above.

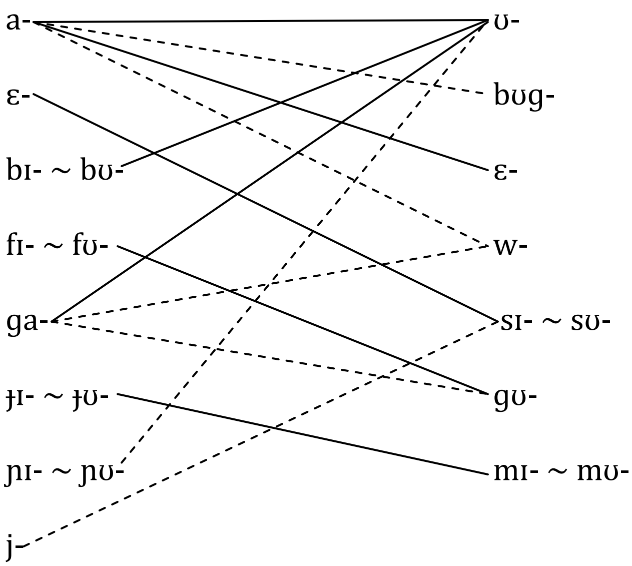
(90) Inherently augmentative nouns

a.	fʊ-xaȶ	'big bull'
b.	fu-ffɐɲɲum	'container for Tobacco '
c.	ga-ʝʊmbʊxɛ	'big mouse'
d.	bɐ-luʝa	'extreme laziness'
e.	bʊ-kkax	'significant baldness'
f.	bu-ttɐmɐlɐŋ	'lacking many teeth'

2.1.2.5 Singular-plural pairing

We have seen that nouns referring to countable entities have a pair of class markers, one for singular and another for plural. We have also seen in the discussion that one singular class prefix may have more than one plural correspondent and different singular markers may also have the same plural counterpart. The diagram below shows the singular-plural pairings of Eegimaa class markers. The lines not only show the possible pairings but also the frequency of each. Common pairings are represented with solid lines and less frequent pairings are indicated by dashed lines.

(91) Pairings of noun class markers



Collective nouns do not have any singular-plural pairs of markers because their referents are viewed as including more than one entity. In other terms, collective nouns are countable nouns which are inherently plural.

2.1.2.6 Abstract nouns

Abstract nouns display a wide range of nominal marking. Some of them select for the prefix *ga-*, shown in the examples below.

(92) *ga-* as abstract marker

a. ga-ffɪm 'trust'

b. ga-maŋ 'love'

c. ga-ɪʝa 'greed'

d. ga-ffas 'knowledge'

e. gɐ-xoli 'fear'

f. ga-ʝamɔr 'understanding'

Other abstract nouns are marked by the prefixes *ba-* and *bɪ- ~ bʊ-*, as can be seen in the following example.

(93) Abstract nouns with *ba-*

a. ba-sɛn ‘generosity’

b. ba-ppalay ‘friendship’

c. ba-ɸax ‘lack of discipline’

d. ba-llɛcɛʈ ‘carelessness’

e. ba-kkʊr ‘cleanliness’

f. ba-ffʊr ‘stubbornness’

(94) Abstract nouns with *bɪ- ~ bʊ-*

a. bɪ-lɛx ‘poverty / despair’

b. bi-jjix ‘misfortune’

c. bi-celeʈ ‘meanness’

d. bʊ-rɔŋ ‘life’

e. bu-lɐʈ ‘dislike’

f. bu-ɣuno ‘stupidity’

The prefixes *ga-*, *ba-* and *bɪ- ~ bʊ-* are the main indicators of abstract nouns. However, in a few cases, other prefixes are also found with abstract nouns.

(95) Miscellaneous abstract marking

a. e-ssumay ‘joy’

b. fɪ-ɲɲɪlɛ ‘childhood’

c. fʊ-ffanɛ 'old age'

d. ɲʊ-ssʊ 'shame'

e. ma-aɣɛn 'truth'

f. mu-ssɐli 'dexterity'

g. si-ʝimor 'forgetting'

h. sʊ-ɔsɛn 'remembering'

i. ɟɐ-ɐri 'beauty'

2.1.2.7 Mass nouns

The prefix *mɪ- ~ mʊ-* is one of the most representative markers of mass nouns. As can be seen from the examples in (35), most of the mass nouns which take this prefix refer to fluids.

(96) Mass noun marking: *mɪ- ~ mʊ-*

a. mɪ-ɪl 'juice / maternal milk'

b. mɪ-sɪs 'salt'

c. mu-xum 'honey'

d. mʊ-ffʊ 'tears'

e. mʊ-sʊr 'urine'

f. mʊ-ʊ 'sea/river water'

There are also many mass nouns in Eegimaa which take the prefixes *ɛ-* and *bɪ- ~ bʊ-*, as illustrated in examples (36) and (37).

(97) Mass noun marking: *ɛ-*

a. ɛ-ɲa ‘type of herb’

b. ɛ-ʊs ‘sand’

c. ɛ-ɸɔr ‘flour’

d. e-rus ‘air’

e. ɛ-ssɛl ‘grass’

f. ɛ-mmanɔ ‘rice’

(98) Mass noun marking: *bɪ- ~ bʊ-*

a. bɪ-sɛm ‘rust’

b. bɪ-ssɛs ‘tobacco salt’

c. bʊ-nʊx ‘palm wine’

d. bʊ-ppaɲ[13] ‘powder from oyster shell ’

e. bʊ-kkaʃ ‘type of food’

f. bu-kkuɣaj ‘manure / ash’

Other prefixes are also used with mass nouns, although less commonly than the ones mentioned above. (38) provides cases of mass nouns marked with various prefixes.

(99) Miscellaneous mass nouns marking

a. ba-ssɛs ‘broken rice’

b. ga-mɔn ‘dew’

c. fi-sim ‘blood’

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[13] A powder from seashells used in the preparation of cotton thread.

d. fʊ-ʊs 'big quantity of sand'

e. fa-kkɔr 'smoke'

f. w-aƫ 'feces'

g. s-ambun 'fire'

2.1.2.8 Infinitives

Regular infinitives are indicated by the prefix *ɛ-*.

(100) Regular infinitive

a. ɛ-lɔβ 'speak'

b. ɛ-ʃaf 'warn'

c. e-ƫux 'hold'

d. ɛ-sʊm 'smoke'

e. ɛ-makkɔr 'take care of somebody'

A small set of verbs are marked with the prefixes *ma-* and *ɟa-*. Most verbs which take the prefix *ɟa-* refer to such activities as fishing and hunting.

(101) Irregular infinitive

a. ɟa-bbuƫ 'fish'

b. ɟa-ssaw 'hunt'

c. ɟa-law 'catch'

d. ma-sur 'urinate'

e. ma-rɛm 'drink'

2.1.2.9 Collectives

Certain words beginning with *ba*-, *ε*- and *fa*- denote a group of entities. The prefix *ba*- is the most frequent collective marker. In all recorded cases, collective nouns starting with *ba*- and *fa*- denote sets of small entities.

(102) Collective nouns

a. ba-lɔl ‘termites’

b. ba-ȶʊɲɟa ‘lice’

c. ba-kkɔna ‘fleas’

d. bɐ-xorox variety of small fish

e. e-sux ‘people/group of people’

f. fa-aj̥ ‘bees’

2.1.2.10 Locatives

The prefixes *tı*- and *nı*- are respectively found with a handful of words referring to spatial location and temporal location.

(103) Locative marking

a. t-ɪɲ ‘some place’

b. tı-ccɛ ‘somewhere’

c. t-au-ȶ-ɛ ‘here’

d. t-ɔ ‘there’

e. n-anıŋ ‘that time’

f. n-ɔ ‘when’

2.2 Nominal dependents and concord

2.2.1 Adjectives

Eegimaa adjectives have a morphological dual patterning. Some behave like verbs in the sense that they take verbal morphemes and also have the distributional properties of verbs, whereas others, mainly derived from nouns, take nominal morphemes.

(104) Eegimaa verbal and nominal adjectives

a. si-βe sʊ-ɲʊgɛȶ

CM-cow SR-black

'black cows'

b. si-βe sa-ɲʊgɛȶ-ɛ

CM-cow SR-black-PERF

'cows which are black'

c. ø-an a-ffan

CM-person CM-old

'grown up/old person'

d. e-lullum w-ɐine

CM-white.person CM-male

'male white people'

In (43b), the adjective takes relative and aspectual markers which are normally attached to verbs and this raises the controversial issue of whether or not Niger-

Congo languages have 'true' adjectives. The term 'verbal adjective' is often used to refer to adjectives which behave like verbs and the term 'nominal adjective' for those with nominal properties (Dixon & Aikhenvald 2004). The adjectives in (43c) and (43d) are derived from nouns and cannot take verbal morphemes.

2.2.2 Articles

2.2.2.1 Definite articles

Eegimaa has two definite articles which are *a~ʊ* and *-ma*. The definite article *a~ʊ*, like the demonstrative markers (§2.2.4), has a discontinuous form and the consonant of the class marker is not only prefixed but also infixed to this form for agreement purposes. With the class markers *ɛ-* and *ʊ-* which consist just of a vowel, the glides *j* and *w* are used respectively to mark the agreement.

(105) Definite article: a~ʊ

a. **b**ɐ-ɟur **b**a**β**ʊ

CM-girl CM.DEF.ART

'the girl'

b. **f**ʊ-xalaβ **f**a**f**ʊ

CM-backyard CM.DEF.ART

'the backyard'

c. **ɛ**-xʊlɔl **j**a**j**ʊ

CM-chicken CM.DEF.ART

'the chicken'

d. **ʊ**-ʊl **w**a**w**ʊ

CM-face CM.DEF.ART

'the faces'

When the definite article modifies a noun which takes the class markers *ø*- or *a*-, the agreement marking is performed by infixing the consonant *x*, as shown in (45) below.

(106) Definite article: axʊ

a. ø-an ø-axʊ

CM-person CM-DEF.ART

'the person'

b. a-ɲɲɪl ø-axʊ

CM-child CM-DEF.ART

'the child'

c. a-ʈaʝa ø-axʊ

CM-fighter CM-DEF.ART

'the fighter'

The definite -*ma* only attaches to a handful of words.

(107) Definite article: -*ma*

a. ø-pay-ma 'the father'

b. ø-ɟay-ma 'the mother'

c. ø-aine-ma 'the male'

d. ø-aare-ma 'the female'

In a few recorded cases, -*ma* attaches to adjectives in elliptical constructions and functions as a comparative determiner.

(108) -*ma* as a comparative marker

a. -ppʊ-ma 'the youngest'

b. -ffan-ma 'the oldest son'

c. -ine-ma 'the male'

2.2.2.2 Indefinite articles

The morpheme -*ccɛ* is an indefinite marker. It serves as an article when it modifies a noun but it can also stand as the subject of a verb, as in (48f). In either case, -*ccɛ* always takes the class marker of the noun to which it refers. In examples (48a-e), -*ccɛ* functions as an article.

(109) -*ccɛ* as an indefinite article

a. a-ccɛ a-ɲɲɪl 'a boy'

b. ba-ccɛ bɐ-ʝur 'a girl'

c. ga-ccɛ ga-nnaj 'one year'

d. gʊ-ccɛ gʊ-ppaʈa 'some ducks'

e. ɛ-ccɛ ɛ-ɟɟamɛn 'a goat'

f. a-ccɛ na-vvɔɣ-ɔm

CM-INDEF SM-call-1.SG.OBJ

'Someone called me'

Note that -ccɛ can occur before or after the noun it modifies. Also note that in the absence of both definite and indefinite articles, the class marker also conveys the idea of indefiniteness. This is certainly due to the fact that in the absence of any articles, the noun has a generic reading which indeed entails an indefinite reading.

2.2.3 Possessives

Eegimaa possessive morphemes fall into two categories. There are eight possessive suffixes and eight free possessive markers which are exclusively used for human possessors. The table in (49) lists both types of possessives. It should be noted that the English possessive 'our' is rendered in Eegimaa in three ways depending on how many people are involved and whether the listener is included or not. When the listener is excluded, the suffix *-oli* is used. The form *-ɔla* is used when the referent is possessed only by the speaker and one listener. When the referent belongs to more than two people and the listener(s) is included, the suffix *-ɔlal* is used.

(110) Human possessive markers

	Bound possessives	Free possessives
1.SG	-ɔm	CM-umbam
2.SG	-ɪ	CM-ijja
3.SG	-ɔl	CM-ɔla
1.PL EXCL	-oli	CM-ololi
1.PL INCL$_1$	-ɔla	CM-ɔlɔla
1.PL INCL$_2$	-ɔlal	CM-ɔlɔlal
2.PL	-ʊl	CM-ɔlʊl
3.PL	ɪl	CM-ɔlɪl

(111) Illustrating possessive marking in Eegimaa

a. Saɲasaɲa a-sɔm-ɔm

Saɲasaɲa CM-aunt-POSS

'Saɲasaɲa is my aunt.'

b. sɪ-nnaŋ-ɔl su-ssum

CM-food-POSS SM-good

'His/her food is good' (lit: 'His/her food it good')

c. ɲɪ-xɪn ɲaɲʊ ɲol-oli

CM-ricefiled CM.DEF SR-POSS

'The ricefield is ours'

In addition to the possessives above, there are also two other possessive markers commonly used in Eegimaa and these are: *CM-ɔ* and *CM-ala*. The former is for nonhuman possessors whilst the latter can be used with either type of possessors and is often reduced to the forms *CL-aa* which is used with nouns beginning with a consonant and *CL-al* used with nouns which start with a vowel.

(112) *CM-ɔ* and *CM-ala* possessives

a. fʊ-ppaȶa-ɔl gʊ-ɛ f-ɔ gʊ-lɛȶ

CM-duck-POSS CM-egg CM-POSS CM-absent

'The eggs of his/her duck are missing.'

b. gʊ-ɛ gaɣʊ g-aa fʊ-ppaȶa-ɔl gʊ-lɛȶ

CM-egg CM.DEF CM-POSS CM-duck-POSS CM-absent

'The eggs of his/her duck are missing.'

c. fi-ɟɟin fafʊ f-al Aŋɔlɛn fʊ-ʝɐlo

CM-bull CM.DEF CM-POSS Aŋɔlɛn CM-big

'The bull of Aŋɔlɛn is big.'

2.2.4 Demonstratives

Eegimaa makes a three-way distinction between demonstratives: **proximal** (close to the speaker), **medial** (relatively away from the speaker) and **distal** (further away from the speaker). Following Diessel (1999), I classify Eegimaa demonstratives into determiners and identifiers. Gundel, Bassene, Gordon, Humnick and Khalfaoui (2010) analyze Eegimaa[14] demonstratives in terms of their cognitive function, focusing on the type of information they (and other referring expressions)

[14] The work by Gundel, Bassene, Gordon, Humnick and Khalfaoui (2010) examines the cognitive function of referring expressions in four languages: Eegimaa, Kumyk, Ojibwe and Tunisian Arabic.

encode and the cognitive status they signal. In this section, I will exclusively discuss Eegimaa demonstratives as spatial deictic markers.

2.2.4.1 Demonstrative determiners

Demonstrative determiners are deictic words which serve to refer the listener to the entity being described. Eegimaa demonstrative determiners can be analyzed as a combination of the definite article *a~ʊ* and one of the three demonstrative suffixes listed in (52).

(113) Demonstrative suffixes

proximal	-ɛ
medial	-ʊ
distal	-ʊa

The combination of the definite article and the demonstrative suffixes yields the three Eegimaa demonstrative determiners illustrated in the examples in (53).

(114) Demonstratives determiners

a. su-ɣuʈum saʊsɛ

CM-vulture CM.DEM.PROX

'These vultures'

b. sʊ-xʊmba saʊsʊ s-al Adama

CM-pig CM.DEM.MED CM-POSS Adama

'Those pigs belong to Adama.'

c. ɲɪ-xɪn ɲaʊɲʊa ɲɪ-arɔ

CM-ricefield CM.DEM.DIST CM-good

'The ricefield over there is fertile'

When the definite article combines with the demonstrative suffixes to form a demonstrative determiner, it displays a different morphological behavior. We saw in §2.1.3.2.1 a double agreement marking on the definite article which consists in prefixing and infixing the consonant of the class marker. As a component of a demonstrative determiner, a~ʊ only allows the infixation of the consonant *x* which, as mentioned earlier, serves as an agreement marker for singular human nouns which take the class markers ø- or a-. Also note that when the demonstrative determiners modify a singular human noun which takes either one of these two class markers, the consonant *m* is inserted between the definite article and the demonstrative suffix.

(115) Human singular demonstrative determiners

a. ø-an ø-axʊmɛ

CM-person CM-DEM.PROX

'This person'

b. ɐ-kkuʝa ø-axʊmʊ

CM-wrestler CM-DEM.MED

'That wrestler'

c. a-ffan ø-axʊmʊa

CM-old CM-DEM.DIST

'That elder over there'

2.2.4.2 Demonstrative identifiers

Demonstrative identifiers are less common types of demonstratives. They are used in identificational phrases and clauses and have the dual function of a demonstrative and a copula. They have the meaning 'this / that is', 'these / those are', 'here / there is' 'here/there are'. Eegimaa demonstrative identifiers also take the suffixes -ɛ, -ʊ and -ʊa which we find in demonstrative determiners.

(116) Types of demonstrative identifiers in Eegimaa

	inflectable	invariable
proximal	ʊ-CM-ɛ	dɐure
medial	ʊ-CM-ʊ	dɐuru
distal	ʊ-CM-ʊa	dɐudua

The two types of demonstrative identifiers have different morphosyntactic properties. The items termed inflectable partake in concord and occur in postnominal position, whereas the invariable demonstratives identifiers do not participate in concord and they occur in prenominal position.

(117) Identificational constructions

a. bɪ-rɪl baβʊ ʊβɛ

CM-bowl CM.DEF CM.DEM.be

'Here is the bowl'

b. su-ɣuʈum ʊsʊa

CM-vulture CM.DEM.be

'Here are some vultures'

c. dɐure gɐ-in

DEM.be CM-hen

'This is a hen'

d. dɐuduɐ fi-ɟɟin Aŋɔlɛn

DEM.be CM-bull Aŋɔlɛn

'That is the bull of Aŋɔlɛn '

2.2.5 Numerals

The Eegimaa numeral system is based on five and its multiples. The numbers from one through five and the numbers ten, fifteen and twenty constitute the basic numbers on which all other numbers are expressed. The number six, for instance, is expressed as *fu-tok ni j-anur* (five and one). The Eegimaa number system is dactylonomic in the sense that people count with reference to the fingers. The word for ten which is *gu-ɲɛn* actually means 'hands' and this is in reference to the ten fingers of both hands. The word for fifteen is *ga-at* 'foot' and the idea is that you are adding five fingers from one foot to the already counted ten fingers of the hands. The word for twenty is *ɐ-vvi*[15] which means 'king' and this is the highest Eegimaa number.

(118) Eegimaa numeral system

cardinals		ordinals	
-anʊr	'one'	-tinar	'first'
-uβa	'two'	-utten	'second'
-ffɐ̰ji	'three'	-ffɐtten	'third'
-bbaɣɪr	'four'	-barɪɣɛn	'fourth'
fʊ-ȶɔx	'five'	-tɔɣɛn	'fifth'
gu-ɲɛn	'ten'		
ga-aȶ	'fifteen'		
ɐ-vvi	'twenty'		
e-ȶemel	'one hundred'		
e-uli	'one thousand'		
ɛmɪlɪɔŋ	'one million'		

To refer to numbers such as one hundred, one thousand and a million, Eegimaa resorts to loanwords from Wolof (téemeer), Mandinka (wuli) and French (million). Ordinal numbers above -*tɔgɛn* are expressed with the morpheme -*kkan* 'make or do' followed by a cardinal number, as shown in (58d).

[15] In Eegimaa, a prince who has more (or less) than twenty fingers cannot be enthroned as a king.

(119) Number phrases

a. bu-llɐr bu-utten

CM-work CM-NUM

'Second job'

b. ɐ-ɸur-ol ɐ-ʈinar

CM-young.man-3PL.POSS CM-NUM

'His/her first son'

c. bu-ʈɐʝ Baɪmban nɪ Elubalɪr bu-sola

CM-fight Baimban and Elubalir CM-NUM

'The last fight between Baimban and Elubalir'

d. fʊ-bbarʊm fafʊ fa-kkan-me fʊ-ʈɔx nɪ j-anʊr

CM-sheep CM.DEF SR-make-PERF CM-NUM and CM-NUM

'The sixth sheep' (lit: the she which makes it five and one)

The cardinal numbers *-anʊr* through *-bbagɪr* and all ordinal numbers show concord with the noun they modify.

2.2.6 Concord

The notion of concord has been introduced in §2.1.1.2. In this section, I will confine the discussion only to cases not presented in that section and which are worth mentioning. In Eegimaa, in most cases, the concord system requires attaching a class marker or the consonant of a class marker of a noun to all the words which relate to the noun. However, there are a few class markers which take different forms when it comes to concord. The table in (59) only lists those class markers and their concord forms.

(120) Class markers with different concord forms

CM	concord
ɛ- (pl)	gʊ-
bʊg-	gʊ-
w-	ʊ-
j-	ɛ-

The examples in (60) provide illustration on how the class markers listed in (59) pattern in concord.

(121) Irregular concord marking

a. e-jjola gʊ-ccɛ gʊ-ɔn-ɔl

CM-Joola CM-INDEF CM-raise-3.SG.OBJ

'S/he was raised by some Joola people'

b. j-aŋ ɛ-jaxa ɛ-ttɛɸ-ɪ

CM-house CM-beautiful CM-build-PASS

'A beautiful house was built'

c. w-af ʊ-ccɛ ʊ-ttɪŋ-ɔ-ɛ

CM-thing CM-INDEF CM-smell.good-DER-PERF

'Something smells good'

d. bʊɣ-an ga-ɟʊɣɔɛ gʊ-ɸaɲ-ɪl

CM-person SR-beautiful CM-engage-3.PL.OBJ

'They are engaged to beautiful people'

2.3 Verbal inflectional morphemes

In Eegimaa, a verb in a clause or sentence often has various morphemes attached to it and among such are the subject markers, the object markers as well as morphemes which convey information about tense, aspect and modality (TAM).

2.3.1 Subject markers

Eegimaa has free subject pronouns as well as bound subject markers which are prefixed to the verb stem. Each free subject pronoun has a bound counterpart. The inventory of both types of pronouns is provided in (61).

(122) Subject pronouns

	Free pronouns	Bound pronouns	
		Set1	Set2
1.SG	iɲɟe	nɪ-	ɪ
2.SG	aʊ	nʊ-	ʊ-
3.SG	acila	na-	a-
1.PL.EXCL	woli	ɟɪ- ~ ɟʊ-	ɟɪ- ~ ɟʊ-
1.PL.INCL1	wɔla	nʊ-..-a	ʊ-..-a
1.PL.INCL2	wɔlal	nʊ-..-al	ʊ-..-al
2.PL	bʊrʊ	ɟɪ- ~ ɟʊ-	ɟɪ- ~ ɟʊ-
3.PL	bʊgɔ	gʊ-	gʊ-

Free pronouns are often omitted but the bound pronouns are mandatory and they serve an agreement function. Bound subject markers consist of two sets with different usage. Pronouns in the first set attach to **realis** verb forms, meaning that the event described by the verb is known for certain to have taken place, whereas the pronouns in the second set attach to *irrealis* verb forms (the event described by the verb is not known to have occurred).

(123) Illustrative examples on the use of Eegimaa bound pronouns

a. a-ssɪw sʊ-xʊmba sasʊ.

SM-feed CM-pig CM.DEF

'S/he feeds the pig'

b. ʊ-lɔβ a-ɸaɲɔr-ɪ a-sɔmmɛn

SM-tell CM-brother-in-law-2SG.POSS SM-hurry

'Tell your brother-in-law to hurry up'

c. na-lɔβ-ɛ ga-xɔŋɛn g-a-ɣ-u

SM-tell-PERF CM-commission CM.DEF

'S/he delivered the message'

d. Barɪŋga na-ʈɛɣ-ɛ ga-sɪx

Barɪŋga SM-hit-PERF CM-shot

'Barɪŋga fired a shot'

2.3.2 Personal object markers

The morphemes which serve as personal object markers are identical to those used to indicate possession. Their only difference is that the possessive markers attach to nominals, whereas the object markers attach to verbs.

(124) Inventory of personal object markers

	Personal object markers
1.SG	-ɔm
2.SG	-ɪ
3.SG	-ɔl
1.PL.EXCL	-oli
1.PL.INCL1	-ɔla
1.PL.INCL2	-ɔlal
2.PL	-ʊl
3.PL	-ɪl

(125) Illustrative examples

a. pan a-ccam-ɪ

FUT SM-pay-2SG.OBJ

'S/he will pay you'

b. gʊ-ppal-ɔl gʊ-ram-ɔl

CM-friend-3SG.POSS CM-save-3SG.OBJ

'His/her friends saved him/her'

c. ø-ɟa-ɔm a-ffan a-xʊrɔm

CM-mother-1SG.POSS CM-old SM-raise-1SG.OBJ

'My grandmother raised me'

d. ga-nnaj bu-xuʈ baβʊ sɪ-ɟɟa-oli gʊ-kkan-oli u-ffoɲ u-ssum

CM-year CM-initiation CM.DEF CM-mother-1PL.POSS CM-do-1PL.OBJ CM-song CM-good

'During the initiation, our mothers composed nice songs for us'

Eegimaa also has a nonhuman object marker, *CM-ɔ,* whose morphological shape is identical to that of the nonhuman possessive marker discussed in (§2.1.3.3). As a possessive marker, *CM-ɔ* is preceded by an NP denoting the possessor, whereas the object marker is always preceded by a verb.

(126) Illustrative examples of nonhuman object marker

a. j-aŋ-ɔl fɪ-rɪxɪɲɟaŋ j-ɔ fʊ-lɔ-ɛ

CM-house-3SG.POSS CM-roof CM-POSS CM-fall-PERF

'The roof of his/her house fell'

b. nɐ-ʝu f-o bu-llɐr nɛvvɔnɔl?

SM-able CM-OBJ CM-work alone

'Can s/he fix it alone?'

c. e-sux j-aɪ pan gʊ-rambɛn-ɔl mɪn a-ccɔkkɔr f-ɔ

CM-people CM-DEF FUT CM-help-3.SG.OBJ CON SM-make CM-OBJ

'People will help him/her fix it'

2.3.3 Aspect markers

In theory, there is a clear delineation between tense and aspect. Tense refers to the temporal location in which some event takes place, whereas aspect has to do with how that event enfolds. In many Tense-oriented languages, the verb inflects for present, past and future. However, in practice, the line between tense and aspect is often hard to draw in the sense that in many languages which are supposedly tense-oriented, the verb often conveys temporal as well as aspectual information. Let us consider the three English sentences below.

(127) Tense and aspect in English

a. She *works* really hard.
b. In Casamance, we *produce* rice.
c. They *played* a beautiful game.

The first two sentences provide information not just about the temporal location of the two events (working and producing) but also about their habitual aspect. They happen in the present time but also on a regular basis. The third sentence indicates that the event took place in the past and it is complete (perfective aspect). English is therefore a language where the tense/aspect distinction in not rigidly maintained and they are often conflated. Eegimaa can be described as an aspectual language meaning that in this language, the emphasis is laid on whether the action described by the verb is complete or not.

2.3.3.1 Perfective markers

In Eegimaa, two morphemes are used to signal perfective aspect.

2.3.3.1.1 Perfective marker -ɛ

This morpheme indicates that the event described by the verb is viewed by the speaker as complete. Examples are given in (67).

(128) Perfective aspect marking with -ɛ

a. na-ffas-ɛ

3SG.SM-know-PERF

'I know'

b. gʊ-ppal-ɔl gʊ-jaβ-ɛ

CM-friend-3SG.POSS 3PL.SM-marry-PERF

'His friends are married'

c. w-aar-ɔl gʊ-βan-ɛ bʊ-rɔx

CM-wife-3SG.POSS 3PL.SM-finish-PERF CM-sow

'His wives have finished sowing'

d. na-ʃɪɣ-ɛ na-ttɔɣ-ɪl gʊ-kkaj

3SG.SM-arrive-PERF 3SG.SM-find-3PL.OBJ 3PL.SM-leave

'When s/he arrived, they had already left'

In (67a), the fact of knowing is viewed as a whole and in Eegimaa, it does not matter that much when the event takes place but it is its completion or lack thereof which really matters.

2.3.3.1.2 Perfective marker ba- ~ -ɛr

This morpheme indicates that the event denoted by the verb has been completed before another event takes place.

(129) Perfective aspect marking with ba- ~ -ɛr

a. nɔ na-ʃɪɤ mɛ bʊβɔ ba-kka-ɛr
   when 3SG.SM-arrive MOOD 3SG.SUBJ leave.PERF
   'When s/he arrived, they had already left'

b. na-jaβ-e bu-xuʈ baβu ba-ggɐl-er
   3SG.SM-marry-PERF CM-initiation CM.DEF past.PERF
   'He got married after the initiation'

c. gʊ-ttɔɤ-ɔl ɔ ba-βan-ɛr ɛ-aɲ
   3PL.SM-find-3PL.OBJ 3SG.SUBJ finish.PERF CM-cultivate
   'They found that he finished cultivating'

2.3.3.1.3 Past-perfective marker

The prefix *-ɛn* is used to express an event completed at a distant past. It can be used in conjunction with the perfective marker -ɛ.

(130) Illustrative examples

a. na-sɛn-ɛn-ɔl
   SM-give-PERF-3.SG.OBJ
   'S/he had given him/her'

b. nɪ-lɔβ-ɛn-ɛ gʊ-ppal-ɔm

SM-tell-PERF-PERF CM-friend-1.SG.POSS

'I had told my friends'

c. gʊ-vvɔɣ-ɛn-ɛn-ɔl

SM-call-RED-PERF-3.SG.OBJ

'They had called him/her'

The morpheme *-ɛn* also attaches to nouns to show that the referent no longer has the attribute denoted by the nouns. Examples are provided in (70).

(131) Use of *-ɛn* with nominals

a. a-llaɣ-ɛn

CM-healer-PERF

'Former healer'

b. u-kkuʝ-a-ɛn

CM-wrestle-DER-PERF

'Former wrestler'

c. sɪ-ɣalaŋ-ɛn-ɪl

CM-lover-PERF-3.PL.POSS

'Their ex-lovers'

2.3.3.2 Progressive marker

The morpheme used to express progressive aspect is identical to the demonstrative identifier *ʊ-CL-ʊ* we discussed in §2.2.4.2. This morpheme is used conjointly with the preposition *nɪ* but in some cases, the preposition can be omitted.

(132) Examples of progressive marking

a. aʊ ʊmʊ nɪ fɪ-ʈɪɲ

2.SG 2.SG.PROG PREP CM-eat

'You are eating'

b. bʊ-nʊnʊxɛn baβʊ ʊβʊ nɪ ɛ-lɔ

CM-tree CM.DEF.ART 3.SG.PROG PREP CM-fall

'The tree is falling'

c. si-βe-ol ʊsʊ nɪ bu-ʈɐʝ

CM-cow-3.SG.POSS CM.DEF.ART PREP CM-fight

'His/her cows are fighting'

2.3.3.3 Imperfective marker

Imperfective aspect is signaled in Eegimaa by suffixing the morpheme -ɛrʊt to the verb. It indicates that the event denoted by the verb is viewed as incomplete.

(133) Examples of imperfective marking

a. gʊ-kkaj-ɛrʊʈ

SM-leave-IMPERF

'They have not yet left'

b. ɪ-jaβ-ɛrʊʈ

SM-marry-IMPERF

'I am not yet married'

c. ʊ-βan-ɛrʊʈ

SM-finit-IMPERF

'You have not yet finished'

2.3.3.4 Habitual markers

In Eegimaa, habitual aspect is expressed with two morphemes, depending on whether it is a positive or a negative habit.

2.3.3.4.1 Positive habitual markers

The morpheme which serves to mark a positive habit is *nɪxɪ* which takes the forms *nʊxʊ* and *naxa* respectively in the second and third person singular. Note that this morpheme is followed by a reduplicated form of the verb. It should be added that when the subject or concord marker prefixed to the verb begins with a vowel, the final vowel of the habitual marker is dropped and when it begins with a consonant, it is the whole final CV of the habitual marker which is dropped.

(134) Examples of positive habits expressed with *nɪxɪ*

a. nɪx(ɪ) ɪ-ʈɪt-tɪɲ sʊ-ɔl

HAB SM-RED-eat CM-fish

'I eat fish'

b. nɪ(xɪ) gʊ-aw-waɲ

HAB SM-RED-cultivate

'They cultivate'

c. nax(ɪ) a-sʊs-sʊm

HAB SM-RED-take.snuff

'S/he takes snuff'

2.3.3.4.2 Negative habitual marker

Negative habitual aspect is expressed with the morpheme *-eriʈ*. It conveys the idea that, usually, the event or state expressed by the verb does not occur. It therefore negates an event or state which otherwise would have occurred regularly.

(135) Examples of negative habits expressed with *-eriʈ*

a. gʊ-mori-eriʈ

SM-sleep-NEG.HAB

'They don't sleep'

b. ɟu-ɸur-eriʈ

SM-exit-NEG.HAB

'We don't go out'

c. a-rambɛn-eriʈ bʊɣ-an

SM-help-NEG.HAB CM-people

'S/he does not help people'

2.4 Derivation

2.4.1 Nominal derivation

2.4.1.1 Conversion

Various studies on Jóola languages as well as on many Bantu languages have argued for a derivational function of noun classes (Barry 1987, Aikhenvald 2000 and Sagna 2008). I argue that in Eegimaa, class markers do not derive nouns from verbs[16] and that all nominalizing affixes are suffixes. The nominals in all the examples below are derived not by changing the class marker but by attaching a zero morpheme to the base.

(136) ø-derivation

a.	*ɛ*-ccam	'to pay'	-ccam-ø	*ba*-ccam-ø	'payment'
b.	*ɛ*-sɛn	'to give'	-sɛn-ø	*ba*-sɛn-ø	'generosity'

If we posit a nominalization process whereby the noun class is actually the nominalizing affix, such a process will have to take place outside the NP; which is really problematic since the NP is part of the classifier phrase (CLP). It is therefore safe to claim that in Eegimaa, class markers do not serve a nominalizing purpose and that verbs are turned into nouns by attaching a derivational suffix. Only after the nominalization process has taken place, is the class marker adjoined to provide information about the class to which the derived nominal belongs.

[16] In Eegimaa, the only case where class markers may serve a derivational function is in deriving augmentative or diminutive nouns from other nouns. For instance from the word *ɛ-be* 'cow' we can have *ɲ-be* 'small cow' and *ga-be* 'big cow'.

2.4.1.2 Agentive: -a

The suffix *-a* attaches to verbal stems to derive nouns which refer to the agent of the action denoted by the verb. Below are examples.

(137) Agentive nominalization

a.	-waɲ	'cultivate'	-waɲ-a	→	-waɲa	'cultivator'
b.	-rɔŋ	'live'	-rɔŋ-a	→	-rɔŋa	'person who lives'
c.	-kkɔŋ	'cry'	-kkɔŋ-a	→	-kkɔŋa	'person who cries'

In very few cases, this morpheme serves to derive nouns which refer to the instrument used to perform an action, which can also be interpreted as 'acting' on something. An example is shown in (77) below.

(138) Instrumental nominal derived with -a

a.	-ɪb	'cut'	-ɪb-a	→	-ɪβa	'knife'

One may argue in favor of two distinct suffixes, meaning an agentive *-a* and an instrumental *-a* which happen to be homographs. I will not disagree with such a view. However, it should be noted that the literal translation of the word *-iβa* is 'cutter'.

2.4.1.3 Instrumental: -ʊm

This morpheme derives nouns referring to the instrument which serves to perform the action denoted by the verb.

(139) Instrumental nominals

a.	-rʊs	‘cut’	-rʊs-ʊm	→	-rʊsʊm	‘sickle’
b.	-ffaŋ	‘lock’	-ffaŋ-ʊm	→	-ffɐŋum	‘key’
c.	-ɟɟɪk	‘limp’	-ɟɟɪk-ʊm	→	-ɟɟɪɣʊm	‘walking stick’
d.	-gab	‘serve’	-gab-ʊm	→	-gɐβum	‘ustensil used to serve food’

It should be noted that when *-um* is suffixed to a transitive verb, it derives an instrumental nominal, as shown in the examples (78a-d) above, and when it is attached to an intransitive verb, the resulting noun refers to the location where the action takes place.

(140) Location nominals derived with -ʊm

a.	-kkuj	‘wrestle’	-kkuj-ʊm	→	-kkuj̯um	‘wrestling field’
b.	-ɔmʊnɔr	‘meet’	-ɔmʊnɔr-ʊm	→	- omunorum	‘venue’
c.	-ssil	‘cook’	-ssil-ʊm	→	- ssilum	‘kitchen’
d.	-nɔɣɛn	‘enter’	-nɔɣɛn-ʊm	→	- noɣenum	‘entrance’

2.4.1.4 Abstract: -aj

This morpheme attaches to both nouns and verbs to derive abstract nouns.

(141) Abstract nominals derived with -aj

a.	-ppal	‘friend’	-ppal-aj	→	-ppalaj	‘friendship’
b.	-ɟɟʊ	‘initiate’	-ɟɟʊ-aj	→	-ɟɟʊaj	‘novelty’
c.	-ssum	‘be good’	-ssum-aj	→	-ssumaj	‘peace’

This morpheme is also commonly used with words referring to localities and ethnic groups. The derived words denote the appurtenance of something to the specified locality or ethnic group.

(142) Derived nominals for localities and ethnic groups

a.	-wɔlɔf	'Wolof'	-wɔlɔf-aj	→	-wɔlɔfaj	'of Wolof people'
b.	-fula	'Fula'	-fula-aj	→	-fulaaj	'of Fula people'
c.	–lullum	'White'	-lullum-aj	→	-lullumaj	'of White'
d.	-ssiŋ	'Essiŋ'	-ssiŋ-aj	→	-ssiŋaj	'of / from Essiŋ'

2.4.1.5 Manner: -ɛr

This morpheme also serves to derive abstract nouns. Unlike *-aj* which attaches to both nouns and verbs, *-er* only attaches to verbal stems. It derives nouns with the meaning 'the way you verb'.

(143) Abstract nominals derived with -ɛr

a.	-kkan	'do'	-kkan-ɛr	→	-kkanɛr	'the way of doing'
b.	-ber	'laugh'	-ber-ɛr	→	-berɛr	'the way of laughing'
c.	-ɟaw	'walk	-ber-ɛr	→	-ɟaɛr	'the way of walking'
d.	-tiñ	'eat'	-tiñ-ɛr	→	-tiñɛr	'the way of eating'

2.4.2 Verbal derivation

2.4.2.1 Verbalizer: -ɛt

We saw in the previous section how nouns are derived from verbs, a process known as nominalization. In Eegimaa, it is also possible to derive verbs from nouns and the morpheme which serves such a purpose is the suffix *-ɛt*. Verbs derived with *-ɛt* always convey the meaning ‘be or look for what is denoted by the noun’.

(144) Verbs derived from nouns

a.	-kɔn	‘filth’	-kɔn-ɛt	→	-kɔnɛȶ	‘be filthy’
b.	-pɔr	‘dust’	-pɔr-ɛt	→	-pɔrɛȶ	‘be dusty’
c.	-maŋgʊ	‘mango’	-maŋgʊ-ɛt	→	-maŋgʊɛȶ	‘look for mangoes’
d.	-far	‘belly / pregnancy’	-far-ɛt	→	-farɛȶ	‘be expecting’

2.4.2.2 Causative: -ɛn

The morpheme *-ɛn* is attached to verbs and adjectives to derive verbs with the meaning ‘to cause to verb / adjective’.

(145) Causation

a.	-tɛj	‘run’	-tɛj-ɛn	→	-tɛjɛn	‘drive’
b.	-kkɔŋ	‘cry’	-kkɔŋ-ɛn	→	-kkɔŋɛn	‘make somebody cry’
c.	-sa	‘burn’ (intr)	-sa-ɛn	→	-saɛn	‘burn’ (tr)
d.	-gal	‘be spoilt’	-gal-ɛn	→	-galɛn	‘spoil’ (tr)

In few recorded cases, the morpheme -ɛn serves to convert nouns into verbs.

(146) Deriving causal verbs from nouns

a.	-vvi	‘king’	-vvi-ɛn	→	-vvien	‘enthrone’
b.	-ccɪnn	‘fetish’	- ccɪnn-ɛn	→	- ccɪnnɛn	‘perform initiation ceremony’

2.4.2.3 Reversal: -ul

Attaching the suffix *-ul* to a verbal base creates a transitive verb with the meaning 'to undo the action suggested by the verbal base'.

(147) Reversive verbs

a.	ɛ-bbɔɲ	'to fold'	ɛ-bbɔɲ-ul	→	ebboɲul	'to unfold'
b.	ɛ-ppɛk	'to close'	ɛ-ppɛk-ul	→	eppeɣul	'to open'
c.	ɛ-fʊt	'to cover'	ɛ-fʊt-ul	→	ɛfʊlʊl	'to uncover'
d.	ɛ-fɔk	'to bury'	ɛ-fɔk-ul	→	efoɣul	'to unbury'

2.4.2.4 Descriptive: -ɔ

The suffix -ɔ attaches to verbal bases to derive descriptive verbs.

(148) Descriptive verbs

a.	ɛ-kkan	'to do, put'	ɛ-kkan-ɔ	→	ɛkkanɔ	'put on (dress)'
b.	ɛ-jab	'to marry'	ɛ-jab-ɔ	→	ejɐβo	'to get married'
c.	ɛ-li	'to wake up'	ɛ-li-ɔ	→	elio	'wake up'
d.	ɛ-ccik	'to shave'	ɛ-ccik-ɔ	→	ecciɣo	'to have a hair cup'

Words derived with the suffix -ɔ have a reflexive interpretation. For instance the word *eli* which is the base from which *elio* is derived, is transitive and conveys the meaning that the person who is performing the action of 'waking up' is different from the person who is woken up. However, the verb *elio* implies that the subject woke up on his/her own. In examples (88a-c), the reflexive meaning is also perceptible.

(149) Descriptive verbs with reflexive meaning

a.	ɛ-ʊw	'to bathe'	ɛ-ʊw-ɔ	→	ɛʊwɔ	'to take a shower'
b.	ɛ-ssɪm	'to dress'	ɛ-ssɪm-ɔ	→	ɛssɪmɔ	'to dress' (REFL)
c.	ɛ-sur	'to burn'	ɛ-sur-ɔ	→	esuro	'to burn oneself'

2.4.2.5 Reflexives: -ɔrɔ

Although words derived with the morpheme *-ɔ* have a reflexive reading, such a reading is more salient in words derived with the morpheme *-ɔrɔ*.

(150) Reflexive verbs

a.	ɛ-bʊtt	'to fool' (v)	ɛ-bʊtt-ɔrɔ	→	ɛβʊttɔrɔ	'to fool oneself'
b.	ɛ-ccik	'to shave'	ɛ-ccik-ɔrɔ	→	ecciɣoro	'to shave' (REFL)
c.	ɛ-jɪb	'to cut'	ɛ-jɪb-ɔrɔ	→	ɛjɪβɔrɔ	'to cut oneself'
d.	ɛ-ɟʊk	'to see'	ɛ-ɟʊk-ɔrɔ	→	ɛʝʊɣɔrɔ	'to see oneself'

2.4.2.6 Reciprocity: -ɔr

Verbs derived with the morpheme *-ɔr* express a reciprocal relationship between participants.

(151) Reciprocal verbs

a.	ɛ-ɟʊk	'to see'	ɛ-ɟʊk-ɔr	→	ɛʝʊɣɔr	'to meet'
b.	ɛ-bɐll	'to respond'	ɛ-bɐll-ɔr	→	eβɐllor	'to converse'
c.	ɛ-rambɛn	'to assist'	ɛ-rambɛn-ɔr	→	ɛrambɛnɔr	'to help one another'
d.	ɛ-rɪf	'to challenge'	ɛ-rɪf-ɔr	→	ɛrɪfɔr	'to challenge one another'

2.4.2.7 Reduplication

Words are also derived by repeating a morpheme or part of it, a process known as reduplication and which will be discussed in detail in chapter 4.

(152) Verbal reduplication

a.	ε-lɔb	'to talk'	ε-RED-lɔb-εn	→	εlɔllɔβεn	'to grumble'
b.	ε-lɪmb	'to be mistaken'	ε-RED-lɪmb-ɔr	→	εlɪllɪmbɔr	'to be lost'
c.	ε-lɔ	'to fall, to hurl'	ε-RED-lɔ-ɔr	→	εlɔlɔɔr	'to rush'

Note that in Eegimaa, reduplication as a derivational process occurs concurrently with one of the suffixation processes. As we will see in chapter 4, in Eegimaa, reduplication also serves an inflectional function, marking perfective aspect.

2.4.2.8 Compounding

Compounding is a word formation process which consists in combining two words to form a new word. This process is found in many languages. However, there is no agreement on how compounds should be written. Sometimes, they are written just as one word, but it also very common to come across compounds written with a hyphen between the two bases and in some cases they are written as two separate words. In Eegimaa, I chose to represent compound words with a space between the bases.

(153) Examples of compound words

a. ø-an m-al

CM-person CM-water

'water person[17]'

b. m-ɔf ɐ-vvi

CM-land CM-king

'the land of the king'

c. ɛ-βɔŋ ɡa-ɲɛn

CM-thy CM-hand

'Forehand' (lit: hand's thy)

2.5 Conclusion

This chapter surveyed the internal structure of words in Eegimaa. We have seen that most Eegimaa words consist of a class marker prefix and a root morpheme, with the class marker providing information about the category to which the referent belongs. However, it should be emphasized that the Eegimaa noun class system is very complex and allows one class marker to mark more than one category. The complexity of the nominal classification system is also reflected in the concord system. Although in most cases it is the class marker of the regent noun which is attached to all the words which relate to this noun to mark concord, some class markers have corresponding concord forms which are morphologically different. The analysis of nominals and their dependents has also revealed further

[17] Monster believed to be half human and half fish.

complexities of the morphology of this language. Many of these nominal dependents consist of discontinuous forms or are made up of a combination of different morphological elements and this often results in a double agreement phenomenon with the concord marker attaching to both elements.

The combination of morphological elements for nominal classificatory, inflectional or derivation purposes very often has repercussions on the phonology. The next chapter will focus on the phonology of Eegimaa and the processes which occur when morphemes are combined.

3. Phonology

3.0 Introduction

The sounds found in a language do not always fulfill the same function. Some have a distinctive function, meaning that they serve to differentiate words, whereas others lack such a function and only occur in specific contexts. Let us consider the following cases.

(154) Sample distribution of [p, b, ɸ, β] in Eegimaa

a.	[pan]	future marker[18]
b.	[ban]	immediate future marker
c.	[ɛnaɸ]	'add'
d.	[ɛnaβ]	'be of good behavior'
e.	[ɟʊppʊ]	'bird'
f.	[ɛsʊmba]	'tobacco'

The sounds [p] and [b] are the distinctive sounds in (93a) and (93b), whereas in (93c) and (93d), the distinctive sounds are [ɸ] and [β]. However, the occurrence of [ɸ] and [β] is very restricted. These two sounds are only found after a vowel, whereas [p] and [b] occur in more than one environment. The sounds [p] and [ɸ] are phonetically related, with the second sound being a spirantized version of the first. The same relationship holds between [b] and [β]. The sounds [p] and [b] which

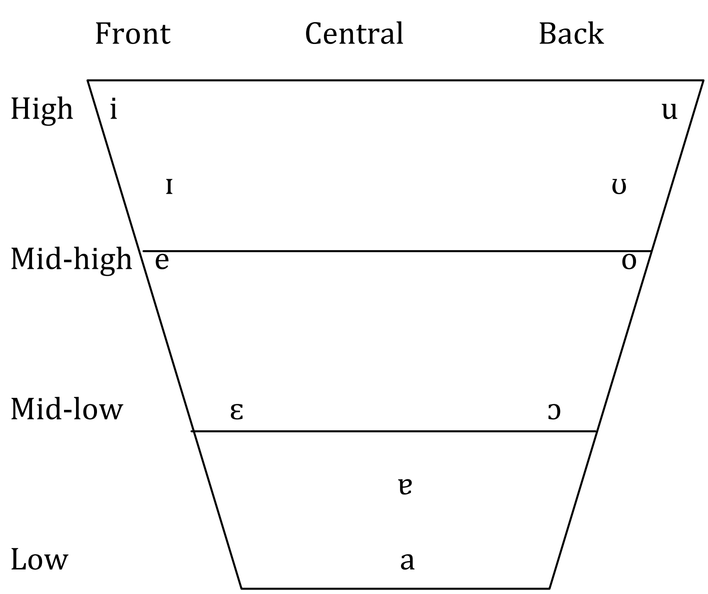
[18] The word *pan* is used to indicate that the event described by the verb will take place some time in the future, whereas with *ban*, the event is imminent.

have a wider distribution are therefore classified as the basic sounds or phonemes and [ɸ] and [β] as their respective contextual manifestations.

The subfield of linguistics which is concerned with how the sounds of languages are organized into a system of contrastive units and the rules governing sound distribution, variation and sequencing is known as phonology. This chapter describes the sound system of Eegimaa. It starts with a discussion of the vowel system, followed by a discussion of the consonant system, the syllable structure and some allophonic processes. The last section of this chapter is devoted to an overview of some of the morphophonological processes found in Eegimaa.

3.1 Vowels

(155) Eegimaa vowel chart



3.1.1 ATR as a distinctive feature

Eegimaa vowels fall into two sets depending on whether they are articulated with an advanced tongue root (+ATR) or a retracted tongue root (-ATR).

(156) ATR vowel sets

+ATR	-ATR
i	ɪ
u	ʊ
e	ɛ
o	ɔ
ɐ	a

The contrast between [+ATR] and [-ATR] is phonemic in Eegimaa and below are examples of minimal pairs.

(157) Contrastive distribution between [-ATR] and [-ATR] vowels

a. /i/ - /ɪ/

/-il/	'groan'	/-sik/	'wharf'	/-li/	'wake up'
/-ɪl/	'sprout'	/-sɪk/	'poison'	/-lɪ/	'be strong'

b. /u/ - /ʊ/

/-un/	'type of dustpan'	/-dus/	'wind'	/-ku/	'from Eku'
/-ʊn/	'hear'	/-dʊs/	'sickle (v)'	/-kʊ/	'dirty'

c. /e/ - /ɛ/

/-el/	'babysit'	/-med/	'swallow'	/-de/	'this'
/-ɛl/	'sound'	/-mɛd/	'small piece'	/-dɛ/	'fit, end'

d. /o/ - /ɔ/

/-oŋ/	'invitation'	/-cːop/	'mouse'	/-lo/	'score'
/-ɔŋ/	'forehead'	/-cːɔp/	'rice measure'	/-lɔ/	'fall'

e. /ɐ/ - /a/

/-ɐl/	'regain'	/-kɐb/	'chew'	/-wɐ/	'who is eager to see'
/-al/	'be ripe'	/-kab/	'bun (food)'	/-wa/	'tap'

As we shall see in 3.4, ATR feature plays a crucial role in vowel harmony. The two sets are mutually exclusive and only vowels from the same set can co-occur in a word.

3.1.2 On the phonemic status of length

The status of vowel length in Eegimaa is becoming, if it is not already, a source of debate among linguists who have worked on this language. Sambou (1989) analyzes vowel length as serving as distinctive function. The same approach is also taken by Tendeng (2007). Sagna (2008) differs from Sambou in this regard, pointing out that in the variety of Eegimaa spoken in his village, Essil, vowel length does not occur. Initially, I personally believed in there being a distinctive opposition between long vowels and short vowels in Eegimaa. However, the more data I collected, the less clear it becomes about the phonemic status of vowel length and also about there being vowel length at all in this language. In rapid speech, a sequence of two identical vowels may be perceived as one long vowel but in normal speech, the two segments are pronounced separately. To determine with certainty the length status of vowels, I conducted a syllable counting experiment in which participants were first trained on how to count the number of syllables in a word by clapping while pronouncing the word. The number of syllables in a word is determined by the number of claps. The words used in the training sessions do not contain adjacent identical vowels. Including words containing adjacent identical vowels in the training sessions would certainly influence the results of the experiment. Forty (40) words were used in the experiment and among these words, twenty (20) have a sequence of two identical vowels. The words were presented to the participants in a way not to suggest any pronunciation. For participants with a certain level of education, a French translated version of the Eegimaa words was presented to them and the first part of the experiment consisted in making sure that they get the intended Eegimaa word. The French words were introduced, one at a time, to each participant to provide the Eegimaa version. For participants who cannot read, I either explained the concept the words stand for or conducted an object naming task in which each participant was presented an item and then asked to provide the Eegimaa word for it. Once the participants got a clear idea of the target words, we proceeded to the syllable counting task.

The research hypothesis was that, if in Eegimaa a sequence of two identical vowels is always perceived as a single long segment, the leftmost words in (97) will receive just one clap, whereas the rightmost words will receive two. If length is not a feature of Eegimaa vowel system, these words will receive, respectively, two and three claps. Below is a sample of the words used in the experiment.

(158) Sample of tested words

f.	[lii]	'heavy'	[ɟɐɐri]	'beauty'
g.	[ɛɛx]	'cassava'	[fʊbaax]	'female goat'
h.	[siit]	'palm nuts'	[maaɣɛn]	'truth'
i.	[faaʝ]	'bees'	[ɛrɛɛn]	'integrate'
j.	[fɪɪx]	'stone'	[ɟɪɪβa]	'knife'
k.	[bɪɪt]	'rice field'	[naaɣɛ]	's/he said'
l.	[mʊʊs]	'swiftness'	[gʊʊnɛ]	'they heard'
m.	[bʊʊl]	'face'	[fʊlɔɔl]	'his/her fall'
n.	[waar]	'wives'	[suuβa]	'two'
o.	[muu]	'supernatural power'	[eelen]	'spare someone from something'

The results of the experiment revealed that in Eegimaa, a sequence of two vowels, be these vowels identical or heterogeneous, is viewed by speakers as two separate segments. The words on the left consistently received two claps, whereas those on the right set received three claps, suggesting that they are viewed respectively as disyllabic and trisyllabic. These results have an important implication for phonological contrast in Eegimaa. They suggest that in the pairs in (98), the contrast is not segmental but structural, meaning that the words differ not in terms of sound contrast, but in syllable count.

(159) Structurally contrastive pairs

a. [eli] 'wake up'
   [elii] 'be heavy'

b. [fʊbax] 'fruit of baobab'
   [fʊbaax] 'female goat'

c. [eɟɐli] 'be big'
   [eɟɐɐli] 'go early'

d. [ɛmʊx] 'kill'
   [ɛmʊʊx] 'itching'

In each of the pairs above, the second word has one syllable more than the first, due to the fact that the adjacent two vowels are nuclei of two separate syllables. Note that the concept of length has received a lot of attention in phonology and a lot of ink has been spilled on how to best represent long segments. Odden (2011) provides a detailed discussion of vowel length and the different proposals out there on how to handle long vowels. The question often raised is whether a long vowel is a sequence of two identical segments or just one segment which differs from its short counterpart on duration. The answer to this question is not straightforward in that, languages go both ways. In a language such as Wolof, long vowels behave like a single unit (Bell 2003). There is a significant opposition between long vowels and their short counterparts.

(160) Phonemic vowel length in Wolof

a. [xɔl] ‘heart’

[xɔːl] ‘watch’

b. [fɛs] ‘full’

[fɛːs] ‘skin (v)’

c. [tur] ‘name’

[tuːr] ‘pour, shrine’

In Hausa, a language spoken in Nigeria, long vowels are viewed as a sequence of two adjacent identical vowels and as such, they behave like diphthongs (Odden 2011). They are shortened in the same environment (in closed syllables) where diphthongs are reduced to single vowels, as showed in (100).

(161) Hausa long vowels and diphthong shortening

a. ɗaː-n-aː ‘my son’

b. ɗa-n-ka ‘your (m.) son’

c. kai ‘head’

d. kai-n-aː ‘my head’

e. ka-n-ka ‘your (m.) head’

In some African languages, vowel length is completely nonexistent. For instance in Yoruba, another language spoken in Nigeria, a sequence of two identical vowels is parsed as heterosyllabic vowels (Akinlabi 2004).

(162) Yoruba vowel sequences

a. [eégún] e.é.gún ‘masquerade’

b. [òótó] ò.ó.tó ‘truth’

c. [eesin] e.e.sin ‘fly’

d. [àánu] à.á.nu ‘sympathy’

e. [òòsa] ò.ò.sa ‘god’

Welmers (1973) notes that in many Mande languages, adjacent identical vowels are treated as nuclei of separate syllables. Subsequent research in this language family supports his findings. Ravenhill (1982) reports four types of syllables in Wan, a Mande language spoken in Ivory Coast. These are: the syllabic nasal N̩, V, CV and CCV. He suggests that sequences of identical vowels be treated as separate segments based on the fact that the vowels are independently assigned tone.

3.1.3 The disjunctive phoneme

Sambou (2005) postulates the existence of a phoneme referred to as ‘disjunctive phoneme’ which occurs between two adjacent vowels and assigns them to different syllables. The particularity, or peculiarity, of this phoneme is that it does not have phonetic properties. The idea of a phoneme without allophones is not new. Post-Bloomfieldian structuralists have posited the existence of such a phoneme occurring at morpheme boundaries and which is therefore referred to as ‘juncture phoneme’ (Bloch and Trager 1942). Harris (1951) describes this phoneme as a ‘zero phoneme’ since despite its distinctive function, it does not have any phonetic realizations. Before proceeding in the discussion of Eegimaa 'disjunctive' phoneme, let us take a quick look at some of the main views phonologists hold of the phoneme.

Although phonologists agree on the function the phoneme serves in a language, i.e. its distinctive function, they differ on its properties. Each linguistics school views the phoneme differently. In the *mentalistic* or *psychological* perspective, the phoneme is basically viewed as a psychological reality. Baudouin, cited by Heaman (1984), actually defines it as a 'psychological equivalent of a speech sound'. The phoneme is therefore treated as an abstract concept or, to use Baudouin terminology, a 'mental image' which speakers try to replicate via sounds. This view of the phoneme as fundamentally an abstract concept is not shared by many phonologists. In *structuralist phonology*, the phoneme is defined with reference to the notions of *contrast*, *allophone* and *context*. It is viewed as having a distinctive function and serves to differentiate words. For instance the difference between the Eegimaa pairs [ɛlaƫ] 'refuse' and [ɛlɛƫ] 'be missing' emanates from the difference in the second vowels. This difference is significant or distinctive since it results in two separate words and the sounds responsible for such a difference are manifestations of separate phonemes.

The phoneme in the structuralist perspective is also viewed as having physical (phonetic) properties. Jones (1967:10) defines it as follows:

'a family of sounds in a given language which are related in character and are used in such a way that no one member ever occurs in a word in the same phonetic context as any other member'.

This view of the phoneme as a family of phonetically related sounds which are in complementary distribution has been very appealing to phonologists. However, it should be noted that the notion of abstractness, even though it does not have the primacy status it serves in mentalistic phonology, is not entirely discarded in Structuralist phonology.

In *Generative Phonology*, the phoneme is defined as a set of distinctive features (Chomsky and Halle 1968). According to this theory, the difference between the word [ɛlaƫ] ‘refuse’ and [ɛlɛƫ] ‘be missing’ holds from the different values the segments [a] and [ɛ] have for the features [back], [front] [low] and [high]. The vowel [a] has the features [+back, -front, -high +low], whereas [ɛ] is [-back, +front, -high, -low]. The phoneme is believed to be a mental representation of a sound, and the allophones the physically instantiations of that sound. Generative phonology brings the concept of abstractness once again into plain focus. There is a subtle difference between mentalists and generativists in their use of the term abstractness. In generative phonology, the term refers to the situation where a surface form of a morpheme diverges from its underlying correspondent. In some cases of abstractness, the underlying form does not even have a phonetic realization. The abstractness issue sparked off a huge controversy among generativists. Kiparsky’s (1968) paper *How abstract is phonology?* and Hyman’s (1970) response *How concrete is phonology?* show the two fronts in the debate. On the one hand there are those who believe that a certain degree of abstractness is conceivable in phonology since it allows to account for certain alternations which otherwise would be left unaccounted for. However, orthodox[19] generative phonology does not set any limits on how much abstractness can be assumed in phonological analysis and some of the solutions proposed by those who subscribed to this theory, especially the cases of underlying form without any phonetic content, was deemed to be extremely abstract (Hooper 1976). The growing dissatisfaction over the abstract analyses proposed by some of those who subscribed to orthodox generative phonology led others to search for an alternative approach in which generative theory is constrained in a way to avoid at least some of the abstract approaches being adopted (Kiparsky 1968). Vennemann (1974) develops a theory, Natural Generative Phonology (NGP), geared toward resolving not just the abstractness issue but also the discontent raised by the ordering of rules which is also at the core of orthodox generative phonology. The Theory is more forcefully presented by Hooper (1976) according to whom abstractness can be restricted via constraints on the underlying forms and on the rules mapping underling forms to surface forms.

'A very strong constraint on rules would be one that does not allow abstract rules at all. It would require that all rules express transparent surface generalizations, generalizations that are true for all surface forms and that, furthermore, express the relation between surface forms in the most direct manner possible. We will call this condition the True Generalization Condition. The True Generalization Condition claims that the rules speakers formulates are based directly on surface forms and that these

[19] Orthodox Generative Phonology refers to the traditional version of Generative Phonology proposed in Sound Patterns of English (Chomsky and Halle 1968).

rules relate one surface form to another, rather than relating underlying to surface form.' (Hooper 1976:13)

The NGP espoused by Hooper constitutes a radical departure from orthodox generative phonology. The True Generalization Condition not only bans generalizations which are not observable on the surface but also limits the discrepancy between the underlying form of a morpheme and how this morpheme is phonetically realized. NGP therefore advocates a 'concrete' approach to phonology. This theory has also had its share of criticisms, most of which levied upon its strong and uncompromising claims. Let us remember that the stronger a claim, the more susceptible it is to be challenged. Although the idea of regulating phonological rules is salutary in the sense that a restriction on permissible rules prevents a situation where almost any form can be derived from any rule, it is also a hard fact that for some phonological processes found in many languages, there does not seem to be a concrete approach to account for them. In such cases, abstractness may serve as an alternative approach (Gussmann 1980).

The 'disjunctive' phoneme postulated by Sambou does not just assign contiguous vowels to separate syllables. It is also believed to be responsible for the vowel-zero alternations in Eegimaa. Let us take a look at the following data.

(163) Vowel-zero alternation

a.	/a-an/	→	an	'person'
b.	/ɟɪ-an/	→	ɟan	'worthless person'
c.	/fʊ-al/	→	fal	'river / sea'

d. /fʊ-øal/ → fʊ.al ‘type of reptile’

e. /ga-al/ → gal ‘wisp of hair’

f. /ga-øal/ → ga.al ‘furrow’

In Eegimaa, as we shall see in (§3.5.6), the vowel of the class marker is sometimes deleted when the root begins with a vowel. However, there is a plethora of exceptions to this deletion process. In (102d) and (102f), the vowel of the class marker is maintained. The absence of deletion is, according to Sambou, attributable to the fact that underlyingly, the two vowels are not adjacent. The presence of the ‘disjunctive’ phoneme (represented by the symbol /ø/) between the two vowels saved the vowel of the classifiers from deletion.

Sambou traces the ‘disjunctive’ phoneme to glides. He notes that this phoneme originates from glides. In Eegimaa, glides are deleted when they occur between vowels. However, their deletion is never followed by vowel deletion.

(164) Glide deletion

a. /ɛ-wal/ → ɛ.al ‘be ripe’

b. /na-waɲ/ → na.aɲ ‘s/he cultivate’

c. /na-wʊn/ → na.ʊn ‘s/he heard’

d. /ɛ-jɛl/ → ɛ.ɛl ‘resonate’

e. /gʊ-jɪb/ → gʊ.ɪβ ‘they cut’

f. /gʊ-jɪn/ → gʊ.ɪn ‘they did on purpose’

Evidence that each of the words in (103) contains an underling glide comes from the repetition of the root. This repetition yields an alternation between a glide at the base initial position and the lack of such a glide at the beginning of the reduplicant. The underling glide is deleted at the beginning of the reduplicant because it occurs between two vowels but maintained at the beginning of the based where it even affects the coda, if any, of the reduplicant.

(165) Glide-zero alternation

a.	/ɛ-RED-wal/	→	ɛ.aw.wal	'it is ripe'
b.	/na-RED-waɲ/	→	na.aw.waɲ	's/he cultivated'
c.	/na-RED-wʊn/	→	na.ʊw.wʊn	's/he heard'
d.	/ɛ-RED-jɛl/	→	ɛ.ɛj.jɛl	'it resonated'
e.	/gʊ-RED-jɪb/	→	gʊ.ɪj.jɪβ	'they cut'
f.	/gʊ-RED-jɪn/	→	gʊ.ɪj.jɪn	'they did on purpose'
g.	/na-RED-jas/	→	na.a.jas	's/he migrated[20]'
h.	/na-RED-ja/	→	na.a.ja	's/he stabbed'
i.	/gʊ-RED-ɪ/	→	gʊ.ɪ.ɪ	'they filled in'

One may be tempted to consider the idea that the presence of the glide might be due to an insertion process. Indeed, glide insertion is a common process in many languages, and it usually serves as a strategy to resolve vowel hiatus. However, such a hypothesis will be defeated in Eegimaa by the unpredictable environment where the insertion occurs. If the presence of the glide at the beginning of the based was

[20] Refers to a temporary (seasonal) migration when a person leaves his / her place and move to another place to work.

due to an insertion process, we would have had a glide in (104i). The glide-zero alternation is therefore a consequence of deletion rather than insertion. Glide deletion does not feed vowel deletion, which means that the rule which deletes glides is ordered after the vowel deletion rule.

Sambou's claim that the 'disjunctive' phoneme originates from glides does not sit well with Sagna (2008) who demonstrates that in a dialect of Eegimaa known as Banjal and in Joola Fogny, other consonants are found between the two vowels in hiatus. Below are the data he provides in his disapproval of Sambou's claim.

(166) Comparison between Joola Eegimaa spoken in Essil and Banjal and Joola Fogny (Sagna 2008:77)

	G.E. Essil	G.E. Banjal	Jóola Fógny	Gloss
a.	ɛ.al	ɛ.**x**al	ɛ**x**aal	'to ripen'
b.	ɛ.a.βʊt	ɛ.**x**a.βʊt	N/A (ɛtafa)	'ant'
c.	fʊ.as	fʊ.as	fʊ**l**as	'broom'
d.	ɛ.ɪ.βa	ɛ.ɪ.βa	ɛ**l**ɪba	'knife'
e.	ɛ.a.lɔ	ɛ.a.lɔ	ka**w**alɔ	'to come down'
f.	ɛ.ɪ.lɔ	ɛ.ɪ.lɔ	ka**j**ɪtɔ	'to stand up'

The variety of Eegimaa spoken in Essil is very similar to most varieties spoken in other villages of Mof Avvi. Banjal is certainly the village with a more distinct accent. The difference between Banjal accent and the varieties spoken in the other villages is more salient both at the phonetic and lexical levels. Looking at the data in (105), we soon realize that the consonant [x] is not always present between the two adjacent vowels and in fact, vowel hiatus is very common in the variety of Eegimaa spoken in Banjal. The data does support Sagna's observation that in Joola Fogny various consonants are indeed found between the two vowels. Sambou's proposal to account for vowel-zero alternation, a process found in many Joola languages, is challenged by the existence of many counterexamples not just in Joola Banjal and Joola Fogny, but also in other Joola languages. For instance, in Joola Huluf the word for 'to weave' is *ka**h**ɛʃ* and in Gusilay, the word for 'to tell' or 'to say' is *ɛ**r**ɛɣ*. In Eegimaa, the corresponding words are, respectively, *gaɛʃ* and *ɛɛɣ*. The origin of the 'disjunctive' phoneme therefore needs to be investigated further.

I mentioned earlier that the reason why phonologists resort to abstract analysis is that such an analysis serves to account for certain phonological phenomena in the absence of a 'concrete' solution. It is in this perspective that we have to situate the 'disjunctive' phoneme approach. Now, a question worth asking is whether it is really necessary to postulate the existence of a disjunctive phoneme in order to account for the ban on tautosyllabicity and vowel-zero alternations in Eegimaa. The results of the experiment reported in §3.1.2 revealed that in Eegimaa, two vowels are not allowed within the same syllable, be these vowels identical or different. The two strategies used to ensure that two vowel segments do not surface in the same syllable are deletion and hiatus. Vowel deletion only occurs when a class marker is attached to a root beginning with a vowel and it is covered in §3.5.6. As discussed there, this deletion process is governed by a minor rule since in most cases, both vowels are maintained. Therefore, deletion can be viewed as resulting not from the absence of a 'disjunctive' phoneme, but from the presence of the diacritic feature

[+CM vowel deletion]. We have seen in (103) and (104) that glide deletion always results in a hiatus configuration between the vowel of the class marker and the vowel of the root. There too, we do not need to assume the presence of a disjunctive element in order to account for the lack of subsequent vowel deletion. The absence of vowel deletion can simply be attributed to the absence of the diacritic feature or to a rule ordering relation in which the rule responsible for vowel deletion is ordered before the glide deletion rule. Also, when a vowel-initial suffix is attached to a stem ending with a vowel, deletion does not occur and the vowels are always parsed into separate syllables. Based on all these cases of hiatus, it is fair to claim that in Eegimaa vowel deletion is not the basic trend. It is actually their maintenance which is required.

3.2 Consonants

3.2.1 Singleton consonants

The inventory of Eegimaa singleton consonants is provided in (106).

(167) Singleton consonants

	BILABIAL	LABIO-DENTAL	ALVEOLAR	PALATAL	VELAR	GLOTTAL
STOP	p b		t d	c ɟ	k g	ʔ
NASAL	m		n	ɲ	ŋ	
FRICATIVE		f				
APPROXIMANT	w			j		
TRILL						
LATERAL			l			

3.2.2 Eegimaa 'prenasalized' consonants

Previous studies of Eegimaa (Bassene2007, Tendeng 2007, and Sagna 2008) report the existence of 'prenasalized' consonants in this language. Indeed, the sequences nasal-voiced obstruents (NÇ̬s) are very common in Eegimaa and are actually the only types of nasal-obstruent sequences (NCs) allowed in this language (see chapter 5 for detail). In this section, I will argue that these are not prenasalized segments per se but, rather, a sequence of two segments. The approach to prenasalization adopted in this study is one which views prenasalized segments as unitary, meaning that they phonologically function as one segment and have the duration of a single segment (Herbert 1975). In the following discussion, I will show that what is often referred to as prenasalized consonants in Eegimaa are actually sequences of a nasal followed by a voiced homorganic obstruent. Until the status of these sounds is clearly established, the term prenasalized will always be put in quotation marks whenever it refers to Eegimaa NC sequences.

Phonetically, prenasalized consonants can be defined as sounds which have a dual articulation. They start out with a nasal articulation, with the velum lowered to form an oral closure, but during the release of the nasal, the velum is raised, therefore blocking the nasal cavity and this results in the production of a stop with a 'nasal kick off' (Armstrong 1940, cited by Hurbert 1986:7). These sounds have been the center of extensive investigation and one of the issues often raised is whether prenasalized stops should be considered as nasals or as obstruents. The nasal kick-off of these sounds may well legitimize an analysis in which they are viewed as having the features [+nasal, +sonorant] which are characteristic of nasal sounds.

However, the obstruent ending of prenasalized consonants also lead to analyzing them as [-sonorant]. The analysis of prenasalized consonants as obstruent nasals is attributed to McCawley (Chomsky and Halle 1968: 317). Ladefoged (1971) suggests that prenasalized consonants be viewed as having a special feature not present in both nasal and oral consonants. He proposes the feature [*prenasality*]. Prenasalized stops are therefore analyzed as [-nasal, -sonorant, +prenasality].

Another issue which has intrigued linguists as far as the treatment of prenasalized consonants is concerned is whether they should be treated as unitary segments or as sequences of two segments. Three criteria are often used to determine whether they should be classified as one segment. These are: (1) homorganicity of the two components, (2) their duration and (3) their ability to occur in syllable onset position (Herbert 1975). The first criterion requires the two components of the prenasalized consonant to be homorganic, the second that they have the durational equivalence of a simple consonant and the third criterion requires the whole prenasalized consonant to be able to function as an onset of a syllable. African languages, especially those in the Bantu branch, are well-known for exhibiting prenasalization. Eegimaa has four 'prenasalized' stops which are [mb], [nd], [ɲɟ] and [ŋg]. They occur in root initial, root medial as well as root final positions.

(168) Distribution of ‘prenasalized’ consonants

a. [mb]		b. [nd]	
[ga-mbas]	‘tail-flick’	[ba-ndaɸ]	‘flat side of a tool’
[s-ɛmbɛ]	‘strength’	[sʊ-gʊndax]	‘fruits of borassus flabellifer’
[ga-lamb-ɔl]	‘his/her side’	[ga-band-ɔl]	‘his/her shoulder’
b. [ɲɟ]		d. [ŋg]	
[fa-ɲɟa]	‘fight’	[ɛ-ŋgɔɲ]	‘hay’
[ɛ-fɛɲɟɛŋ]	type of stool	[ɛ-βaŋgal]	type of hat
[ɛ-faɲɟ-ɛn]	‘cause to bounce’	[fɪ-ʈɛŋg-ɔl]	‘his/her ‘fɪʈɛŋg’[21]’

In Eegimaa, like in many other languages, ‘prenasalized’ consonants contrast with both simple nasal consonants as well as oral stops.

(169) Contrast between ‘prenasalized’, nasal and oral consonants

a. /ɟɪ-mbas/	‘tail-flick (DIM)’	b. /ʊ-sɛn/	‘give’
/ɟɪ-bas/	type of dance	/ʊ-sɛnd/	‘sculps’
/ɟɪ-mas/	‘spit (N, DIM)’	/ʊ-sɛd/	‘spoons’
b. /ɛ-tɪɲ/	‘eat’	d. / ɛ-gag/	‘throttle’
/ɛ-tɪɲɟ/	‘cheat’	/ɛ-gaŋg/	‘weave a basket ring’
/etiɟ/	‘stop’	/ʊ-baŋgal/	type of hat
/etiɲɟ/	‘be disgusted’	/ʊ-baŋal/	‘let us keep’

[21] Type of fishing net.

I mentioned above the criteria often utilized in the discussion concerning whether prenasalized consonants should be treated as unitary segments or as sequences of segments. Eegimaa ‘prenasalized’ consonants pass the first criterion since the nasal component and the obstruent component are always homorganic. However, there is mounting evidence pointing toward a classification of these sounds as sequences of segments. The first piece of evidence comes from a comparison of the duration of these ‘prenasalized’ consonants and their nasal and stop components. An acoustic measurement of the duration of these three segments yielded the results shown in (109).

(170) Duration of ‘prenasalized’, nasal and stop consonants

ɟɪ-**m**as	74ms		ʊsɛ**n**ɪl	70.7ms
ɟɪ-**b**as	49.7ms		ʊsɛ**d**ɪl	43.9ms
ɟɪ-**mb**as	167.9ms		ʊsɛ**nd**ɪl	165.2ms

The results of the acoustic analysis show that the duration of a ‘prenasalized’ consonant is greater than that of a nasal and an obstruent combined. This is inconsistent with the second criterion.

Another piece of evidence has to do with the ability of ‘prenasalized’ consonants to occur syllable initially. In Eegimaa, the two components of a ‘prenasalized’ consonant are assigned to separate syllables. The language does not permit complex onsets and by assigning them to separate syllable, it clearly suggests that they are viewed as a sequence of segments instead of just one segment.

The third piece of evidence concerns their behavior in word final position. In Eegimaa, 'prenasalized' consonants are reduced to their nasal component in word final position (see §3.4.2). The deletion of the obstruent also suggests that the two components are considered as two separate segments.

3.2.3 Geminates

Except for the glottal stop, each of the consonants listed in (106) has a geminate counterpart. Most of these geminates are found in root initial position; voiceless stops are the only ones to occur both root-initially and root-finally. Below are minimal pairs showing the phonemic status of singleton and geminate segments.

(171) Singleton/germinate contrast

a. /p/ - /pp/

/ɛ-paŋ/	'shrine'	/ga-pɔk/	type of tree	/ɛ-tɔp/	'approach'
/ɛ-ppaŋ/	'fishing nat'	/ga-ppɔk/	'scoop of sand'	/ɛ-tɔpp/	'deafen

b. /b/ - /bb/

/ɛ-bif/	'ventilate'	/fʊ-baŋ/	'keeping'	/na-bɔɲ/	's/he sent'
/ɛ-bbif/	'bring bad luck'	/fʊ-bbaŋ/	'post'	/na-bbɔɲ/	's/he folded'

c. /t/ - /tt/

/ɛ-tas/	'untie'	/ɛ-tun/	'carry'	/ɛ-tal/	'spread'
/ɛ-ttas/	'rinse'	/ɛ-ttun/	'respond'	/ɛ-ttal/	'eat[22]'

[22] Eat just rice without sauce, fish, meat or anything.

d. /d/ - /dd/

/ba-daɟ/	‘porridge’
/ba-ddaɟ/	‘small nails’

e. /k/ - /kk/

/ba-kan/	type of drum	/ga-kɔɲ/	‘big whistle’	/bʊ-dɔk/	‘planting’
/ba-kkan/	‘contribution’	/ga-kkɔɲ/	‘pasture[23] (v)’	/bʊ-dɔkk/	‘work’

f. /g/ - /gg/

/ɛ-gɔl/	‘entangle’	/ɛ-gʊb/	‘reverse’	/ɛ-gan/	‘be skinny’
/ɛ-ggɔl/	‘fold’	/ɛ-ggʊb/	‘maize’	/ɛ-ggan/	‘tell’

g. /c/ - /cc/

/ɛ-cɔc/	‘cut (v)’	/ga-cac/	‘cut (n)’	/ga-cɪl/	‘vain’
/ɛ-ccɔc/	‘be mean’	/ga-ccac/	‘flank’	/ga-ccɪl/	‘fiber’

h. /ɟ/ - /ɟɟ/

/ɛ-ɟas/	‘be quick’	/ɛ-ɟɔnɛn/	‘be late at night’	/ga-ɟɛl/	‘insult’
/ɛ-ɟɟas/	‘detour (v)’	/ɛ-ɟɟɔnɛn/	‘fix’	/ga-ɟɟɛl/	‘piece of palm nut shell’

i. /m/ - /mm/

/ɛ-mat/	‘be present’	/ɛ-mɪl/	‘dash’	/ɟa-mɛŋ/	‘hare’
/ɛ-mmat/	‘walk slowly’	/ɛ-mmɪl/	‘trunk’	/ɟa-mmɛŋ/	‘crowd’

[23] Can also mean to ‘watch someone do something s/he is instructed to do’

j. /n/ - /nn/

/ɛ-nab/	'be correct'	/gʊ-nak/	'days'
/ɛ-nnab/	type of snake	/gʊ-nnak/	'they wait'

k. /ɲ/ - /ɲɲ/

/ ɛ-ɲɐb/	'play (a game)'	/ɛ-ɲɛk/	'be sharp'
/ ɛ-ɲɲɐb/	'elephant'	/ɛ-ɲɲɛk/	'spotted'

l. /ŋ/ - /ŋŋ/

/ɟɪ-ŋɛŋ/	'astound'	/ɟɪ-ŋam/	'small open area'
/ɟɪ-ŋŋɛŋ/	'small claw'	/ɟɪ-ŋŋam/	fishing technique

m. /f/ - /ff/

/ɛ-faŋ/	'surpass'	/ɛ-ful/	'straw'	/ɛ-fɔd/	'pick'
/ɛ-ffaŋ/	'lock'	/ɛ-fful/	'drag'	/ɛ-ffɔd/	'lose (voice)'

n. /s/ - /ss/

/ga-sal/	'prase'	/ɟɪ-sɪk/	' poison (dim)'	/ɛsɔt/	'leak'
/ga-ssal/	'sprout'	/ɟɪ-ssɪk/	'finger'	/ɛssɔt/	'hurt[24]'

o. /w/ - /ww/

/ɛ-waŋ/	'be hard'	/ɛ-wal/	'be ripe'
/ɛ-wwaŋ/	'curse'	/ɛ-wwal/	'stone'

[24] To cause pain to someone by touching his/her unhealed wound.

p. /j/ - /jj/

/ɛ-jil/ 'groan' /ɛ-jɪl/ 'grow (intrans)' /ɛ-jaŋ/ type of musical instrument

/ɛ-jjil/ 'spend a year away' /ɛ-jjɪl/ 'immerge' /ɛ-jjaŋ/ 'transparent'

q. /l/ - /ll/

/ɛ-lat/ 'refuse' /ɛ-luk/ 'put on one's garment' /gʊ-li/ 'they woke'

/ɛ-llat/ 'hang' /ɛ-lluk/ 'mud' /gʊ-lli/ type of fruit

In the previous section (§3.2.2), I argued that what is sometimes referred to in the previous studies of Eegimaa as 'prenasalized 'sounds should be considered NC clusters and I provided evidence supporting why they should be indeed viewed as sound sequences. Eegimaa geminates should also be analyzed as a sequence of two identical sounds. Supporting evidence comes not just from the duration of geminates in comparison to their singleton correspondents, but also from the way geminates pattern in the syllable structure. Word medial geminates are always assigned to separate syllables and degemination is a very common process (see §3.5.3.2.3 and chapter 4 for details)

3.3 Syllable structure

Eegimaa allows five types of syllables. These are listed in the table below.

(172) Eegimaa syllables

Syllables	Examples
V	ʊ 'bathe, oyster', ɔ 'him'
CV	tɪ 'shallow', lɔ 'fall'
VC	ɪf 'breathe', ʊn 'hear'
CVC	mul 'ripe', fɪr 'sour'
CVCC	rɔkk 'bounce', tɔpp 'deafen'

Research in syllable theory has revealed that the core syllable type found in all languages is CV (Jakobson 1962, Cairns and Feinstein 1982, Clements and Keyser 1983, Carlisle 2001). However, languages have their specific requirements for permissible syllables. Some languages ban vowel-initial syllables (Jakobson 1962, Clements and Keyser 1983). The requirement here is that every syllable must begin with a consonant, i.e. every syllable must have an onset[25]. Other languages disallow syllables ending in consonants or codas (Jakobson 1962, Clements and Keyser 1983). Even for languages which permit both onsets and codas, they do restrict the number of consonants which can occur in these positions. Eegimaa allows both onsetless syllables as well as syllables with codas. However, there are principles governing the type of consonants which can occur in coda position. Any singleton consonant can occur in a word-final coda. Germinates consisting of voiceless stops

[25] See chapter 4, §4.6.3.2 for a discussion of the Onset-Rhyme Theory.

are also found in that position. As for word-medial codas, there are two restrictions. A word-medial coda must be either a nasal consonant which is place-linked to the following voiced obstruent onset or any singleton consonant identical to the following onset. Complex segments such as prenasalized consonants and geminates are therefore simplified in word-medial coda and such a simplification is followed by assimilation to the following onset. If the following syllable begins with a vowel, in that case the complex segment is maintained but parsed into a coda and an onset. This is illustrated in (112).

(173) Reduction of complex segments in word-medial coda

a.	/a-famb-ʊt/	→	a.fam.bʊƫ	's/he did not make noise'
b.	/na-RED-famb/	→	na.faf.fam	's/he made noise'
c.	/na-tɔpp-ɔl/	→	na.ƫɔp.pɔl	's/he deafened him/her'
d.	/na-RED-tɔpp/	→	na.ƫɔt.tɔpp	's/he deafened'

We saw that prenasalized consonants and geminates underlyingly occur root initially. However, the components of these segments are always parsed into separate syllables since Eegimaa does not allow complex onsets.

(174) Parsing of root-initial complex segments

a.	/ɛ-bbat/	→	ɛb.baƫ	'swear'
b.	/ɛ-ffaŋ/	→	ɛf.faŋ	'lock'
c.	/ʊ-mmag/	→	ʊm.maɣ	'debts'
d.	/sɪ-ndɛ/	→	sɪn.dɛ	'stuff'
e.	/ga-mbas/	→	gam.bas	'tail-flick'

3.4 Allophonic Processes

This section surveys some of the realizations of Eegimaa phonemes, and one of the most characteristic allophonic processes in this language is that where stops are realized as continuants in a certain environment, a process known as spirantization.

3.4.1 Spirantization

In Eegimaa, stops are spirantized when they follow a vowel. The data in (114) provides illustration.

(175) Sample cases of spirantization

a.	[pɛ]	'all'	[ɛɸɪƫ]	'harvest'	[ɛlɪɸ]	'search'
	[puddum]	'adder'	[gaɸɔr]	'dust'	[eccoɸ]	'mouse'
	[paɸʊrʊ]	'roughly'	[uɸiβ]	'shout'	[fittɛɸ]	'wall'
b.	[bʊʊl]	'face'	[gaβaŋ]	'leather'	[ɛlaβ]	'boil'
	[bɪllɛf]	'nest'	[biβil]	'cotton'	[ɛlɔβ]	'speak'
	[bakkan]	'contribution'	[eβif]	'fan (v)'	[galʊβ]	'rain/raining'
c.	[tɔɔn]	'next year'	[bʊƫʊm]	'mouth'	[siːƫ]	'palm nuts'
	[taʊtɛ]	'here'	[ɛƫar]	'advise'	[ɛƫʊƫ]	'middle'
	[tɪnax]	'time'	[eƫi]	'wipe'	[ɛɟɟɔƫ]	'touch'

d. [do] ‘there’ [fɪrɪm] ‘voice’ [ɛfɔr] ‘pick’

[dɐure] ‘here’ [erus] ‘wind’ [fullur] ‘ant-hill’

[dei] ‘where’ [bʊra] ‘bed’ [erir] ‘be complete’

e. [cab] ‘quick’ [eʃiʈ] ‘start’ [ɟɪxɪʃ] ‘meeting’

[baʃaf] ‘warning’ [ɛmmɔʃ] ‘darkness’

[ɛrʊʃɛn] ‘exaggerate’ [ɟɪɣɛʃ] ‘mock’

f. [ɟaaj] ‘mother’ [mʊʝax] ‘intelligence’ [fʊjɔʝ] ‘meeting’

[ɟɔɔn] ‘nothing’ [bɐʝur] ‘girl’ [ɛffɪʝ] ‘light (v)’

[ɟʊɔl] ‘fish’ [fiʝeŋ] ‘stem’ [ɛxaʝ] ‘animal’

g. [kɔnɔʝ] ‘type of vulture’ [baxʊ] ‘dirtiness’ [etux] ‘hold’

[ɛxam] ‘chase’ [ɛbɔx] ‘dance’

[sʊxɔɲ] ‘whistles’ [ɛɟɟɪx] ‘limp’

h. [gamɔn] ‘dew’ [fɪɣɛn] ‘yesterday’ [gɐriɣ] ‘quarrel’

[gɔ] ‘it’ [bɐɣun] ‘idiot’ [ɛɣɔɣ] ‘be tight’

[gʊβɔŋ] ‘thighs’ [bʊɣan] ‘people’ [emmaɣ] ‘borrow’

The rule which changes stops into spirants is provided in (115).

(176) Spirantization rule

[-son, -cont] → [+cont] / [+syll, -cons]_______

Another common allophonic process concerns the simplification of prenasalized sounds.

3.4.2 Segment reduction

In word final position, prenasalized sounds are reduced to their nasal components. In (116), the stop component of the prenasalized sound is maintained in all positions but final.

(177) Sample cases of segment reduction

a.	/ɛ-sʊmb/	→	ɛsʊm	‘snuff tabacco’
b.	/ɛ-sʊmba/	→	ɛsʊmba	‘tobacco’
c.	/ɛ-rend/	→	eren	‘float’
d.	/ɛ-rend-en/	→	erenden	‘make float’
e.	/ga-ndak-ɔr/	→	gandakɔr[26]	‘harvest’
f.	/ɛ-faɲɟ/	→	ɛfaɲ	‘bounce (intrans)’
g.	/ɛ-faɲɟ-ɛn/	→	ɛfaɲɟɛn	‘cause to bounce’
h.	/ɛ-wɔŋg/	→	ɛɔŋ	‘offer (v)’
i.	/na-wɔŋg-ɔl/	→	naɔŋgɔl	‘s/he offered her/him’

[26] When the term *gandakɔr* is used instead of the generic term *εφιɫ*, the implicature is that the crop yield is extremely low.

The alternation NC ~ N displayed in (116) above can be accounted for by positing a rule which deletes the C element in final position. This rule is stated in (117).

(178) Reduction of prenasalized sounds

[-nas, -son, +prenas] → [+nas] / ____]

The context where a phoneme occurs often affects the way it is pronounced. In this section, we have seen that stops are realized differently depending on whether they occur at the beginning of a word or elsewhere, and whether they are preceded by a vowel or a consonant. We have also seen that the realization of prenasalized segments is also affected by the position where they occur. In Eegimaa, sounds changes are even more prominent at morpheme boundaries and what follows is a discussion of some of the most common sound changes which occur when morphemes are combined.

3.5 Morphophonological processes

3.5.1 Stem final voicing

In Eegimaa, the sounds [x] and [ɣ] often alternate in stem final position. Let us take a look at the data in (118).

(179) [x] ~ [ɣ] alternation

a.	[eβux]	'be soft'	[eβuɣen]	'to soften'
b.	[ɛɸʊx]	'invite'	[ʊɸʊɣɔl]	'invite him/her'
c.	[ɛβɔx]	'dance'	[aβɔɣʊt̞]	's/he did not dance'

d.	[fɪttɪx]	'war'	[ʊttɪɣa]	'warriors'
e.	[eccix]	'shave (trans.)'	[ecciɣo]	'shave'
f.	[baȶɛx]	'contribution'	[aȶɛɣʊȶ]	's/he did not contribute'
g.	[ʊxax]	'feet'	[ʊxaɣɪl]	'their feet'

The allophonic status of the sounds [x] and [ɣ] has already been established in §3.4 and there, it has been shown that they are spirantized versions of [k] and [g], respectively. The alternation between [x] and [ɣ], as displayed in the data above, brings into focus two competing hypotheses. The first hypothesis is that the voiceless velar is voiced when it occurs between vowels while the second hypothesis posits a devoicing process which changes the voiced velar to its voiceless counterpart in word final position. The rules for both processes are given in (119) and (120).

(180) Velar voicing

[+dor, -cor] → [+voi] / [+syll]___[+syll]

(181) Velar devoicing

[+dor, -cor] → [-voi] /______]$_{wd}$

Let us observe both hypotheses closely to see if either of them accounts for the alternation process. The hypothesis which states that it is the voiceless velar which is voiced intervocalically seems to work since in all cases, there is some voicing going on and it does take place when the voiceless velar occurs between vowels. For instance in (118a-f), the final [x] changes to [ɣ] when a suffix beginning with a vowel is added. However, (118g) looks challenging for this hypothesis in the sense that the first [x] occurs between [ʊ] and [a] without there being any voicing. Actually, in Eegimaa, the sound [x] is very common intervocalically and additional cases are provided in (121).

(182) Intervocalic [x]

a. [fʊxɔw] 'head'

b. [ɛxam] 'chase'

c. [muxum] 'honey'

d. [ɛxɪʃ] 'write'

e. [ɛxɔndɔr] 'neck'

f. [ɛxʊlɔl] 'chicken'

If the first hypothesis was correct, the words above would have surfaced with the voiced velar fricative instead of the voiceless velar fricative. The voicing rule in (119) therefore applies inconsistently within the same language and this is a problem. The quality of the vowels surrounding the sound [x] does not seem relevant to the application of this rule in the sense that in (118f) and (121f), [x] occurs in exactly the same phonetic context and yet, in (118f), voicing occurs, whereas in (121f) it does not. In each language, words are assessed by the same set of phonological rules. Now, a rule may fail to apply because the context suitable for its application has been erased due to the application of another rule; a phenomenon known as *bleeding*. However, in the data in (121), there are no rules which could have blocked the voicing process. Therefore, a different approach is needed to account for the [x] ~ [ɣ] alternation.

The second hypothesis which posits that the alternation is due to the effect of a rule which devoices the sound [ɣ] in word final position is also problematic because in Eegimaa, [ɣ] does occur in final position. The data in (114h) provides instances of words ending in [ɣ] and below are supplementary cases.

(183) Additional words ending in [ɣ]

a. [ɛxɔɣ] 'be narrow, make a lot of noise'

b. [ɛrɛɣ] 'be tired, defeat'

c. [ɛmmɪɣ] 'be tight'

d. [exɐɣ] 'lean'

e. [ɛɣaɣ] 'throttle'

f. [gummɐɣ] 'borrowing'

The existence of cases such as the above also suggests that we need to explore a third approach to account for the [x] ~ [ɣ] alternation. Devoicing is obviously not what is driving the alternation; otherwise in (122) the devoicing rule would have converted the [ɣ] to [x]. The data we have analyzed do not support either of the two hypotheses put forward to account for the alternation. Now, let us revisit our first hypothesis which posits a voicing process which takes place when [x] occurs between vowels. A morphological segmentation of the data in (118), repeated below as (123), shows that the alternation only occurs when a suffix beginning with a vowel is added to the stem.

(184) [x] ~ [ɣ] alternation: a morpheme division

a.	[e-βux]	'be soft'	[e-βuɣ-en]	'to soften'
b.	[ɛ-ɸʊx]	'invite'	[ʊ-ɸʊɣ-ɔl]	'invite him/her'
c.	[ɛ-βɔx]	'dance'	[a-βɔɣ-ʊt]	's/he did not dance'
d.	[fɪ-ttɪx]	'war'	[ʊ-ttɪɣ-a]	'warriors'
e.	[e-ccix]	'shave (trans.)'	[e-cciɣ-o]	'shave'
f.	[ba-ȶɛx]	'contribution'	[a-ȶɛɣ-ʊȶ]	's/he did not contribute'
g.	[ʊ-xax]	'feet'	[ʊ-xaɣ-ɪl]	'their feet'

In (123g) the root begins and ends with [x]. The attachment of the class marker does not change the voicing status of the first [x] but when a suffix is added, the final [x] changes to [ɣ]. As mentioned earlier, the quality of the vowels involved does not come into play here. Actually what we have is a voicing process that is sensitive to the stem edge. The rule which converts [x] to [ɣ] is provided in (124).

(185) Final velar voicing

[+dor, -cor] → [+voi] /___]$_{stem}$ [+syll, -cons]

Phonological rules such as (124) are referred to as *context-sensitive* in the sense that they only apply in specific contexts. In Eegimaa, the voicing process only occurs at the stem edge and the problem with the first hypothesis is that it does not take into account the context sensitivity of this process and therefore some of its predictions are inaccurate.

The stem-final alternation between [x] ~ [ɣ] results in a neutralization process between the phonemes /k/ and /g/ since both are realized as [ɣ] when a suffix beginning with a vowel is added.

(186) /k/ - /g/ neutralization

a.	/gɐrik/	→	[gɐrix]	'type of winnowing basket'
	/gɐrig/	→	[gɐriɣ]	'quarrel'
b.	/ɛxɔk/	→	[ɛxɔx]	'attach, bundle'
	/ɛxɔg/	→	[ɛxɔɣ]	'be close, be noisy'
c.	/gɐrik-ɔl/	→	[gɐriɣol]	'his/her type of winnowing basket'
	/gɐrig-ɔl/	→	[gɐriɣol]	'his/her quarrel'
d.	/naxɔk-ɛ/	→	[naxɔɣɛ]	's/he attached'
	/naxɔg-ɛ/	→	[naxɔɣɛ]	's/he is close / noisy'

The contrast observed in (125a) and (125b) has been neutralized in (125c) and (125d) and the minimal pairs have becomes homonymous.

The final voicing alternation found in Eegimaa has also been reported in many languages. Blench (2006a, b) notes such a process in Eastern Berom, a variety of Berom language spoken in central Nigeria. In the data in (126), the sounds [p] and [k] become voiced when a suffix is added.

(187) Voicing alternation in Eastern Berom

a.	do**p**	dó**b**ós	'join two ends'
b.	kwo**p**	kwo**b**os	'grow old'
c.	ro**p**	ro**b**os	'rain'
d.	ka**k**	ka**g**as	'crucify'
e.	lɔ**k**	lɔ**g**ɔs	'build'
f.	su**k**	su**g**us	'stir'
g.	pas	bapas	'new'

In Eastern Berom, just like in Eegimaa, prefixation does not have any voicing effect on the stem initial consonant. This can be seen in (126g) where the attachment of the concord marker *ba-*, although it results in the sound [p] being in a context favorable for voicing since it occurs between two voiced sounds, it does not change the laryngeal feature of this sound. However, suffixation does affect the laryngeal feature of [p] and [k] and this suggests that the voicing rule in this language is sensitive to the final edge of the word.

Luo, a Nilotic language spoken in Kenya, presents a fascinating and a much debated case of final voicing alternation. This language has often been cited as a clear case of morphophonemic polarity in which the addition of a suffix beginning with a vowel reverses the voicing specification of the root final consonant and below are some of the data often provided in the discussions.

(188) Final voicing alternation in Luo (Tucker 1994)

	Singular	Plural	Gloss
a.	ala**p**	ælæ**b**e	'open space'
b.	gɔ**t**	gɔ**d**ɛ	'hill'
c.	agɔ**k**ɔ	agɔ**g**ɛ	'chest'
d.	kitæ**b**u	kite**p**e	'book'
e.	kɛ**d**ɛ	kɛ**t**ɛ	'twig'
f.	hɪ**g**a	hi**k**e	'year'

The data seems to exhibit an instance of voicing polarity with the final consonant of the singular form changing its voicing specification when the plural marker is added. This has been the stand taken by many linguists who have worked on this language. However, as Bye (2006), Trommer (2008) and de Lacy (2010) suggest, the voicing polarity argument deserves minute scrutiny in the sense that this claim is incompatible with the fact that in this language, underlying root final voiceless stops do not undergo voicing changes. The data in (128) show no voicing reversal.

(189) [voice] preservation in Luo plural forms (Trommer 2006)

	UR	Plural	Gloss
a.	/cu**p**æ/	cu**p**e	'bottle'
b.	/i**p**/	i**p**e	'tail'
c.	/ɔt̪i**t̪**ɔ/	ɔt̪i**t̪**ɛ	'small thing'
d.	/bat̪/	be**t̪**e	'side'

e.	/ɔkɔ**c**ɔ/	ɔkɔ**c**ɛ	‘neck rest of sisal trunk’
f.	/la**c**/	læ**c**e	‘urine’
g.	/osi**k**i/	osi**k**e	‘stump’
h.	/la**k**/	le**k**e	‘tooth’

The data in (128) obviously challenge the polarity hypothesis and suggest that the voicing alternation in this language needs to be rethought. Indeed, this alternation is not due to a systematic process whereby [αvoice] becomes [-αvoice]. In Luo, stops are devoiced when they occur in root final position. The attachment of the plural marker therefore allows the underlying voicing specification to surface faithfully. When the root ends with a vowel, the preceding consonant keeps its voicing status in the plural form if it is a voiceless consonant. If it is voiced, it becomes voiceless when the plural marker is added. The data in
(127) are represented below as (129) showing the underlying form of each word and how it is realized in both singular and plural.

(190) Final voicing alternation in Luo

	UR	Singular	Plural	Gloss
a.	/ala**b**/	ala**p**	ælæ**b**e	‘open space’
b.	/gɔ**d**/	gɔ**t**	gɔ**d**ɛ	‘hill’
c.	/agɔ**k**ɔ/	agɔ**k**ɔ	agɔ**g**ɛ	‘chest’
d.	/kitæ**b**u/	kitæ**b**u	kite**p**e	‘book’
e.	/kɛ**d**ɛ/	kɛ**d**ɛ	kɛ**t**ɛ	‘twig’
f.	/hɪ**g**a/	hɪ**g**a	hi**k**e	‘year’

The underlying voicing specification of the root final stop is maintained in the plural forms in (129a) and (129b) but altered in the rest of the data. In (129c), the underlying voiceless velar stop becomes voiced when the plural suffix is added and this stands in direct contradiction with the pattern which immerges from the data in (128). However, it should be noted that the word *agɔ**k**ɔ* has two plural alternates which are *agɔ**g**ɛ* and *agɔ**k**ɛ* (Trommer 2008). Words such as these cannot serve as compelling evidence for voicing polarity. For the proponents of this hypothesis to dispel the suspicion surrounding their proposed accounts of Luo voicing alternation, they need to come up with an explanation as to why in so many words, in fact in most words, the final consonant of the root keeps its underlying voiceless feature when the plural form is added and also provide enough cases of native[27] Luo words which unequivocally and systematically turn root final voiceless stops into voiced stops. Luo does, however, have a reversal rule which changes the rightmost voiced stop of a root ending with a vowel into a voiceless stop (see de Lacy 2010 for further discussion).

The voicing alternation noted in Luo and in Eastern Berom provides further support to the case I am making about Eegimaa voicing alternation since in all three cases, the rules responsible for such an alternation are only sensitive to the rightmost consonant of the stem.

[27] The data often provided in support of the voicing of underlying voiceless stops includes English loanwords such as koti 'coat' and ongeti 'blanket' in which the attachment of the plural marker causes the final consonant to be voiced (kodi and ongeti respectively) (Okoth-Okombo 1982). The reason why it is important to use native Luo data is that loanwords sometimes differ phonologically from native words and a hypothesis of this magnitude should be given impetus by data exclusively native to the language.

3.5.2 Lateralization

Another alternation found in Eegimaa is that between [ȶ] and [l]. This alternation also occurs stem finally, as shown in (130).

(191) [ȶ] ~ [l] alternation

a.	[ɛfʊȶ]	‘cover’	[ɛfʊlɔr]	‘cover oneself’
b.	[bulɐȶ]	‘hatred’	[bulɐlor]	‘hate one another’
c.	[ɛssɔȶ]	‘hurt’	[ɛssɔla]	‘wound’
d.	[ɛɸɪȶ]	‘harvest’	[naɸɪlɛ]	‘s/he has harvested’
e.	[gafaȶ]	‘fence’	[gafalɔm]	‘my fence’
f.	[fʊxat]	‘big bull’	[fʊxalɔm]	‘my big bull’
g.	[buxuȶ]	‘initiation’	[buxulil]	‘their initiation’

Here too, we have two competing hypotheses. One hypothesis is that the alternation is caused by a delateralization rule which turns underlying /l/ into [ȶ] in stem final position. According to this hypothesis, the attachment of a suffix allows the lateral to surface without any changes.

(192) Delateralization rule

[+cor, +lat] → [-lat, -voi, -strid] / $\_\_\_\_\_\_]_{stem}$

The delateralization rule does not work, considering the frequency of [l] in stem final position. (132) provides sample instances of words ending in [l].

(193) Sample words ending in [l]

a. [ɛʈɪl] ‘be wrong’

b. [bibil] ‘cotton’

c. [gɐʈul] ‘cloud’

d. [balɔl] ‘termites’

e. [gaɟɛl] ‘insult’

f. [mal] ‘water’

g. [ebɐl] ‘respond’

An alternative hypothesis posits a lateralization process taking place at the right edge of the stem and according to this hypothesis, this process is triggered by the addition of a suffix beginning with a vowel. The rule responsible for this process is provided in (133).

(194) Lateralization rule

[+cor, -voi, -strid] → [+lat] / ____]$_{\text{stem}}$ [+syll, -cons]

This rule is also sensitive to the rightmost edge of the stem and it seems to work. At least it perfectly accounts for the alternation displayed by the data in (130). Let us test it with further data.

(195) [ʈ] ~ [l] alternation: supplementary data

a.	[ɛxɔʈ]	‘hide (INTRANS)’	[ɛxɔlɛn]	‘hide (TRANS)’
b.	[buɣuʈ]	‘carry on the back’	[buɣulo]	‘be carried on the back’

c.	[ɛxaƫ]	‘leave, stop’	[ɛxalɔ][28]	‘remain somewhere’
d.	[gabbʊƫ]	‘fishing line’	[gabbʊlɪ]	‘your fishing line’
e.	[bɪƫɪƫ]	‘exchange’	[bɪƫɪlɔr][29]	‘type of exchange’
f.	[gɐsomuƫ]	‘illness’	[gɐsomulil]	‘their illness’
g.	[ɛʃɛƫ]	‘death’	[ɛʃɛlɔl]	‘his/her death’

These data also illustrate the rule in (133), thereby providing further support to the hypothesis that in Eegimaa, a stem final underlying /t/ becomes a lateral before a vowel. This alternation also results in a neutralization of /t/ and /l/ in the sense that the addition of a suffix creates a context only favorable for [l] and both phonemes are therefore realized as [l]. This neutralization process is illustrated in the following data.

(196) /t/ - /l/ neutralization

a.	[gafaƫ]	‘fence’	[gafalɔm]	‘my fence’
	[gafal][30]	‘hair’	[gafalɔm]	‘my hair’
b.	[gaaƫ]	‘foot’	[gaalɪ]	‘your foot’
	[gaal]	‘furrow’	[gaalɪ]	‘your furrow’
c.	[gʊɔƫ]	‘feet’	[gʊɔlɪ]	‘your feet’
	[gʊɔl]	‘in-laws’	[gʊɔlɪ]	‘your in-laws’

[28] Literally, the word means ‘to leave oneself somewhere’
[29] This word refers to a type of exchange whereby a man cultivates for a woman and in return, the woman sows or harvests for him.
[30] *gafal* refers to hair which grows in the body and also to the fur. The hair which grows in the head is called *wal*.

d. [nɐiȶ] ‘s/he flew’ [nɐilene] ‘s/he had flew’

[nɐil] ‘s/he moaned’ [nɐilene] ‘s/he had moaned’

3.5.3 Reduplication

Reduplication is an important source of sound changes and two types of reduplication are found in Eegimaa.

3.5.3.1 Complete reduplication

It occurs when the base ends with a vowel. It is referred to as *complete* since the entire base is copied without any changes. Below are examples. The reduplicant is referred to as RED and it is underlined in the forms in the right column.

(197) Sample cases of complete reduplication

a.	/RED-de/	→	re.re	‘(it) fits’
b.	/RED-dɐli/	→	rɐ.li.rɐ.li	‘it is far’
c.	/ɛ-RED-kʊ/	→	ɛ.xʊ.xʊ	‘it is dirty’
d.	/na-RED-ɟu/	→	nɐ.ʝu.ʝu	‘s/he is capable of’
e.	/na-RED-fa/	→	na.fa.fa	‘s/he continued’
f.	/na-RED-ɟʊgɔ/	→	na.ʝʊ.ɤɔ.ʝʊ.ɤɔ	‘s/he is beautiful’
g.	/ni-RED-sudo/	→	ni.su.ro.su.ro	‘I burned myself’

As can be seen in each of the examples above, the base is copied without any modification. However, in another form of reduplication termed *partial* or *incomplete*, the copy, and sometimes the base, undergoes various types or sound changes.

3.5.3.2 Partial reduplication

Partial reduplication mainly occurs when the base ends with a consonant. The final consonant of the base undergoes various types of changes among which are deletion and assimilation.

3.5.3.2.1 Consonant deletion

Voiceless consonants in the base final coda are deleted in the reduplicant. This is illustrated by the words in (137).

(198) Deletion of voiceless consonants

a.	/na-RED-tas/	→	na.<u>ƫa</u>.ƫas	's/he detached'
b.	/nɪ-RED-kɪc/	→	nɪ.<u>xɪ</u>.xɪʃ	'I wrote'
c.	/gʊ-RED-pɪt/	→	gʊ.<u>ɸɪ</u>.ɸɪƫ	'they harvested'
d.	/gʊ-RED-rɪf/	→	gʊ.<u>rɪ</u>.rɪf	'they challenged'
e.	/na-RED-rop/	→	nɐ.<u>ro</u>.roɸ	's/he stepped back'
f.	/nɪ-RED-bɔk/	→	nɪ.<u>βɔ</u>.βɔx	'I danced'
g.	/gʊ-RED-ɟʊk/	→	gʊ.<u>ʝʊ</u>.ʝʊx	'they saw'

The rule responsible for the deletion process is also sensitive to the final edge of the reduplicant and is formulated as shown in (138).

(199) Consonant deletion rule

$[\text{-voi}] \rightarrow \varnothing \,/\, \underline{\hspace{2em}}]_{\text{RED}}$

This rule predicts a systematic deletion of voiceless consonants in the reduplicant coda. The implication is that the deletion process in not motivated by the first segment of the base since in Eegimaa, voiceless consonants are deleted in the reduplicant coda regardless of whether the base begins with a consonant or vowel. In (137), the base begins with a consonant and this may suggest that the deletion is triggered by the onset of the base. However, in (139), the base begins with a vowel and yet, deletion occurs.

(200) Supplementary cases of voiceless consonant deletion

a. /e-RED-it/	→	e.<u>i</u>.iƫ	‘it flew’
b. /nɪ-RED-ap/	→	nɪ.<u>a</u>.aɸ	‘I forged’
c. /nʊ-RED-ɪf/	→	nʊ.<u>ɪ</u>.ɪf	‘you breathed’
d. /na-RED-ɛc/	→	na.<u>ɛ</u>.ɛʃ	‘s/he plated’
e. /na-RED-ʊs/	→	na.<u>ʊ</u>.ʊs	‘s/he is swift’
f. /gʊ-RED-ɔt/	→	gʊ.<u>ɔ</u>.ɔƫ	‘they returned home’
g. /gʊ-RED-ak/	→	gʊ.<u>a</u>.ax	‘they plucked / weeded’

From the data (139), it becomes clear that Eegimaa does have a restriction on the type of consonants that can occur in the reduplicant coda and that voiceless consonants are obviously not allowed in that position.

Languages have traditionally been classified as *stress-timed*, *syllable-timed* or *mora-timed* (Pike 1945). In some languages (e.g. Dutch, English, and German), stress is the timing unit, meaning that the amount of time required to produce two consecutive stressed syllables is roughly the same. Such languages are referred to as stress-timed languages. Other languages use the syllable as a timing unit. In these languages, syllables within a word are produced with approximatively the same duration. These languages are referred to as syllable-timed. French and Spanish are among the languages often cited as examples of syllable-timed languages. In languages such as Luganda, a Bantu language spoken in Uganda, and Japanese, it is the mora which serves as a unit of timing. In these languages, syllables are viewed in terms of how many moras they contain. The different moras within a syllable are produced with the same amount of time.

The concept of mora has been appealing in phonology. Many phonological processes have been argued to be driven by the moraic specification of sounds. In Eegimaa, the mora plays a crucial role in the reduplication process. I will argue that non moraic sounds are dropped in the reduplicant coda, whereas moraic sounds are retained. The next chapter provides a detailed account of the moraic status of Eegimaa segments, the phonetic correlation of the mora and its effect on the reduplication process. For now, let us assume that the deletion of voiceless singleton consonants is due to the fact that these sounds do not bear moras.

Voiceless singleton obstruents are not the only consonants to elide in the reduplicant coda. Glides are also deleted in this position.

(201) Glide deletion

a.	/nɪ-RED-daw/	→	nɪ.ra.raw	‘s/he stretched’
b.	/nɪ-RED-law/	→	nɪ.la.law	‘s/he requested’
c.	/nʊ-RED-ɟɔw/	→	nʊ.ʝɔ.ʝɔw	‘s/he went’
d.	/ɛ-red-kɛw/	→	ɛ.xɛ.xɛw	‘it hatched’
e.	/na-RED-kɔj/	→	na.xɔ.xɔj	‘s/he recovered’
f.	/na-RED-buj/	→	na.βu.βuj	‘s/he restarted’
g.	/gʊ-RED-gʊj/	→	gʊ.ɣʊ.ɣʊj	‘they are a few’

It should be noted that in Eegimaa, final glides behave like vowels and form diphthongs with the preceding vowels. The deletion is motivated by the fact that tautosyllabic vowel sequences are not allowed in this language. There is one moraic slot which is occupied by the first component of the diphthong, the vowel, and therefore the glide is deleted. The claim I am making here is that Eegimaa does not allow branching moras.

The rule in (138) only accounts for the deletion of voiceless consonants in the reduplicant coda. We need a more general rule which requires the deletion of any nonmoraic segment in that position and such a rule is provided in (141).

(202) Deletion of nonmoraic segments

$[-\mu] \rightarrow \emptyset \ / \ \_\_\_]_{\mathrm{RED}}$

This rule also implies the maintenance of moraic consonants in the reduplicant coda. Indeed, in Eegimaa, voiced obstruents and liquids are moraic and they are retained in the reduplicant coda. However, they undergo assimilation.

3.5.3.2.2 Consonant assimilation

Consonant assimilation is another process commonly found in Eegimaa reduplication. When the final coda of the base is a voiced obstruent or a liquid, it is retained in the reduplicant. However, it assimilates completely to the following singleton onset.

(203) Complete assimilation

e.	/ɛ-RED-lʊb/	→	ɛ.lʊl.lʊβ	‘it rained’
f.	/nʊ-RED-cɔb/	→	na.ʃɔc.cɔβ	‘s/he chose’
g.	/na-RED-dɛg/	→	na.rɛd.dɛɣ	‘s/he is annoying’
h.	/na-RED-gal/	→	na.ɣag.gal	‘s/he is bad’
i.	/gʊ-RED-tɔɟ/	→	gʊ.ȶɔt.tɔʝ	‘they closed’
j.	/gʊ-RED-mɔɟ/	→	nɪ.mɔm.mɔʝ	‘they dived’
k.	/gʊ-RED-fid/	→	gʊ.fif.fir	‘they refused’

The data in (142) illustrate a process of complete assimilation of voiced obstruents and liquids. Although these are mora-bearing sounds, they cannot occur in the reduplicant coda with all their underlying features since this would violate the requirement of the coda condition. The assimilation process is therefore motivated by the coda condition which requires a word-medial coda to be either a consonant identical to the following onset or a nasal which shares the same place of articulation with the following voiced obstruent onset. The assimilation rule is stated as shown in (143).

(204) Assimilation of voiced obstruents and liquids

$[\mu, \text{-syll}, \text{-nas}] \rightarrow [\{\text{-syll}\}_1] \ / \ \underline{\quad\quad}]_{\text{RED}} \ [\{\text{-syll}\}_1]$

Nasals are also moraic but they undergo various assimilation processes depending on whether the following consonant is voiced, voiceless or an approximant. So they require different assimilation rules and that explains why they are excluded in the formulation of the rule above. A brief description of Eegimaa nasal assimilation is given in § 3.5.4 and a detailed description of this process is provided in chapter 5.

It should be noted that complete assimilation of obstruents and liquids in the reduplicant coda only occurs when the base begins with a singleton. When the initial consonant of the base is a geminate, any consonant in the reduplicant coda is deleted. In the data below, both voiced obstruents and liquids are deleted.

(205) Consonants deletion before geminates

a.	/nɪ-RED-ppɪl/	→	nɪp.pɪp.pɪl	'I made way'
b.	/nɪ-RED-nnal/	→	nɪn.nan.nal	'I mashed'
c.	/nɪ-RED-kkɪb/	→	nɪk.kɪk.kɪβ[31]	'I measured'
d.	/gʊ-red-ggɪb/	→	gʊg.gɪg.gɪβ	'they are greedy'
e.	/gʊ-RED-ttɛd/	→	gʊt.tɛt.tɛr	'they crawled'

[31] *ɛkkɪβ* is only used when it comes to measuring the quantity of rice you need for cooking. Outside this context, it is the word *ɛllɪx* which is used for whatever is being measured.

f. /na-RED-bbud/ → nab.bub.bur ‘s/he lost’

g. /na-RED-mmag/ → nam.mam.maɣ ‘s/he borrowed’

In Eegimaa, Consonant clusters are restricted to a CC configuration whereby the two elements are either identical or consist of nasal and its homorganic voiced obstruent. In each of the words in (144), a total assimilation of the reduplicant coda would yield three consecutive identical consonants and this is beyond the permissible consonant sequencing in this language. The deletion process is therefore due to the limitation on possible consonant clusters. As it will be shown in chapter 4 and chapter 5, the deletion of a moraic consonant before a geminate does not lead to the deletion of the mora itself. The first consonant of the geminate becomes the new host of the mora.

3.5.3.2.3 Degemination

Sometimes, the deletion of the reduplicant coda has repercussions on the following geminate. In (145), the deletion of a voiceless obstruent or a glide in the reduplicant coda results in the following geminate becoming a singleton; a process known as *degemination*.

(206) Deletion followed by degemination

a. /nɪ-RED-llɪk/ → nɪl.lɪ.lɪx ‘I tried / measured’

b. /nɪ-RED-llat/ → nɪl.la.laƫ ‘I hung’

c. /gʊ-RED-ttɛp/ → gʊt.tɛ.ƫɛɸ ‘they built’

d. /nʊ-RED-ffus/ → nuf.fu.fus ‘you went (there)’

e. /gʊ-RED-kkɪc/ → gʊk.kɪ.xɪʃ ‘they marked’

f.	/na-RED-ppus/	→	nɐ<u>p.pu</u>.ɸus	‘s/he spat’
g.	/nʊ-RED-ssaw/	→	nʊ<u>s.sa</u>.saw	‘you hunted’

The data in (145) show degemination of the base onset. However, there do exist cases where it is the reduplicant geminate coda which changes into a singleton consonant. The reduplicant coda always degeminates before a consonant.

(207) Degemination of the reduplicant coda

$[\text{-syll}_1]\ [\text{-syll}_1] \rightarrow [\text{-syll}_1]\ /\ \underline{\hspace{3em}}]_{\text{RED}}\ [\text{-syll}]$

Degemination of the reduplicant coda is motivated by the requirement that word-medial coda be simple and is always followed by complete assimilation, as illustrated in (147).

(208) Degemination followed by complete assimilation

a.	/nʊ-RED-tɪkk/	→	nʊ.<u>ƫɪt</u>.tɪkk	‘s/he filled’
b.	/nʊ-RED-dɔkk/	→	nʊ.<u>rɔd</u>.dɔkk	‘you worked’
c.	/na-RED-bʊtt/	→	na.<u>βʊb</u>.bʊtt	‘s/he deceived’
d.	/na-RED-sɔpp/	→	na.<u>sɔs</u>.sɔpp	‘s/he hurt in the eye’
e.	/gʊ-RED-tɔpp/	→	gʊ.<u>ƫɔt</u>.tɔpp	‘they deafened’
f.	/nɪ-red-cɪpp/	→	nɪ<u>ʃɪc</u>.cɪpp	‘I pinched’

3.5.4 Nasal assimilation

Nasal assimilation is another common process in Eegimaa. Nasals always assimilate to the following consonant and the nature of the assimilation depends on whether that consonant is a voiced obstruent, a voiceless obstruent or an approximant.

3.5.4.1 Place assimilation

Place assimilation occurs when the nasal is followed by a voiced obstruent.

(209) Nasal place assimilation

a.	/gʊ-RED-bɔɲ/	→	gʊ.βɔm.bɔɲ	‘they sent’
b.	/gʊ-RED-ban/	→	gʊ.βam.ban	‘they finished’
c.	/nɪ-RED-dɛm/	→	nɪ.rɛn.dɛm	‘I drank’
d.	/nɪ-RED-duŋ/	→	ni.run.duŋ	‘I bent / continued’
e.	/na-RED-ɟʊn/	→	na.j̥ʊɲ.ɟʊn	‘s/he is alone’
f.	/na-RED-gan/	→	na.ɣ̥aŋ.gan	‘s/he is skinny’

Note that in Eegimaa, nasal-obstruent (NC) clusters only consist of a nasal and its homorganic voiced stop. Therefore, nasals always take on the place feature of the following voiced obstruents. The rule responsible for nasal place assimilation is provided in (149).

(210) Nasal place assimilation rule

[+nas] → [α place] / _____[α place, +voi, -son]

3.5.4.2 Complete assimilation

When a nasal is followed by a voiceless obstruent, it completely assimilates to that consonant.

(211) Complete nasal assimilation before voiceless obstruents

a.	/nɪ-RED-pɪn/	→	nɪ.ɸɪp.pɪn	'I counted'
b.	/nɪ-RED-tɪɲ/	→	nɪ.ȶɪ**t**.**t**ɪɲ	'I ate'
c.	/na-RED-sɛn/	→	na.sɛ**s**.**s**ɛn	's/he gave'
d.	/na-RED-tʊn/	→	na.ȶʊ**t**.**t**ʊn[32]	'he remarried'
e.	/gʊ-RED-cɪn/	→	gʊ.ʃɪ**c**.**c**ɪn	'they inhabited'
f.	/gʊ-RED-cɔŋ/	→	gʊ.ʃɔ**c**.**c**ɔŋ	'they kneeled'
g.	/mʊ-RED-faŋ/	→	mʊ.fa**f**.**f**aŋ	'tired'

The combination nasal-voiceless obstruent (NC̥ henceforth) is banned in Eegimaa. As will be shown in chapter 5, many languages also disfavor NC̥ clusters. In Eegimaa the rule for complete assimilation can be formally represented as in (151).

(212) Complete nasal assimilation before voiceless obstruents

$$[+\text{nas}] \rightarrow [\{-\text{son}, -\text{voi}\}_1] \;/\; \_\_\_\_[\{-\text{son}, -\text{voi}\}_1]$$

This rule only accounts for complete nasal assimilation triggered by the presence of a voiceless obstruent. However, in Eegimaa, nasals also completely assimilate before approximants and the motive behind this assimilation is that, like NC̥ sequences, nasal-approximant sequences (NC̞) are not permitted either.

[32] The word *ɛȶʊn* refers to the practice whereby a woman whose husband passed away remarries a younger brother of the deceased.

(213) Complete nasal assimilation before approximants

a.	/RED-liŋ/	→	<u>lil</u>.liŋ	'it is tight'
b.	/a-RED-lum/	→	ɐ.<u>lul</u>.lum	'a white person'
c.	/ɛ-RED-lɐn/	→	e.<u>lɐl</u>.lɐn	'It branches out'
d.	/na-RED-wɔŋ/	→	na.<u>ɔw</u>.wɔŋ	's/he offered'
e.	/na-RED-wʊn/	→	na.<u>ʊw</u>.wʊn	's/he heard'
f.	/nʊ-RED-jɪn/	→	nʊ.<u>ɪj</u>.jɪn	'you did it on purpose'
g.	/nʊ-red-waɲ/	→	nʊ.<u>aw</u>.waɲ	'you cultivated'

A second rule is needed to account for the type of complete assimilation nasals undergo when they occur before approximants. Note that this type of assimilation is not due to the phonetic ordeal associated with the production of a cluster of a voiced consonant followed by a voiceless consonant, which is exactly the reason for the ban on NC̥ sequences, but rather has to do with sonority sequencing since nasals are lower in the sonority scale than approximant and many languages disallow these types of clusters (Kenstowicz 1994). The rule in (153) accounts for nasal assimilation before approximants.

(214) Rule for complete nasal assimilation before approximants

[+nas] → [+approx$_1$] / _____[+approx$_1$]

3.5.5 Vowel harmony

In languages with vowel harmony systems, the vowels in a word share one distinctive feature. That feature can be [high], [back], [round], [tense] or [ATR]. In Eegimaa, the harmonic feature is [ATR] and vowels in a word are either [+ATR] or [-ATR].

(215) Eegimaa vowel harmony

a.	/dɐli/	→	dɐli	‘far’
b.	/ɛ-kɛb/	→	ɛxɛβ	‘admit’
c.	/dɐudu/	→	dɐuru	‘DEM (medial)’
d.	/ga-namɔ/	→	ganamɔ	‘siting, concubinage’
e.	/ɛ-gab-ɔd/	→	ɛɣaβɔr	‘share (v)’
f.	/ɛ-dambɛn/	→	ɛrambɛn	‘help (v)’
g.	/gʊ-kkaj-ɪt/	→	gʊkkaɪȶ	‘they did not go’

Eegimaa vowel harmony is controlled by [+ATR], meaning that the presence of a [+ATR] vowel in the root or an affix causes all the vowels in the word to change to their [+ATR] counterparts.

(216) [+ATR] controlled harmony

a.	/ɛ-tim-ɔ/	→	eȶimo	‘sink (v)’
b.	/sɪ-ɟɟegut/	→	siɟɟeɣuȶ	‘parrots’
c.	/ga-kku-ɛt/	→	gɐkkueȶ	‘stealing’
d.	/gʊ-gun-ɔ/	→	guɣuno	‘they are stupid’
e.	/bɪ-ssil-ɔd/	→	bissilor	‘type of dish’

f. /ɛ-ban-ɐli/ → eβɐnɐli 'finish early'

g. /bʊ-wɐl-ɛn/ → buɐlen 'taxation'

In addition to ATR harmony, Eegimaa also displays backness harmony between the vowel of the class marker and the first vowel of the root. When the class marker contains a high front vowel, this vowel becomes high back when the first vowel of the root is a back vowel.

(217) Backness harmony

a. /bɪ-dɛga/ → bɪrɛɣa 'laziness'

b. /bɪ-ffʊtɔr/ → bʊffʊţɔr 'feast'

c. /sɪ-llɛc/ → sɪllɛʃ types of pigeon

d. / sɪ-to / → suţo 'hyenas'

e. /mɪ-cid/ → miʃir 'myrrh'

f. /mɪ-sɔŋ/ → mʊsɔŋ 'little fouls'

g. /mɪ-kʊmba/ → mʊxʊmba 'piglets'

Both types of vowel harmony co-occur. This is more visible if we compare (156b), (156d), (156f), and (156g). The presence of the [+ATR] vowel [o] in (156d) causes the vowel [ɪ] to become [u] while in (156b), (156f), and (156g), [ɪ] only changes to [ʊ] since the trigger is a back [-ATR] vowel.

3.5.6 Vowel deletion

In Eegimaa, the vowel of the class marker is sometimes deleted when the root begins with a vowel.

(218) Sample cases of vowel deletion

a.	/a-an/	→	an	'person'
b.	/ɟɪ-aŋ/	→	ɟaŋ	'small house'
c.	/wa-af/	→	waf	'thing'
d.	/ja-ɔnd/	→	jɔnd	'crocodile'
e.	/sɪ-ɛmbɛ/	→	sɛmbɛ	'strength'
f.	/bʊga-an/	→	bʊɣan	'people'
g.	/sɪ-ambʊn/	→	sambʊn	'fire'

Vowel deletion in this language always targets the final vowel of the class marker and is summed up in the rule below.

(219) Vowel deletion rule

$[+\text{syll}] \rightarrow \text{ø} \ / \underline{\quad}]_{\text{CM}} \ [+\text{syll}]$

Many languages do not allow vowel hiatus and four strategies are often used to resolve this issue. One strategy consists in the two adjacent vowels merging into a third vowel; a process known as *vowel coalescence*. Other ways by which hiatus is resolved consist in the insertion of a glide between the two vowels (glide insertion), in turning one of the adjacent vowels into a glide (glide formation) or in the deletion of one of the vowels. Bergman (1968) who surveys 33 African languages notes that vowel deletion is a very common process used in resolving hiatus. His findings are supported by Casali (1998) who, out of 92 African languages examined, finds that 91 of them resort to vowel deletion. The two researches diverge when it comes to the very vowel which is deleted. According to Bergman, the deletion process targets the leftmost vowel while Casali suggests that both the leftmost and the rightmost vowels may be targeted. In the case of Eegimaa, it is the vowel of the class marker, and therefore the leftmost, which is deleted. However, we have seen in (102) that in this language, the vowel of the class marker is not always deleted. Additional cases are provided in (159).

(220) Vowel hiatus in Eegimaa

a.	/ɛ-ap/	→	ɛ.aɸ	‘forge (iron)’
b.	/ɛ-at/	→	ɛ.aƫ	type of shrine
c.	/fɪ-ɛɲ/	→	fɪ.ɛɲ	‘month, moon’
d.	/ga-ob/	→	gɐ.oβ[33]	‘hole’
e.	/gʊ-ɔl/	→	gʊ.ɔl	‘inlaws’
f.	/ga-ind/	→	gɐ.ind	‘hen, size’
g.	/ʊ-ʊɟ/	→	ʊ.ʊj̡	‘souls’

Hiatus situation resulting from morpheme concatenation is very common in Eegimaa and deletion is a minor rule which affects only a handful of words. In generative phonology, such words are believed to carry a diacritic feature [+X rule], X being the rule affecting these words (Kiparsky 1968). In Eegimaa, the diacritic feature is [+CM vowel deletion]. The deletion rule only targets the words which carry this feature and as a consequence, words which lack this feature surface with all their underlying vowels.

[33] gɐoβ refers to a hole in a tree

3.6 Conclusion

The various sound changes in Eegimaa sometimes render the study of the phonological system quite challenging. To meet this challenge and provide an accurate description of the phonology, I adopted an approach in which phonological theories are supplemented by experiments. These experiments have shown that in Eegimaa, vowel length is not a phonological feature and that a sequence of two vowels is always parsed as nuclei of two separate syllables. The results of the experiments have also suggested a treatment of Eegimaa prenasalized consonants not as single sounds with a simultaneous nasal-stop articulation, but rather as sequences of a nasal followed by a stop.

I have also shown that the vowel-zero alternation found in Eegimaa can be accounted for without positing a phoneme without any phonetic realization, which is exactly what characterizes the 'disjunctive' phoneme proposed by Sambou. This chapter also surveyed some of the morphophonological processes, among which reduplication, nasal assimilation and vowel harmony which will be discussed in detail in the following chapters.

4. Case study I: Reduplication

4.0 Introduction

I will start off this chapter with a case regarding a man, El Hadj Mansou Mbaye, a traditional communicator working for *Radiodiffusion Télévison Sénégalaise* (RTS), the Senegalese public broadcasting network. He is often referred to as *Cə dəgg dəgg* ('in true truth') because this term comes very frequently in his speech. The term morphologically consists of the morphemes *cə* which is a locative marker and the repeated word *dəgg* which means 'truth'. El Hadj Mansou does not use this term anyhow. A closer look at his speech shows that he consistently uses it to stress the veracity of the idea conveyed in the clause it modifies. It therefore serves a pragmatic function. We all repeat words for various reasons. Sometimes we repeat words as a ways to keep the conversation going while we are searching for the exact word for the concept we are referring to and these repeated words serve as *fillers*. In other cases, we repeat words to reinforce an idea, just like El Hadj Mansour when he uses the term *Cə dəgg dəgg*. Some people even repeat words for pathological reasons such as stammering. However, this chapter focuses on a special type of repetition, reduplication, which is a morphological process whereby a linguistic element is repeated for inflectional or derivational purposes (McCarthy and Prince 1995). Reduplication is a very common process in Eegimaa and serves both a derivational as well as an inflectional function. Two types of reduplication occur in Eegimaa: *complete reduplication* in which a morpheme is repeated without any modifications whatsoever and *partial reduplication* whereby a morpheme is copied with some changes. Partial reduplication is of paramount interest in this chapter in that it presents various wrinkles. Voiceless singleton consonants and glides are deleted in the reduplicant coda, whereas other consonants are maintained. The objective of this chapter is to provide a uniform account for this dual behavior. I argue that the dual behavior of consonants in the reduplicant coda is due to a difference in moraicity. Nonmoraic consonants are deleted, whereas moraic consonants are preserved, but have to undergo assimilation to conform to the requirements of the coda condition in this language. After a brief discussion of the functions of reduplication in Eegimaa and a brief survey of some of the purposes it serves in other languages, I will discuss the two types of reduplication (e.g. partial and complete) observed in Eegimaa, present more data and my hypotheses, before presenting my analysis.

4.1 Function of reduplication

In Eegimaa, reduplication has a derivational function as well as an inflectional function. We saw in section §2.4.2.7 that words can be derived in Eegimaa via reduplication. As a derivational process, reduplication very often co-occurs with one of the suffixation processes used to derive words. Below are additional examples on the derivational role of reduplication.

(221) Sample of words derived by reduplication

a.	/ɛ-RED-ɟɔk-ɛn/	→	ɛ.ʝɔ.ʝɔ.ɣɛn	‘to help’
b.	/ɛ-RED-bɛd-ɔd/	→	ɛ.βɛb.bɛ.rɔr	‘to laugh continuously’
c.	/ɛ-RED-kkan-ɔd/	→	ɛk.kak.ka.nɔr	‘to be very active’

d.	/ga-RED-lɔb-ɔd/	→	ga.<u>lɔl</u>.lɔ.βɔr	‘conversation’
e.	/ɛ-RED-taɟ/	→	ɛ.<u>ȶat</u>.ta.ʝɔr	‘to try hard’
f.	/ɛ-RED-ɟak-ɔd/	→	ɛ.<u>ʝa</u>.ʝa.ɣɔr	‘to be vigilant’

Reduplication is also used for inflectional purposes. For instance the perfective or complete aspect is expressed in Eegimaa in three ways. It can be conveyed with just the verbal base to which the subject agreement marker is attached. As pointed out by Bassene (2007), this form of expressing perfect aspect is found in storytelling and is therefore often referred to as *narrative aspect*. The perfective aspect can also be expressed with the suffix *-ɛ* attached to the verbal base. The third way by which perfect aspect is conveyed is reduplication. So, in Eegimaa, reduplication also serves a syntactic function.

(222) Perfective aspect

a.	/na-dɔbɔ/	→	na.rɔ.βɔ	‘s/he sat’
b.	/na-kkaj/	→	nak.kaj	‘s/he left’
c.	/na-rɔbɔ-ɛ/	→	na.rɔ.βɔ.ɛ	‘s/he sat’
d.	/na-kka-ɛ/	→	nak.ka.ɛ	‘s/he left’
e.	/na-RED-dɔbɔ/	→	na.<u>rɔ.βɔ</u>.rɔ.βɔ	‘s/he sat’
f.	/ na-RED-kkaj/	→	na<u>k.ka</u>.xaj	‘s/he left’

There is a subtle difference between the perfective aspect expressed with the morpheme -ɛ and the perfective aspect expressed via reduplication. This difference lies in the level of emphasis. Reduplication provides emphasis on the completeness of the event expresses by the verb, whereas the morpheme -*ɛ* gives a neutral reading.

Reduplication is found in many other languages where it serves various purposes. For instance in Wolof, reduplication is basically a derivational process and serves to derive both nouns and verbs.

(223) Wolof nominal and verbal reduplication

d.	/gɐm/	‘believe’	/ RED-gɐm /	→	gɐm.gɐm	‘belief’
e.	/man/	‘capable’	/ RED-man/	→	man.man	‘capability’
f.	/rɐk/	‘difficult’	/RED-rɐk/	→	rɐk.rɐk	‘difficulty’
g.	/gor/	‘man’	/RED-gor-lʊ/	→	gor.gor.lu[34]	‘to try hard’
h.	/saf/	‘tasty’	/RED-saf-al/	→	saf.sa.fal	‘make tasty’
i.	/tɔɟ/	‘break’	/RED-tɔɟ/	→	tɔɟ.tɔɟ	‘debris’

In Seereer-Siin, a West Atlantic language spoken in Senegal, reduplication also has a derivational function. Agentive nominals are derived by copying the verb stem to the left. However, the copy displays various morphophonological processes among which consonant mutation and compensatory vowel lengthening (McLaughlin 2000).

(224) Seereer-Siin agentive reduplication

a.	waaɗ	‘research’	/RED-waaɗ/	→	o.baa.waaɗ	‘researcher’
b.	fec	‘dance’	/RED-fec/	→	o.pee.fec	‘dancer’

[34] Note that in the formation of verb from nouns in Wolof, reduplication co-occurs with suffixation.

c.	xoox	‘cultivate’	/RED-xoox/	→	o.<u>qoo</u>.xoox	‘farmer’
d.	dap	‘launder’	/RED-dap/	→	o.<u>taa</u>.dap	‘launderer’
e.	gim	‘sing’	/RED-gim/	→	o.<u>kii</u>.gim	‘singer’
f.	ɟal	‘work’	/RED-ɟal/	→	o.<u>caa</u>.ɟal	‘worker’

Riggle (2006) provides a detailed description of the reduplication process in Pima, showing that in this language, the plural form of words is marked by repeating either the first consonant or the first CV sequence, as shown in (164).

(225) Pima plural reduplication

a.	ɲumatʃ	‘liver’	ɲu-RED-matʃ	→	ɲu.<u>ɲu</u>.matʃ	‘livers’
b.	mavit	‘lion’	ma-RED-vit	→	ma<u>m</u>.vit	‘lions’
c.	koson	‘packrat’	ko-RED-son	→	ko<u>k</u>.son	‘packrats’
d.	ʧimait̠	‘cake’	ʧi-RED-mait̠	→	ʧi<u>ʧ</u>.mait̠	‘cakes’
e.	hod̠ai	‘rock’	ho-RED-d̠ai	→	ho.<u>ho</u>.d̠ai	‘rocks’
f.	ʃoiga	‘pet’	ʃo-RED-iga	→	ʃo.<u>ʃo</u>i.ga	‘pets’

It should be noted that C-reduplication is the preferred type of reduplication in Pima and that CV-reduplication only occurs when copying just a consonant would generate a disallowed coda or cluster (Riggle 2006).

In Ilocano, reduplication also serves an inflectional purpose. It is used to mark plurality, comparative forms of adjectives and progressive aspect (Hayes 1989).

(226) Ilocano plural, comparative and progressive reduplication

a.	kaldíŋ	RED-kaldíŋ	→	<u>kal</u>-kaldíŋ	‘goats’

b.	púsa	RED-púsa	→	<u>pús</u>-púsa	'cats'
c.	na-lagdá	na-RED-lagda	→	na-<u>lag</u>-lagdá	'more durable'
d.	na-pintás	na-RED-pintas	→	na-<u>pin</u>-pintás	'prettier'
e.	sáŋit	ʔag-RED-saŋit	→	ʔag-<u>saŋ</u>-sáŋit	'is crying'
f.	taráy	ʔag-RED-taráy	→	ʔag-<u>tar</u>-taráy	'is running

Marantz (1982) and Riggle (2003) also report cases of reduplication in Chukchee, a Paleosiberian language which forms absolute singular of words by repeating part of the stem to the right.

(227) Chukchee absolute plural reduplication

Marantz (1982:451)

a.	nute	nute-RED	→	nute-<u>nut</u>	'earth'
b.	jilʔe	jilʔe-RED	→	jilʔe-<u>jil</u>	'gopher'

Riggle (2003:3)

c.	mêrê	mêrê-RED	→	mêrê-<u>mêr</u>	'tears'
d.	quli	quli-RED	→	quli-<u>qul</u>	'voice'
e.	tala	tala-RED	→	tala-<u>tal</u>	'meat'

4.2 Size and position of the reduplicant

Cross-linguistic studies have revealed that the reduplicant can be a prefix, a suffix or an infix (McCarthy and Broselow 1983). For instance in Wolof, Seereer-Siin and Ilokano, the reduplicant is a prefix. In Chukchee the reduplicant is suffixed to the stem, whereas in Pima the reduplicant is an infix. There exist reports of some languages making use of a reduplication process known as consecutive reduplication, which consists in bisyllabic words reduplicating in such a way that the first syllable becomes an infix and the second syllable a suffix. Chunk (1999) notes the occurrence of this process in Korean where a word such as *kikwe* ‘strange’ is reduplicated as *ki-ki-kwe-kwe* to mean ‘very strange’. Kitagawa (1987) also discusses a similar process in Mandarin Chinese. There is room for the argument that these are instances of circumfixation since the two syllables of the reduplicant sandwich the last syllable of the base. But, in strict morphological consideration, a circumfixation process involves the discontinuous affix sandwiching the entire base, not just part of it.

The most common reduplication process is one in which the reduplicant is prefixed to the base. In Eegimaa, the reduplicant is a prefix. Note that the size of the reduplicant in Eegimaa is totally dependent upon the size of the base and on whether the base is partially or entirely copied.

(228) Sample examples on the size of the reduplicant

a.	/na-RED-ɪf/	→	na.ɹ.ɪf	‘s/he breathed’
b.	/na-RED-lɔ/	→	na.lɔ.lɔ	‘s/he fell’
c.	/na-RED-mat/	→	na.ma.maƫ	‘s/he attended’
d.	/na-RED-somut/	→	nɐ.so.mu.so.muƫ	‘s/he is sick’
e.	/na-RED-bidiŋɔ/	→	nɐ.βi.ri.ŋɔ.βi.ri.ŋɔ	‘s/he is dizzy’
f.	/na-RED-gunnenod/	→	nɐ.gun.ne.nog.gun.ne.nor	‘s/he played the fool’

4.3 Types of reduplication in Eegimaa

4.3.1 Partial reduplication

Partial reduplication, sometimes referred to as incomplete reduplication, is a process whereby part of a morpheme is repeated. In Eegimaa, partial reduplication occurs when the base ends with a closed syllable. In each of the examples in (168), only the Consonant-Vowel (CV) element of the base is copied.

(229) CV reduplication

a.	/nɪ-RED-tas/	→	nɪ.<u>t̬a</u>.t̬as	'I detached'
b.	/nɪ-RED-lɔj/	→	nɪ.<u>lɔ</u>.lɔj	'I swam'
c.	/nɪ-RED-law/	→	nɪ.<u>la</u>.law	'I requested'
d.	/na.RED.lɔs/	→	na.<u>lɔ</u>.lɔs	's/he rubbed'
e.	/na-RED-caf/	→	na.<u>ʃa</u>.ʃaf	's/he warned'
f.	/RED-lɔf/	→	<u>lɔ</u>.lɔf	'it is near'

In Eegimaa, there are many cases of reduplication in which the whole CVC is copied, with the coda undergoing featural changes. These are still cases of partial reduplication since the reduplicant and the base are not identical. Examples are provided in (169).

(230) CVC reduplication

a.	/na-RED-gab/	→	na.<u>ɣ̬ag</u>.gaβ	's/he dished'
b.	/na-RED-baɟ/	→	na.<u>βab</u>.baj̬	's/he possesses'
c.	/na-RED-tɛb/	→	na.<u>t̬ɛt</u>.tɛβ	's/he carried'
d.	/gʊ-RED-taɟ/	→	gʊ.<u>t̬at</u>.taj̬	'they fought'

e. /gʊ-RED-pud/ → gu.<u>ɸup</u>.pur ‘s/he is out’

f. /gʊ-RED-fɔd/ → gʊ.<u>fɔf</u>.fɔr ‘they picked’

In all the examples above, the reduplicant coda assimilates and becomes identical to the following onset. In (169a) and (169b) the assimilation process only involves the place features since the reduplicant coda and the base onset already have the same voicing specification, whereas in (169c) - (169f) both the place and the voicing features of the reduplicant coda are altered.

4.3.2 Complete reduplication

Reduplication is referred to as *complete* or *total* when an entire morpheme is repeated. In Eegimaa, complete reduplication occurs when the base ends with an open syllable. Below are examples.

(231) Complete reduplication

a. /na-RED-lɔ/ → na.<u>lɔ</u>.lɔ ‘s/he fell’

b. /nɪ-RED-ga/ → nɪ.<u>ɣa</u>.ɣa[35] ‘I am thirsty’

c. /RED-dəli/ → <u>dɐ.li</u>.rɐ.li ‘it is far’

d. /nʊ-RED-ɟʊ/ → nʊ.<u>ɟʊ</u>.ɟʊ ‘you can’

e. /na-RED-dɔbɔ/ → na.<u>rɔ.βɔ</u>.rɔ.βɔ ‘s/he sat’

f. /na-RED-lumo/ → nɐ.<u>lu.mo</u>.lu.mo ‘s/he coughed’

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[35] The word *εɣa* denotes a strong thirst for something and is mainly used to refer to a strong thirst for wine.

4.4 Statement of the problem

The locus of this chapter is the sound changes which occur when morphemes are copied. Many sound changes are indeed observed in the reduplicant coda. The data in (171) show that voiceless singleton consonants and glides are deleted when they occur in the reduplicant coda.

(232) Deletion of voiceless singleton obstruents and glides

a.	/ɛ-RED-sɔt/	→	ɛ.sɔ.sɔƫ	'it licked'
b.	/gʊ-RED-tɔp/	→	gʊ.ƫɔ.ƫɔɸ	'they approached'
c.	/na-RED-bɔs/	→	na.βɔ.βɔs	's/he made a detour'
d.	/gʊ-RED-dɪf/	→	gʊ.rɪ.rɪf	'they challenged'
e.	/nɪ-RED-sɔw/	→	nɪ.sɔ.sɔw	'I grilled / roasted'
f.	/ɛ-RED-kaj/	→	ɛ.xa.xaj	'it is dry'

When a voiceless singleton obstruent or a glide is followed by a geminate consonant, its deletion also affects the geminate. In (172), the degemination process exhibited by the data is due to the deletion of a preceding segment.

(233) Deletion followed by degemination

a.	/ɛ-RED-llɛf/	→	ɛl.lɛ.lɛf	'it nested'
b.	/nɪ-RED-llis/	→	nɪl.li.lis	'I shook'
c.	/na-RED-bbʊj/	→	nab.bʊ.βʊj	's/he snapped upon'
d.	/nɪ-RED-llɪk/	→	nɪl.lɪ.lɪx	'I measured'
e.	/na-RED-ɟɟɪk/	→	naɟ.ɟɪ.ʝɪx	's/he limped'
f.	/nʊ-RED-kkɪʃ/	→	nʊk.kɪ.xɪʃ	'you marked'

Contrary to voiceless singleton obstruents and glides, voiced obstruents and liquids are preserved in the reduplicant coda. However, they assimilate and become identical to the onset of the base, to avoid a violation of the coda condition which, in Eegimaa, as noted earlier, requires a word-medial coda to be either a nasal homorganic to the following voiced obstruent onset or any consonant identical to the following onset.

(234) Assimilation of voiced obstruents and liquids

a.	/na-RED-gab/	→	na.ɣag.gaβ	's/he dished'
b.	/na-RED-baɟ/	→	na.βab.baʝ	's/he possesses'
c.	/gʊ-RED-pud/	→	gu.ɸup.pur	'they are out'
d.	/gʊ-RED-bil/	→	gu.βib.bil	'they waved/invited'
e.	/nɪ-RED-bɔl /	→	nɪ.βɔb.bɔl	'I buried (in a mug)'
f.	/ɛ-RED-jɔg/	→	ɛ.jɔj.jɔɣ	'it is loose'

The data in ((174) shows that when the base ends with a geminate, this geminate is reduced to a singleton consonant in the reduplicant coda. This degemination process is followed by assimilation.

(235) Degemination followed by assimilation

a.	/nʊ-RED-cɪpp/	→	gʊ.ʃiʃ.ʃipp	'they pinched'
b.	/na-RED-dɔkk/	→	na-rɔd.dɔkk	's/he worked'
c.	/na-RED-mʊcc	→	na.mʊm.mʊcc	's/he reduced'
d.	/na-red-ɲɪkk/	→	na.ɲɪɲ.ɲɪkk	's/he pinched'
e.	/na-red-ɲɐgg/	→	nɐ.ɲɐɲ.ɲɐɣ	's/he jumped'

Another wrinkle regarding the status of consonants in the reduplicant coda is that assimilation does not occur when the base has a geminate onset. Voiced obstruents, liquids and geminates are deleted in the reduplicant coda when they are followed by a geminate onset. In fact, any consonant in the reduplicant coda is deleted before a geminate. The reason for this deletion is that Eegimaa allows neither complex codas nor complex onsets word-medially.

(236) Deletion of voiced obstruents, liquids and geminates

a.	/na-RED-llʊɟ/	→	nal.lʊl.lʊʝ	's/he looked'
b.	/nɪ-RED-ppaɟ/	→	nɪp.pap.paʝ	'I cut'
c.	/nɪ-RED-kkɪb/	→	nɪk.kɪk.kɪβ	'I measured (rice)'
d.	/na-RED-bbud/	→	nab.bub.bur	's/he lost'
e.	/ɛ-RED-ɟɟɪl/	→	ɛɟ.ɟɪɟ.ɟɪl	'it is loud'
f.	/nɪ-RED-bbʊtt/	→	nɪb.bʊb.bʊtt	'I fished'

We saw in (172) that deletion of voiceless obstruents in Eegimaa is followed by degemination. In (175), degemination does not occur and one of the components of the geminate actually becomes the coda of the reduplicant, while the other remains the onset of the base.

4.5 Basic arguments

The sound changes observed in Eegimaa reduplication fall into two basic processes: *deletion* and *assimilation*. I propose that this dual behavior exhibited by the consonants is due to a difference in moraicity. Nonmoraic consonants (as in (171) and (172)) are deleted, whereas moraic consonants (as in (173) and (174)) are preserved, but they have to assimilate to conform to the requirements of the coda condition in Eegimaa.

I also propose that the degemination in (172) and the lack thereof in (175) follow from the mora preservation requirement. In (175), although the coda deletes, the mora itself is retained. However, it needs a host and therefore the first element of the geminate onset becomes the mora-bearing coda of the reduplicant. In (172), the deletion of the reduplicant nonmoraic coda affects the geminate. The first segment of the geminate moves to a coda position not specified for mora and therefore is also deleted.

4.6 OT Analysis

4.6.1 Background

Reduplication is certainly one of the most passionately debated issues among phonologists and various approaches have been proposed to account for this phenomenon. These approaches can be grouped into two main approaches: *phonological* and *morpho-semantic*. In the phonological approach, reduplication is viewed as a phonological process whereby some phonological elements (features, tones, segments, moras, syllables, and feet) are copied for inflectional or derivational purposes. In this study, I follow the model proposed by McCarthy and Prince (1995). The model assumes two relations in reduplication and these are shown in the diagram below[36].

[36] The full model actually assumes three relations. The third relation establishes a faithfulness system between the reduplicant and the stem.

(237) Basic model of reduplicative identity

Input: /Af$_{RED}$ +Stem/

⇳ *I-O Faithfulness*

Output: R ⇔ B

B-R Identity

The faithfulness constraints require that the specifications of the input stem be maintained in the output base, while the identity constraints require the output base and the output reduplicant to be identical. McCarthy and Prince (1995) argue for a phonological correspondence between the base and the reduplicant. The notion of correspondence, they define as follows:

(238) Correspondence

Given two strings S_1 and S_2, ***correspondence*** is a relation $\Re$ from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $ß \in S_2$ are referred to as ***correspondents*** of one another when $\alpha \Re ß$.

Correspondence theory therefore provides a mechanism to evaluate the similarity between related forms and in the case of reduplication, it also evaluates the similarity between the reduplicative affix and the base. Complete phonological identity of the reduplicant to the base is obtained in the case of complete reduplication, whereas in the case of partial reduplication, the identity is accordingly referred to as partial.

The morpho-semantic approach views reduplication as a process whereby a semantic feature is duplicated. Inkelas and Zoll (2005) argue against the phonological correspondence relation between the base and the reduplicant and view reduplication as 'morphological doubling'. They claim that reduplication occurs in a language because "the morphology calls twice for a constituent of a given semantic description". The basic structure of the Morphological Doubling Theory (MDT) is given in (178).

(239) Basic Model of MDT

[Output][F+some added meaning]

/input/[F] /input/[F] F=some semantic bundle

MDT requires semantic identity between the base and the reduplicant (or between the two inputs, according to the models). The reduplicant and the base may differ morphotactically and/or phonologically. As the objective of this paper is exactly to account for the phonological difference between the reduplicant and the base, I therefore found the phonological approach more fitting.

Earlier, Kiparski (1986) also put forward a proposal to account for reduplication. In his proposal, he argues that reduplication is amenable to two derivational processes namely compounding and affixation. He equates complete reduplication to compounding, with the reduplicant and the base viewed as two identical bases, and partial reduplication to affixation. Reduplication is indeed an affixation process. In Correspondence Theory, the reduplicant, be it identical to the base or not, is still viewed as an affix which, depending on the language may occur as a prefix, an infix or a suffix.

4.6.2 Deletion as the basic pattern in Eegimaa Reduplication

In Eegimaa, I have shown in (137), (139) and also in (171) and (172) that singleton voiceless consonants are dropped when they occur in coda position in the reduplicant. Below are additional data showing this deletion pattern.

(240) Supplementary data on the deletion of voiceless singleton obstruents

a.	/na-RED-lɔf/	→	na.<u>lɔ</u>.lɔf	's/he approached'
b.	/nɪ-RED-tas/	→	nɪ.<u>ȶa</u>.ȶas	'I detached'
c.	/nɪ-RED-dɔk/	→	nɪ.<u>rɔ</u>.rɔx	'I sowed'
d.	/na-RED-lɔs/	→	na.<u>lɔ</u>.lɔs	's/he rubbed'
e.	/ɛ-RED-dak/	→	ɛ.<u>ra</u>.rax	type of plants
f.	/na-RED-lat/	→	na.<u>la</u>.laȶ	's/he refused'

A legitimate question to ask is why these consonants are deleted. The deletion processes seems to be motivated by the laryngeal status of these consonants and an initial hypothesis is that the language does not allow voiceless consonants in the reduplicant coda. However, the hitch with this hypothesis is that in Eegimaa, voiceless consonants are found in the reduplicant coda where they are followed by an identical consonant at the base onset. (175b) and (175c) are just two cases in point. But in (179) the underlying coda of the reduplicant and the onset of the base are not identical. Therefore, we need an alternative hypothesis which integrates the postulate of the coda condition in Eegimaa. Indeed, in (179) the maintenance of the voiceless consonants at the reduplicant coda would certainly result in a violation of the coda condition in Eegimaa which is defined in (180) below.

(241) CODA-COND: A coda must be a nasal homorganic to the following voiced obstruent onset or any consonant identical to the following onset.

The constraint which forbids the deletion of the reduplicant coda, MAX-BR, is therefore dominated by CODA-COND. If both constraints were equally ranked or if MAX-BR were ranked above CODA-COND, deletion would have yielded ungrammaticality. But this is not the case and it is actually the maintenance of the voiceless obstruent in the reduplicant coda which is harmful. The anti-deletion constraint is defined in (181).

(242) MAX-BR: Every segment in the base must have a correspondent in the reduplicant (McCarthy and Prince 1995).

A ranking of these two constraints is shown in (182) and the tableau in (183) provides illustration of this ranking.

(243) CODA-COND >>MAX-BR

(244) Deletion of the reduplicant voiceless singleton coda

Input: / na.lɔ.lɔf /	CODA-COND	MAX-BR
a. ☞ na.lɔ.lɔf		*
b. na.lɔf.lɔf	*!	

The tableau in (183) shows a conflict between the two constraints since satisfaction of one constraint leads to a violation of the other. The winning candidate (183a) satisfies the coda condition but violates MAX-BR. This is exactly what motivates the ranking in (182). A candidate such as *na.lɔl.lɔf* where the reduplicant coda completely assimilates and becomes identical to the onset of the base would satisfy both constraints. However, it would fail because it violates the constraint which requires each segment in the reduplicant to preserve all the feature specifications of its base correspondent.

(245) IDENT-BR(F): The feature specification of a segment in the base must be preserved in the reduplicant (McCarthy and Prince 1995).

(246) Ban on complete assimilation of the reduplicant voiceless singleton coda

Input: /na-RED-lɔf/	CODA-COND	IDENT-BR(F)	Max-BR
a. ☞ na.lɔ.lɔf			*
b. na.lɔf.lɔf	*!		
c. na.lɔl.lɔf		*!	

Maintaining the coda of the reduplicant is really not a priority in Eegimaa. Deletion of the reduplicant coda is also found in Seereer-Sin, as illustrated by the data in (163). The difference between this language and Eegimaa is that in Seereer-Siin, the deletion of the reduplicant coda is followed by a lengthening of the preceding vowel, whereas in Eegimaa, the deletion process does not have any repercussion on the preceding vowel. Wolof, on the other hand, differs from both Eegimaa and Seereer-Sin in that deletion of the reduplicant coda is prohibited. As can be seen in (162), Wolof is actually one of those languages in which the reduplicant is required to be completely identical to the base. In other words, in Wolof, Max-BR is a high-ranked constraint and the different ranking of this constraint in Eegimaa and Wolof provides further support to the basic claim of OT according to which constraints are universal but their ranking is language specific (Prince and Smolensky 1993).

The data in (173) and (174) show that In Eegimaa, there exist cases in which the reduplicant coda is preserved via assimilation. However, in (185c), although the coda completely assimilates to the following onset, this candidate is ruled out because all the constraints which motivate the assimilation of the reduplicant coda do not apply to singleton voiceless consonants.

There are other ways to satisfy the coda condition without having to resort to deletion. By inserting a vowel at the end of the reduplicant, we obtain a candidate which perfectly satisfies the coda condition. In the word **na.<u>lɔ.fɪ</u>.lɔf*, the coda condition is observed. However, this epenthetic candidate is ill-formed and the insertion of the vowel [ɪ] is exactly what causes its failure since it violates the anti-epenthesis constraint, DEP-BR, which is also high-ranked.

(247) DEP-BR: Every segment in the reduplicant must have a correspondent in the base (McCarthy and Prince 1995).

Insertion of the vowel [ɪ] at the end of base would yield a candidate in which the reduplicant and the base are identical. DEP-BR will, therefore, be satisfied but

DEP-IO will not. This constraint requires the base to be faithful to the stem and it is also high-ranked.

(248) DEP-IO: Every segment in the output must have a correspondent in the input (McCarthy 1995).

Vowel epenthesis does occur frequently in Eegimaa and is found in loanwords. The purpose of this insertion process is to avoid clusters not allowed in the language. For instance, in the word *sɔβɪlɛ*, from Wolof *sɔblɛ* 'onion', the vowel [ɪ] is inserted to avoid an obstruent-liquid sequence. In the French loanword *kʁɪstɔf* 'Christopher' which is pronounced as *kɪrɪsɪtɔf* in Eegimaa, the vowel [ɪ] is inserted twice to avoid both [kʁ] and [st] which are all illicit sequences in Eegimaa. This clearly suggests that in Eegimaa, CODA-COND outranks DEP-IO. However, epenthesis is never found in Eegimaa reduplication. The tableau in (188) is illustrative of the ranking of both anti-insertion constraints.

(249) Ban on segment insertion

Input: /na-RED-lɔf/	CODA-COND	DEP-IO	DEP-BR	MAX-BR
a. ☞ na.<u>lɔ</u>.lɔf				*
b. na.<u>lɔf</u>.lɔf	*!			
c. na.<u>lɔ.fɪ</u>.lɔ.fɪ		*!		
d. na.<u>lɔ.fɪ</u>.lɔf			*!	

The winning candidate obeys all constraints except MAX-BR. This is evidence that Eegimaa values reduplicative well-formedness higher than reduplicative identity.

Another strategy to satisfy the coda condition in Eegimaa without any violations of MAX-BR is through deletion of either the onset or the coda of the base. Now, will such a strategy actually save the reduplicant coda? Certainly not; since the segments in the base are well protected by MAX-IO.

(250) MAX-IO: Every segment in the input must have a correspondent in the output (McCarthy: 1995).

The constraints DEP-IO and MAX-IO assess the identity of the base to the stem and ensure that segments are not added to or subtracted from the base. In Eegimaa, insertion and deletion of base segments are strongly discouraged. However, when it comes to resolving clusters which otherwise would have violated the coda condition, as in the case of loanwords, insertion is preferred. In reduplication, insertion is completely proscribed, whereas deletion is only allowed in the reduplicant coda and this justifies the ranking of MAX-IO over MAX-BR.

(251) Deletion of the base segments banned by Max-IO

Input: /na-RED-lɔf/	CODA-COND	MAX-IO	MAX-BR
a. ☞ na.<u>lɔ</u>.lɔf			*
b. na.<u>lɔf</u>.lɔf	*!		
c. na.<u>lɔ</u>.lɔ		*!	
d. na.<u>lɔ.f</u>ɔf		*!	*

The deletion of the base segments in (190c) and (190d) is fatal for either candidate. Deletion of the reduplicant coda is less costly than deletion of any segments in the base.

We saw in (163) that in Seereer-Siin, the deletion of the reduplicant coda triggers compensatory lengthening. This process is also reported in Pulaar[37] patronymic reduplication (McLaughlin 2006). Eegimaa does not compensate for the lost of a reduplicant coda and the reason why this process does not occur in this language and also the reason why it occurs in languages such as Seereer-Siin and Pulaar will become clear in the next section.

The deletion process which affects Eegimaa consonants at the reduplicant coda is not restricted to voiceless singletons. Glides also follow the same pattern as voiceless singleton obstruents. The data in (171e) and (171f) and the supplementary data in (191) display a systematic pattern of glide elision in the reduplicant coda.

(252) Supplementary data on glide deletion

a.	/na-RED-kaj/	→	na.xa.xaj	's/he is dry'
b.	/gʊ-RED-tɛj/	→	gʊ.ʈɛ.ʈɛj	'they ran'
c.	/gʊ-RED-daw/	→	gʊ.ra.raw	'they scooped out'
d.	/gʊ-RED-nɔw/	→	gʊ.nɔ.nɔw	'they sharpened'
e.	/ɛ-red-kɛw/	→	ɛ.xɛ.xɛw	'it hatched'
f.	/gʊ-red-bʊj/	→	gʊ.βʊ.βʊj	'they redid'

Cross-linguistic studies have revealed that many languages place restrictions on the nature of the sounds which can occur at syllable boundaries. The Syllable

[37] Pulaar is a dialect of Fulani spoken in Senegal. It is the second largest language in the country (after Wolof) and is spoken by more than 23% of the population.

Contact Law (SCL) requires segments at syllable boundaries to observe a certain sonority distance. However, the exact number of sonority steps that must be observed varies from one language to another (Davis and Shin 1999). A Language such as Sidamo, a Cushitic language spoken in Ethiopia, requires the coda to be more sonorous than the following onset, whereas in Icelandic the coda may be less sonorous than the onset but there is a limit on the sonority rise (Gouskova 2004). The bottom line is that at syllable boundary, sequences showing a fall in sonority are preferred over sequences showing sonority rise (Kenstowicz 1994). Obviously, in Eegimaa the deletion of glides in the reduplicant coda is not motivated by a desire to obey SCL since glides are the second most sonorous segments after vowels and in all cases where they are deleted, they should have constituted perfect codas.

Contrary to voiceless singleton obstruents and glides, voiced obstruents, liquids and geminates which occur in the reduplicant coda do not delete. However, they completely assimilate to the singleton onset of the base. This assimilation process is illustrated in (173) and (174). Below are additional data.

(253) Additional data on the assimilation of voiced obstruents, liquids and geminates

a.	/sɪ-RED-kəb/	→	si.xək.kəβ	variety of shellfish
b.	/na-RED-baɟ/	→	na.βab.baj̥	's/he possesses'
c.	/na-RED-ɟɛl/	→	na.j̥ɛɟ̥.ɟɛl	's/he insulted'
d.	/na-RED-kʊd/	→	na.xʊk.kʊr	's/he raised'
e.	/gʊ-RED-tɪkk/	→	gʊ.t̥ɪt.tɪkk	's/he filled'

f. /na-RED-sɔpp/ → na.<u>sɔs</u>.sɔpp ‘s/he hurt’

The dual behavior of Eegimaa consonants in the reduplicant coda raises the question: why do voiced obstruents, liquids and geminates assimilate when voiceless obstruents and glides elide? Based on the behavior of the various consonants in the reduplicant coda, I propose that in Eegimaa, voiced obstruents, liquids and geminates found in the base coda position are all moraic, whereas voiceless obstruents and glides are not. I argue that in Eegimaa, deletion of the reduplicant coda is the basic pattern and complete assimilation is motivated by the requirement that the mora be preserved.

4.6.3 Moraic theoretic approach

The syllable has long been recognized as playing an important role in phonological analysis. However, there has been no agreement on the internal organization of the syllable and different approaches have been offered to account for its structure. Before getting into the moraic theory of syllable structure, which is the approach assumed in this research, let us take a brief look at some of the syllable theories often followed in the discussion of syllable structure.

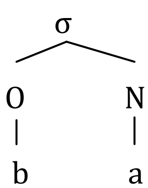
4.6.3.1 Flat Structure Theory (FST)

The flat syllable structure was proposed by some phonologists among whom Kahn (1976) and Clements and Keyser (1983). This theory, like all other syllable theories, postulates two main components for the syllable. On the one hand there is the syllable *Nucleus* and on the other hand, the syllable *Margins* (Clements and

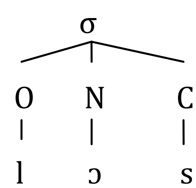
Keyser (ibid)). Vowels and syllabic consonants are the only sounds which can serve as nuclei, whereas nonsyllabic consonants only occur at the margins and are referred to as *onsets* when they occur before the nucleus and *codas* when they follow the nucleus. This theory posits a syllable structure in which the nucleus and the margins are at the same level of representation and are represented independently. This means that the nucleus does not attach to either the onset or the coda. This structure is described as flat and is illustrated in (193).

(254) Flat syllable structure

a. *ba* ‘target’



b. *lɔs* ‘rub’



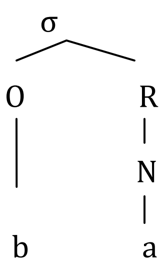
The structures above follow Clements and Keyser’s proposal in which the syllable is viewed as containing three nodes which are the *σ-tier*, the *CV-tier* which includes the nucleus and the syllable margins, and the *segmental tier* also known as the *terminal tier*. Alternative theories such as Onset-Rhyme Theory (ORT) and Body-Coda Theory (BCT) diverge from FST in that they both posit a *rhyme tier* which mediates between the σ-tier and some elements of the CV-tier. The structures proposed by proponents of ORT and BCT are binary.

4.6.3.2 Onset-Rhyme Theory (ORT)

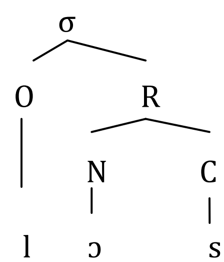
In ORT, the syllable is viewed as consisting of an onset and a rhyme (Pike and Pike 1947, Steriade 1988, Kaye, Lowenstamm and Vergnaud 1990). The rhyme includes the nucleus and the coda. Under this theory, the Eegimaa monosyllabic morphemes *ba* and *lɔs* are represented as shown in (194).

(255) Syllable structure from ORT perspective

a. *ba* ‘target’



b. *lɔs* ‘rub’



A concept central to this theory is that of syllable weight. Two types of syllables are posited and widely accepted in phonology literature. An open syllable (CV) which contains just a short vowel is referred to as *light*, whereas a syllable which contains either a long vowel (CV: / CV:C) or a diphthong (CVVC) is described as heavy. An example of a light syllable is (194a). Languages differ in the way they treat closed syllables containing a short vowel (CVC). Bell (2003) argues that in Wolof, only syllables containing a long vowel are heavy. Wolof CVC syllables, according to Bell, are light and therefore they do not attract secondary stress[38] which only falls on heavy syllables. In Ibibio, a Lower Cross language spoken in southeastern Nigeria, CVC syllables are viewed as heavy (Urua 1999). In Eegimaa, I argue that CVC syllables closed by a singleton voiceless obstruent or a glide are light, whereas all other CVCs are heavy. My claim is based on the behavior of consonants in the

[38] In Wolof, primary stress usually falls on the first syllable of the word. However, when the first syllable of a word is light and the second syllable is heavy, in this case it is the second syllable which bears the primary stress.

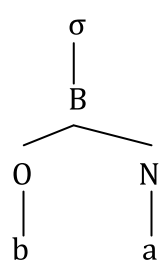
reduplication process and also on acoustic study I conducted, the results of which are provided in (201) and (202).

4.6.3.3 Body-Coda Theory (BCT)

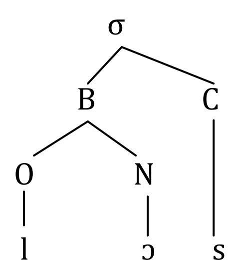
The syllable is analyzed in BCT as consisting of a body which is made up of the onset and the nucleus and a coda (McCarthy 1979). This approach also posits a syllable weight. A heavy syllable is defined in this theory as one which is either branching or having a branching nucleus. Otherwise, it is described as light (Blevins 1995). The structure in (195a) is therefore light since it does not have a coda and its nucleus in not branching, whereas (195b) meets the criterion for heavy syllable in this theory.

(256) Syllable structure from BCT perspective

a. *ba* ‘target’



b. *lɔs* ‘rub’



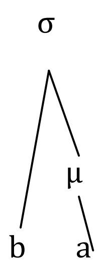
4.6.3.4 Moraic Theory of syllable

This approach to syllable structure, and which is the approach assumed in this study, conceives of the syllable as consisting of moras or units of timing. In moraic theory, light syllables are viewed as consisting of one mora, whereas heavy syllables are viewed as containing two moras (Hyman 1985, McCarthy and Prince 1986, Sato 1993, Cohen 2003).

(257) Syllable structure from the perspective of the Moraic Theory (MT)

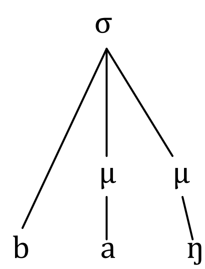
a. monomoraic

ba 'target'



b. bimoraic

baŋ 'living room'



It has often been argued that the difference in consonant moraicity is mainly attributable to (1) the position of the consonant in the syllable and (2) to whether the consonant contributes to the overall weight of the syllable (Hyman 1985, Cohen 2003). Onset consonants are generally considered nonmoraic because they do not contribute weight to the syllable, whereas codas can be moraic depending on their effect on the syllable weight. Moraic codas contribute to syllable weight, whereas nonmoraic codas do not.

Karvonen (2009) argues that in Finnish, codas are not underlyingly specified for moras and that they only become moraic, thereby increasing the weight of the syllable, to host secondary stress in the absence of CVV. McGarrity (2003) also reports that in Kuuku-Yaʔu, when primary stress is assigned to a word initial CV syllable, the onset of the following syllable is geminated and through this gemination process, the underlying CV becomes CVC thereby increasing its weight under the weight-by-position principle (Hayes 1989). Here too, the increase in syllable weight is motivated by the requirement, in this language, that stressed syllables be heavy. These two findings are consistent with the idea that weight is a process-driven phenomenon (Gordon 2006). Many phonological phenomena are known to be weight-sensitive.

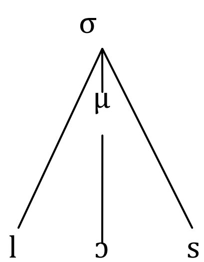
In addition to stress, tone is another phenomenon which is sensitive to the weight of the syllable. Studies in this area have revealed that most tonal languages allow level tone in all syllables, independently of their weight, whereas in many languages, contour tone is found only in syllables containing a long vowel or a diphthong and in CVC syllables (Gordon 2001). Dutcher and Paster (2008) report that in Luganda, a Bantu language spoken in Uganda, only CVV and CVC syllables can bear contour tone. Hausa is another language which allows contour tone only in CVV and CVC syllables, but not in CV (Jaggar 2001). This suggests that in both languages, CVC syllables are heavy. Other phenomena observed to be sensitive to the weight of the syllable are minimal word requirements (McCarthy and Prince 1986), reduplication (McCarthy and Prince 1986, 1995), syllable templatic restrictions (McCarthy and Prince 1986), metrical scansion (Hayes 1988) and compensatory lengthening (Hayes 1989).

In Eegimaa reduplication, the different behavior of the consonants in the reduplicant coda is best captured if we posit a difference in moraicity. Syllables closed by either a voiceless singleton consonant (CVC̥) and syllables closed by a glide (CVG) are reduced to CV in the reduplicant coda , whereas syllables ending with voiced obstruents (CVÇ̬) and those ending with liquids (CVL) keep their CVC shape, with the coda completely assimilating to the following onset. I propose that both (CVÇ̥) and (CVG) are light (monomoraic), whereas (CVÇ̬) and (CVL) are heavy (bimoraic). I subsequently propose a moraic representation of CVC syllables in which a nonmoraic coda is linked to the σ-tier, as shown in (197a), whereas a moraic coda such as in (197b) is associated with one mora.

(258) Monomoraic CVCs vs. bimoraic CVCs

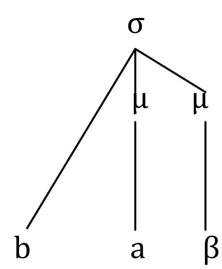
a. monomoraic

lɔs ‘rub’



b. bimoraic

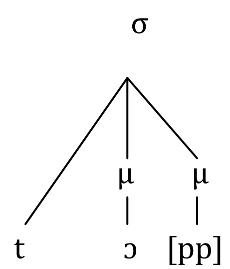
baβ ‘exploit’



In the moraic phonology literature, there is no uniformity as far as the representation of nonmoraic coda consonants is concerned. In some cases, the coda is linked to the σ-tier, as shown in (197), while in other cases, the coda and the nucleus are associated to one mora. The implication of linking the nucleus and the coda to the same mora is that the two segments share the same mora. The notion of mora sharing is not new in moraic phonology. Some languages are reported to allow a mora to dominate more than one constituent. Hubbard (1995a) reports that in Sukuma and Runyambo, two Bantu languages spoken in Tanzania, the nasal component of prenasalized consonants and the preceding vowel are linked to the same mora. Note that an earlier study of the moraic structure of Sukuma by Maddieson (1993) also yields similar results. The mora is originally linked to the nasal. However, in Sukuma and Runyambo as in many Bantu languages, vowels are lengthened before prenasalized consonants. The consequence of the lengthening process is that the resulting lengthened vowel needs more than one mora. In a language such as Luganda, the mora of the nasal is passed onto the lengthened vowel and the whole prenasalized consonant becomes the onset of the following syllable (Hubbard 1995a). But, in Kusuma and Runyambo, this mora ends up being shared between the nasal and the lengthened vowel. Broselow, Chen and Huffman (1997) argue that in Malayalam, a Dravidian language spoken in southern India, a coda consonant and the preceding vowel always share the same mora. Many Arabic varieties are also analyzed as allowing mora-sharing (Broselow 1992, Watson 2007). It was exactly this observation which led Broselow (ibid) to propose the *adjunction-to-mora* rule. According to this rule, a syllable-final mora is more likely to be shared by two constituents with greater sonority distance than those very close on the sonority scale.

In Eegimaa, the way consonants pattern in reduplication suggests that the language does not allow mora-sharing. Each consonant either has its own mora or lacks such a unit. Therefore, in the moraic representation of CVC syllables, I make this difference by associating each voiced obstruent and each liquid to one mora, whereas voiceless obstruents and glides are not associated with any moras but attached to the σ-tier. I also assign one mora to geminate codas since they pattern like voiced obstruents and liquids in reduplication. A word such as *tɔpp* ‘deafen’ which has an underlying geminate will have the structure shown in (198).

(259) Bimoraic CVC_1C_1



Hayes and Abad (1989) discuss two types of reduplication in Ilocano: *light reduplication* and *heavy reduplication*. In light reduplication, a light syllable is copied, whereas in heavy reduplication, the reduplicant consists of a heavy syllable. Eegimaa monosyllabic reduplication[39] can actually be equated to light/heavy reduplication in the sense that the reduplicant is either monomoraic or bimoraic. In polysyllabic reduplication, the final syllable of the reduplicant also has the light/heavy characteristics. I will therefore use the term light reduplication to refer to a reduplication process in which the reduplicant or its final syllable contains just one mora. Similarly, the term heavy reduplication will be used for reduplication in which the copy or its final syllable is heavy.

The mora plays an important role in many phonological processes, among which reduplication. In some languages, the very occurrence of reduplication is dependent on how many moras are contained in the base. McLaughlin (2006)

[39] In monosyllabic reduplication, the reduplicant consists of one syllable, whereas in polysyllabic reduplication, the reduplicant has more than one syllable.

discusses reduplication in Pulaar and notes that in this language, bimoraic patronyms reduplicate to derive nouns referring to the person / people who bear those patronyms, whereas monomoraic patronyms do not reduplicate. The monomoraic patronyms in (199e) and (199f) fail to reduplicate.

(260) Patronymic reduplication in Pulaar

		human (sg)	human (pl)
a.	sal	cal-sal-o	sal-sal-ɓe
b.	sih	cii-sih-o	sii-sii-ɓe
c.	wat	bat-wat-o	wat-wat-ɓe
d.	wan	ban-wan-o	wan-wan-ɓe
e.	paam	paam-o	faam-ɓe
f.	woon	goon-o	woon-ɓe

I mentioned earlier the sensitivity of some phonological processes to syllable weight. In Pulaar, reduplication is also a weight-sensitive process.

Unlike in Pulaar, in Kikuyu, a Bantu language spoken in Kenya, both monomoraic and polymoraic bases reduplicate (Peng 1991). However, it should be noted that in this language, the reduplicant, whether it is copied from a monomoraic base or polymoraic base, always has to be bisyllabic.

(261) Kikuyu diminutive reduplication

a.	RED-hɛ	→	<u>heea</u>-heea	'give a little'
b.	RED-nɛ	→	<u>neea</u>-neea	'hand over a little'

c.	RED-tɛ	→	teea-teea	'discard'
d.	RED-rɔr	→	rɔra-rɔr	'see a little'
e.	RED-carek	→	cara-carek	'pop a little'
f.	RED-hoŋgotok	→	hoŋga-hoŋgotok	'wander a little'

Many Bantu languages require the reduplicant to be of a certain size. The suffix *-a* is found in these languages where, in some cases, it serves to extend the reduplicant to the required size. However, in other cases, the attachment of this suffix is not motivated by the minimal reduplicant size requirement. For instance in (200e) and (200f), the reduplicants would have met the requirement without this extension suffix. In each case, the vowel of the second syllable is replaced by *-a*. An account for why this suffix is attached to reduplicants which do not need extension is beyond the scope of this chapter and therefore, I refer you Peng (1991) and Hyman, Inkelas and Sibanda (2009) for detailed discussion on this issue.

Like in Kikuyu, in Eegimaa, monomoraic bases as well as polymoraic bases reduplicate. However, in Eegimaa, the minimal size for the reduplicant is just one syllable. Some languages have a reduplication process in which just a consonant is copied. We have seen examples of such reduplication in (164). Eegimaa does not permit such reduplication because, obviously, of the minimal reduplicant size requirement.

4.6.4 Moraicity and duration

The mora, as mentioned earlier, has been widely accepted as playing a significant role in phonological analysis. However, there is a disagreement as far as its physical (phonetic) properties are concerned. Some view it just as a phonological construct posited to account for certain phonological phenomena. The mora is therefore treated as an abstract concept without any physical evidence. But, in the 1990s, substantial studies of some of the languages known as moraic brought the abstractness of the mora into the center of an intense debate. Most of these studies argue for some phonetic evidence for the mora. For instance Sato (1993) who conducted acoustic experiments in Japanese, a language often cited as an example of a moraic language, argues for a phonetic correlation between moraicity and consonant duration. She notes that moraic segments in Japanese are longer than nonmoraic ones, and the overall duration of a syllable is affected by the number of moras it contains. Hubbard (1995b) investigates a few Bantu languages, among which Runyambo and Lunganda, and reports that in these languages, words with the same number of moras have approximatively the same duration. Hubbard's finding constitutes a major contribution to the mora debate.

Broselow, Chen and Huffman (1997) also conducted an experimental study designed to examine the phonetic correlation of the mora in Hindi, Malayalam, Levantine Arabic and Egyptian Arabic. The results of their study also show a similar correlation between moraic structure and syllable duration. Cohen (2003) examines the duration of monomoraic, bimoraic and trimoraic syllable words in Hungarian and finds monomoraic syllable words to be shorter than bimoraic which in turn are shorter than trimoraic syllable words. Suomi and Ylitalo (2003) also look at the possible correlation between syllable weight and duration of segments in Finnish.

The results of their study show that in Finnish, segments are longer when they occur in heavy (bimoraic) syllables than in light (monomoraic) syllables.

Al the studies above clearly suggest that the duration of a syllable increases proportionately to the mora count. In other terms, the more moras a syllable contains, the longer it becomes. However, an experimental research by Curtis (2002) yields results which suggest otherwise. In her study, she finds that in Korean, syllables containing moraic codas are *slightly* shorter than those with nonmoraic codas. Acoustic measurements of Eegimaa data confirm Curtis' findings. The CVC syllables which I describe as light have longer duration than heavy CVC syllables.

The conflicting results of the studies on the phonetic evidence of the mora raises legitimate questions. The first question concerns the very nature of the mora itself. Does it really have physical properties which can be measured or is it a phenomenon which should be posited just at a phonological level? Assuming that it has physical properties, what are those properties and what would be the best method to measure them?

The controversy over the directionality of the mora's impact on syllable duration has obscured a significant common finding among all the studies mentioned above. They all show a correlation between syllable duration and syllable structure and this is worth highlighting. It shows that the mora is not just a mere phonological construct but a phonological unit with some phonetic manifestation. However, the method often employed in assessing the manifestation of the mora, a method which is hereby referred to as *Syllable Duration Test* (SDT), focuses on its contribution to the overall syllable duration. The problem with this method is that, by seeking phonetic evidence of the mora exclusively from the lens of its effect on syllable duration, the primary function of the mora as a timing unit tends to be overlooked. In this study, I underline the limits of this approach and I supplement it with a method which privileges an analysis of the duration of the segments assumed to be moraic. I refer to this method as *Constituent Duration Test* (CDT). Ladeforged (2006) argues that in mora-timing languages, the different moras of a word or a syllable are articulated with approximatively the same duration. This observation is what motivated my second experiment. In what follows, I present the results of two experiments conducted under both measurement tests.

4.6.5 Methodology

In both experiments, I used *Praat* to carry out an acoustic analysis of tokens of Eegimaa words. All the words used in the experiments are monosyllabic. In the first experiment, I was interested in the duration of each syllable as a whole. I chose syllables which only differ in terms of their codas and the objective was to find out if the type of coda matters for the overall duration of a syllable. For instance in *lɔs, lɔj*, and *lɔβ*, will the difference in codas result in a difference in syllable duration? The results do show a difference.

(262) Sample of syllable duration in Eegimaa

CVC syllables	durations
lɔs	244ms
lɔj	250ms
lɔβ	180ms
ɸiȶ	500ms
ɸin	406ms

The difference between *lɔs* and *lɔj* is only 6ms, whereas the difference between *lɔs* and *lɔb* is 64ms and the difference between lɔj and *lɔβ* is 70ms. Both *lɔs* and *lɔj* are light, whereas *lɔβ* is heavy. In all cases studied, heavy CVC syllables are consistently shorter than light CVC syllables.

The results in (201), though they show a clear pattern regarding the durational difference between light CVC and heavy CVC syllables, do not tell us anything on the timing function of the mora and therefore, I conducted another experiment in which I measured the duration of vowels and coda consonants in each syllable. Remember that in moraic phonology, the rhyme is believed to be the constituent which carries the weight of the syllable and the onset is generally viewed as irrelevant in the computation of syllable weight. I hypothesized that in a heavy (or bimoraic) CVC syllable, the vowel and the coda will have about the same length, whereas in a light (or monomoraic) CVC syllable, the difference will be more significant. A sample of the results of the experiment is provided in (202).

(263) Duration of vowels vs. codas

lɔs 'rub'	ɔ =75ms	s =62.7ms
lɔβ 'talk'	ɔ= 50.4ms	β = 49.9ms
lɔj 'swim'	ɔ = 75.9ms	j= 64ms
xuʈ 'initiation'	u =77ms	ʈ = 50.1ms
ɟɛl 'insult'	ɛ = 62.8ms	l = 62.8ms
ɟɛn 'sweat'	ɛ = 62ms	n = 62ms
ɸɪn 'count'	ɪ = 69.9ms	n =69.2ms

The results of this experiment consistently show that in the CVCs hypothesized as bimoraic, the vowel and the coda have about the same duration and in many cases they have exactly the same duration. For instance in *ɟɛl* and *ɟɛn*, the vowel and the coda have the same duration. In *lɔβ* and *ɸɪn*, the difference between the vowel and the coda is negligible (0.5ms between [ɔ] and [β] and 0.7ms between [ɪ] and [n]). However, in the CVCs I posited as being monomoraic, the difference between the vowel and the coda is quite significant. These results are consistent with Ladefoged's findings and provide further evidence that the mora may not be as abstract a concept as some linguists argue. After the moraic status of coda consonants has been established, the discussion on why voiced obstruents, liquids and geminates are retained in the reduplicant coda can resume.

4.6.6 Mora preservation

In languages such as Latin (Hayes 1989), Komi Ižma (Shaw 2007), Seereer-Siin (McLaughlin 2000) and Pulaar (McLaughlin 2006), the deletion of a coda consonant which bears a mora results in the lengthening of the preceding vowel, whereas in languages such as Andalusian Spanish, it is the following onset which is lengthened (Campos-Astorkiza 2003). Compensatory lengthening is therefore a strategy to preserve the mora. In Eegimaa, reduplicants are also required to maintain all the moras of the base. The constraint which demands mora preservation in the reduplicant is MAX-BR$_{\mu}$.

(264) MAX-BR$_{\mu}$: Every mora in the base must be preserved in the reduplicant (Shaw 2007).

Complete assimilation helps preserve the mora as well as satisfy the coda condition. However, it does involve featural changes. Let us consider the following examples.

(265) Multiple featural changes in complete assimilation

a. /sɪ-RED-kɐb/	→	si.xɐk.kɐβ	'variety of sea food'
b. /na-RED-tɔb/	→	na.ȶɔt.tɔβ	'eat (quickly)'
c. /nɪ-RED-pib/	→	nɪ.ɸip.piβ	'I shouted'

In (204c), there is a change in the laryngeal feature ([+voice]) of /b/ which becomes [p]. In (204a) and (204b), the change involves both place and manner features. The existence of many cases of complete assimilation in Eegimaa shows that the constraints which require each segment in the reduplicant to maintain all the features of its base correspondent (IDENT-BR(F)) is dominated by both CODA-COND and MAX-BR$_{\mu}$. The ranking between these constraints is illustrated in (205). To keep the tableaux legible, I decided to omit the mark of the mora on the vowels and to show it only on the codas since they are the ones undergoing changes.

(266) Ban on mora deletion

Input: /sɪ-RED-kɐb$_{\mu}$/	CODA-COND	MAX-BR$_{\mu}$	IDENT-BR(F)
a. ☞ si.<u>xɐk$_{\mu}$</u>.kɐβ$_{\mu}$			**
b. sɪ.<u>kɐβ$_{\mu}$</u>.kɐβ$_{\mu}$	*!		
c. si.<u>xɐ</u>.xɐβ$_{\mu}$		*!	

Let us consider an output candidate such as *si.<u>xɐk</u>.kɐβ$_{\mu}$*. This form is identical to the optimal candidate except that its reduplicant coda does not have a mora. Although it satisfies CODA-COND and MAX-BR, it fatally violates MAX-BR$_{\mu}$. This clearly suggests that in (205c), it is not the deletion of the coda consonant per se which is problematic but the deletion of the mora. I will pick up this point very shortly.

We saw in chapter 3 that in Eegimaa, there is a process which changes singleton stops into fricatives when they follow a vowel. This process is fully productive. The constraint which prohibits retaining the underlying [-continuant] feature of singleton stops after vowels is *V[-cont], a context-sensitive markedness constraint.

(267) *V[-cont]: No singleton stop after a vowel

In (205), the optimal candidate incurs a double violation of the low-ranked constraint IDENT-BR(F) because the base underlying segments /k/ and /b/ surface respectively as [x] and [k] in the reduplicant. An output candidate such as *si.<u>kɐk</u>$_{\mu}$.kɐβ$_{\mu}$* would satisfy CODA-COND and MAX-BR$_{\mu}$, with just one violation of IDENT-BR(F). Yet it fails to surface due to its violation of *V[-cont] which, as the data systematically show, is undominated.

(268) Spirantization: *V[-cont]>> IDENT-BR(F)

Input: /sɪ-RED-kɐb$_{\mu}$/	CODA-COND	*V[-cont]	MAX-BR$_{\mu}$	IDENT-BR(F)
a. ☞ si.<u>xɐk</u>$_{\mu}$.kəβ$_{\mu}$				**
b. si.<u>xɐβ</u>$_{\mu}$.kɐβ$_{\mu}$	*!			*
c. si.<u>kɐk</u>$_{\mu}$.kɐβ$_{\mu}$		*!		*
d. si.<u>xɐ</u>.xɐβ$_{\mu}$			*!	

Complete assimilation of voiced obstruents and liquids in the reduplicant coda only occurs when the coda is followed by a singleton onset. When the coda is followed by a geminate onset, voiced obstruents, liquids and also geminates are deleted, but the mora is kept. In this case, the first consonant in the geminate onset becomes the coda of the reduplicant. This deletion is motivated by the fact that Eegimaa does not allow either complex medial codas or complex medial onsets.

(269) *Complex: Word medial codas and onsets must be simple (Prince and Smolensky 1993).

(270) Complex codas and complex onsets not allowed word-medially

Input: /nɪ-RED-bbʊtt$_{\mu}$/	*COMPLEX	CODA-COND	MAX-BR$_{\mu}$	MAX-BR	IDENT-BR(F)
a. ☞ nɪb.bʊb$_{\mu}$.bʊtt$_{\mu}$				*	
b. nɪb.bʊb$_{\mu}$.bbʊtt$_{\mu}$	*!				*
c. nɪb.bʊ.bbʊtt$_{\mu}$	*!		*	*	
d. nɪb.bʊb.bʊtt$_{\mu}$			*!	*	

In (209b), the coda of the reduplicant is identical to the following onset; which is exactly one of the requirements for word-medial codas. Nevertheless, this candidate is ruled out because the onset of the base is complex. The optimal candidate violates MAX-BR but satisfies MAX-BR$_{\mu}$ and all the other constraints. The difference between the optimal candidate and its competitor (209d) is that the latter fails to preserve the mora of the base coda in the reduplicant coda and this violation is fatal.

As mentioned earlier, onsets are generally considered nonmoraic. However, geminates are also considered underlyingly moraic (see Topintzi 2008 for a detailed discussion) and this raises the question of how to treat geminate onsets. Word medial geminates are usually syllabified into a coda-onset schema and the coda is believed to be the host of the mora. In word final position, it is the whole geminate which is believed to be the locus of the mora. What about word initial geminates?

Hume (1997) argues that in Leti, initial geminates are nonmoraic. She bases her argument on the fact that in this language, lexical words are required to be at least bimoraic and no words in this language consist of an initial geminate and a short vowel, which would satisfy the bimoraic requirement if initial geminates were moraic.

Davis (1999) notes that, although in Leti initial geminates are nonmoraic, in Trukese they are. He presents evidence that in Trukese, words are also required to be bimoraic and there are many words which consist of an initial germinate and a short vowel.

Hajek and Goedemans (2003) also provide evidence that in Pattani Malay, initial geminates influence stress assignment and they argue that in this language, initial geminates are moraic. Topintzi (2008) also argues for moraic initial geminates in Marshallese and Trique. She even goes further to claim that these two languages allow geminate onsets both word-initially and word-medially.

In Eegimaa, words are required to have at least one mora and there are many words which consist of just a short vowel, or a geminate and a short vowel. For instance the word for 'salted water' is -*ʊ*, the word for 'be unmatched' is -*tta*. The reduplicated form of -*tta* is -*tta.ta* and this shows degemination. I have shown earlier that deletion of either a singleton voiceless obstruent or a glide in the reduplicant coda causes the geminate onset of the base to degeminate. All these show that in Eegimaa onset geminates are not moraic.

In (197), I proposed a moraic structure in which the voiceless consonant is linked to the σ-tier. Bell (2003) has also adopted such an approach in his treatment of Wolof consonants. Like in Eegimaa, in Wolof, voiceless singleton consonants and glides are also nonmoraic. There are languages which are reported to allow the coda and the nucleus to share a mora. Sukuma (Maddieson 1993 and Hubbard 1995a) and Runyambo (Hubbard 1995a) are often cited in the literature as examples of languages in which a mora may dominate two constituents. In Eegimaa, mora-sharing is not allowed. The constraint responsible for the ban on mora-sharing is defined in (210).

(271) *BRANCH$_{\mu}$: A mora must be linked to a single segmental node (Bermúdez-Otero 2001).

If mora-branching were allowed in Eegimaa, voiceless singleton consonants and glides would have been saved from deletion in the reduplicant coda. But, *BRANCH$_{\mu}$ is highly upheld in Eegimaa and therefore, deletion is less serious an issue than maintaining these sounds. I pointed out in the previous chapter that in Eegimaa, final glides behave like vowels and form a diphthong with the preceding vowel. I also claimed that their deletion in the reduplicant coda is due to the fact that the only existing mora is already associated with the first element of the diphthong, which is the vowel, and the glide is deleted because it is not linked to a mora. The ban on mora sharing is illustrated in (211).

(272) No mora sharing

Input: μ μ /na-RED-law/	*BRANCH$_{\mu}$	Max-BR
a. ☞ μ μ μ na.la.law		*
b. μ μ μ na.law.law	*!*	

The probem in (211b) stems from the fact that the segments in the branching rhyme are linked to the same mora and this is not allowed in Eegimaa. With the constraint in (210), we are now better positioned to understand why Eegimaa does not allow branching nuclei. It follows from the ban on branching moras.

The insertion of a mora, which in this case would have saved the glide from deletion, does not work because Eegimaa does not allow mora insertion. The constraint DEP$_{\mu}$-BR is highly ranked in Eegimaa. The ranking of this constraint is illustrated in (213).

(273) DEP$_{\mu}$-BR: Every mora in the reduplicant must have a correspondent in the base.

(274) Ban on mora insertion

Input: μ μ /na-RED-law/	*BRANCH$_{\mu}$	DEP$_{\mu}$-BR	Max-BR
a. ☞ μ μ μ na.<u>la</u>.law			*
b. μ μ μ na.<u>law</u>.law	*!*		
b. μ μμ μ na.<u>law</u>.law		*!	

Both mora insertion and mora deletion are banned in Eegimaa and I have shown earlier in this chapter that in Eegimaa, a segment can be deleted without such a deletion affecting the mora it carries. This point is worth highlighting. It provides further sypport to a claim made by McCarthy (2000: 160) according to which 'moras are subject to faithfulness requirements independent of the segments that sponsor them'.

4.7 Conclusion

What transpired from the analysis of Eegimaa reduplication process is that the dual behavior of consonants in the reduplicant coda is indeed attributable to moraicity. The analysis has revealed that the consonants which are deleted are nonmoraic. The requirement that moras be preserved in the reduplicant is always observed. Therefore, moraic codas are kept, unless the following onset is a geminate; in which case they are deleted, with the first segment of the geminate becoming the new host of the mora. The deletion of moraic codas serves as a strategy to satisfy *Complex which bans complex codas and complex onsets in word medial position. It transpired from the analysis that in Eegimaa, the faithfulness constraints MAX-BR and IDENT-BR(F) are low-ranked and therefore, the reduplicant coda either deletes of completely assimilates to spare the high-ranked constraints *COMPLEX, CODA-COND and MAX-BR$_{\mu}$.

In the next chapter, I will discuss the different assimilation processes which nasals undergo. Nasal assimilation could well have been discussed in this section since some of the data upon which my analysis is based are indeed instances of reduplication. However, nasal assimilation presents many wrinkles and therefore I deemed it useful to devote a whole chapter to this process.

5. Case study II: Nasal assimilation

5.0 Introduction

The phonology literature is replete with cases showing that in many languages, the type of possible NC sequences is subject to restrictions. Some languages only allow NC clusters consisting of a nasal and a homorganic obstruent. Other languages prove to be even more restrictive in the sense that they only allow a nasal to be followed by a voiced homorganic obstruent, and Eegimaa is one of these languages. In this language, nasals are required to assimilate to the articulation of the following consonant. Assimilation may be partial or complete depending on the type of consonant which follows the nasal. When a nasal is followed by a voiced obstruent, it assimilates to the place of that consonant, as shown in (214).

(275) Place assimilation

a.	/na-RED-baŋ/	→	na.βa**m**.**b**aŋ	‘s/he kept’
b.	/na-RED-dɛm/	→	na.rɛ**n**.**d**ɛm	‘s/he drank’
h.	/pan ɟʊ-ɟɔw /	→	pa**ɲ** **ɟ**ʊ.ʝɔw	‘we will go’
i.	/ban gʊ-ɟɔw/	→	ba**ŋ** **g**ʊ.ʝɔw	‘they are going’

Let us note beforehand that onsets never change and only codas undergo assimilation. As can be seen in the examples above, nasals assimilate in place to the following voiced obstruent. However, when the nasal is followed by a voiceless obstruent or an approximant consonant, complete assimilation occurs. Cases in point are given in (215).

(276) Complete assimilation

c. /na-RED-kɔŋɛn/ → na.<u>xɔ.ŋɛ**k**</u>.**k**ɔ.ŋɛn 's/he sent a message'

d. /ɟɪ-tɪɲ pɛ/ → ɟɪ.tɪ**p p**ɛ 'eat it all'

e. /ɛ-RED-laɲ/ → ɛ.<u>la**l**</u>.**l**aɲ 'type of plant'

f. /pan wɐdi/ → pa**w w**ɐri 'it will be fine'

The main objective in this chapter is to provide a detailed account of nasal assimilation in Eegimaa and the challenge is to examine the various markedness constraints which are responsible for both partial and complete nasal assimilation in this language.

The OT literature provides an account of some of the assimilation processes affecting nasal consonants. For instance, Pater (2001) discusses nasal assimilation in Austronesian languages, showing why these languages and most world languages tend to avoid nasal-voiceless obstruent (NÇ̥) clusters. However, Eegimaa not only bans nasal-voiceless obstruent sequences, but also nasal-approximant (NÇ̩) sequences and nasals completely assimilate to avoid these two configurations. This chapter approaches nasal assimilation in Eegimaa as a process motivated by three phonetically grounded markedness constraints (NPA, *NÇ̥, and *NÇ̩) interacting with faithfulness constraints. I will further argue that, even though place assimilation can be accounted for by one single constraint (NPA), complete assimilation is best explained by taking into account the two phonetic driving forces, voicing and sonority. Accordingly, I will use two constraints, *NÇ̥ and *NÇ̩, to account for complete assimilation. Before I get into an OT analysis of Eegimaa nasal assimilation, I will first provide a detailed descriptive account of this process. In support for the claim that NC sequences are subject to tight restrictions cross-linguistically, I survey a few languages which also display patterns alike those found in Eegimaa. I will end this chapter with a comparative study of the NC requirements in both Eegimaa and Joola Fogny, a closely related language. A central claim of the original conception of OT (Prince and Smolensky 1993) is that constraints exist in all languages but are ranked differently. The purpose of this comparative study is to show how the different ranking of constraints in both languages accounts for the difference in their NC requirements.

5.1 A descriptive approach to Eegimaa nasal assimilation

In many African languages, nasal-obstruent sequences (NC) are the only permissible clusters (Clements 2000). However, the nasal and the obstruent are required to be homorganic, and in most cases, when they are not homorganic, the nasal assimilates to conform to this requirement[40]. Nasal assimilation is therefore a very common process in many African languages and assimilation can be partial or complete. In Eegimaa, nasals always assimilate to the articulation of the following consonant. In other words, nasal assimilation is always regressive in Eegimaa and nasals assimilate partially or completely depending on the voicing status of the following consonant and also on whether that consonant is an approximant or not.

[40] In Akan, sometimes it is the obstruent which assimilates to the nasal.

5.1.1 Place assimilation

Place assimilation occurs when the nasal is followed by a voiced obstruent. Example (214) provides instances of place assimilation and below are additional cases.

(277) Additional examples of partial assimilation in Eegimaa

g.	/ɛ-kkan ga-ɟɔw/	→	ɛk.ka**ŋ** **g**a.ʝɔw	‘to name’
h.	/pan gʊ-bɔk/	→	pa**ŋ** **g**ʊ.βɔx	‘the will dance’
i.	/ pan gʊ-lɔ/	→	pa**ŋ** **g**ʊ.lɔ	‘they will fall’
j.	/gʊ-RED-baŋ /	→	gʊ.βa**m**.baŋ	‘they kept’
k.	/na-RED-ban/	→	na.βa**m**.**b**an	‘s/he finished’
l.	/na-RED-dɔŋ/	→	na.rɔ**n**.**d**ɔŋ	‘s/he is alive’
m.	/ɛ-RED-dɛɲ/	→	ɛ.rɛ**n**.dɛɲ	‘it cracked’
n.	/gʊ-RED-ɟɪŋ/	→	gʊ.ʝɪ**ɲ**.ɟɪŋ	‘they climbed’
o.	/gʊ-RED-ɟagɛn/	→	gʊ.ʝa.ɣɛ**ɲ**.ɟa.ɣɛn	‘they tasted’

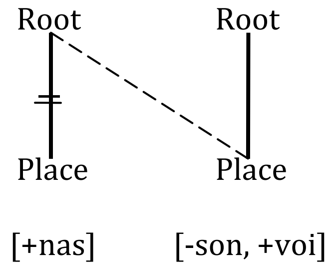
The rule governing place assimilation was given in (149) and is repeated below for easy reference.

(278) Place assimilation rule

[+nas] → [α place] / _____[α place, +voi, -son]

Assimilation involves the spreading of one or more features from one segment to another. Viewed from this angle, nasal place assimilation can be schematized as in (218).

(279) Representation of place assimilation



The requirement that a nasal be placed-linked to the following voiced obstruent is not unique to Eegimaa. What follows is a survey of few African languages which, like Eegimaa, demand NCs to be made of homorganic segments. Interestingly, in many African languages, the sequence nasal-voiced obstruent (NC̬) is the only type of NC allowed and nasals place-assimilate only when they are followed by a voiced obstruent. Before voiceless obstruents, various strategies are adopted among which are nasal deletion, postnasal voicing, and fusion. In each of the languages surveyed, I will also discuss the strategy utilized to resolve illicit NC sequences.

Brown (1972) discusses nasal assimilation in Lumasaaba, also known as Lugusi, a Bantu language spoken in Uganda. In this language, nasals assimilate to the place of the following voiced obstruent. It should be noted that in this language, nasals only assimilate to voiced obstruents and are deleted before voiceless obstruents. The deletion of the nasal triggers the lengthening of the preceding vowel.

(280) Nasal assimilation Lumasaaba

a.	/in-bululuka/	→	i**mb**ululuka	‘I fly’
b.	/in-daβilo/	→	i**nd**aβilo	‘a miror’
c.	/in-goloβe/	→	i**ŋg**oloβe	‘a pig’
d.	/in-zuguza/	→	i**nz**uguza	‘I throw’
e.	/in-paja/	→	i:paja	‘a male goat’
f.	/in-teβe/	→	i:teβe	‘a chair’
g.	/in-kokolo/	→	i:kokolo	‘a boat’
h.	/in-sija/	→	i:sija	‘a bowstring’

In Venda, a Bantu language spoken in South Africa, nasals are also required to take the place feature of the following voiced obstruent but are deleted before voiceless obstruents (Ziervogel, Wentzel & Makuya 1961). As shown in (220), NC̬ sequences in Venda always consist of homorganic sounds.

(281) Nasal assimilation in Venda

a.	n-guvho	→	**ŋg**uvho	‘blanket’
b.	n-kholomo	→	kholomo	‘fowl’
c.	n-dou	→	**nd**ou	‘elephant’
d.	n-themo	→	themo	‘chopping’
e.	n-budzi	→	**mb**udzi	‘goat’
f.	n-phele	→	phele	‘hyena’

The deletion process observed in Lumasaaba and Venda is a strategy to resolve NC̥ clusters which are not permitted in both languages. In Oshikwanyama, a Bantu language spoken in Angola and which also only allows NC̬s, NC̥ sequences are resolved via a process known as nasal substitution (Pater 2001).

(282) Nasal substitution in Oshikwanyama (Steinbergs 1985)

a.	/eːN-pati/	→	[eː**m**ati]	'ribs'
b.	/oN-pote/	→	[o**m**ote]	'good-for-nothing'
c.	/oN-tana/	→	[o**n**ana]	'calf'
d.	/oN-tuogwa/	→	[o**n**uŋgwa]	'basket'
e.	/eːN-kaku/	→	[eː**ŋ**aku]	'shoes'
f.	/oN-kwate/	→	[o**ŋ**wate]	'prisoner of war'

The process often referred to as nasal substitution actually entails two other processes. The nasal which occurs before a voiceless obstruent place-assimilates. However, since the language does not allow NC̥ clusters, the voiceless consonant is deleted. Let me point out that all the words in (221) are native Oshikwanyama words. Now, let us take a look at the loanwords in (222).

(283) Postnasal voicing in Oshikwanyama

a.	[bibɛl] GERM	→	[o**mb**ibela]	'bible'
b.	[dæm] ENG	→	[o**nd**ama]	'dam'
c.	[stæmp] ENG	→	[sita**mb**a]	'stamp'
d.	[pɹɪnt] ENG	→	[pele**nd**a]	'print'
e.	[trɔŋk] AF	→	[o**nd**oloŋgo]	'prison'
f.	[ɪŋk] ENG	→	[oi**ŋg**a]	'ink'
g.	[dɑŋki] ENG	→	[o**nd**o**ŋg**i]	'donkey'

A phenomenon noted cross-linguistically is that loanwords are very often modified to conform to the phonological rules governing each borrowing language. In (222a) and (222b), the nasal component of the class marker /oN-/ assimilates to the place of articulation of the voiced obstruent and this is a rule which exists in Oshikwanyama. However, this language does not have a rule which requires voiceless obstruents to become voiced after a nasal. The postnasal voicing rule exhibited in (222c) - (222g) only applies to loanwords (Steinbergs 1985). This raises the question regarding the borrowability of rules. There is an agreement among linguists that words are the linguistic items which are most frequently borrowed, especially when the concept they denote is foreign to the people of the borrowing language. A massive borrowing of words may indeed result in the emergence of new rules for handling the loanwords and these rules may eventually be extended to apply to native words. Let us take the example of the English stress assignment rule. Before the Norman Conquest of England (1066-1088), the English language had a straightforward stress assignment rule whereby words are stressed on the first syllable (Thomason 2006). The intense borrowing of words from French resulted in the emergence of a more complex rule which applies to both French loanwords as well as native English words and the new rule is not only category dependent but also quantity sensitive (Hayes 1981). Thomason and Kaufman (1988) provide a detailed discussion on how new rules may enter a language via the borrowing of lexical items. In the case of Oshikwanyama, more data are needed in order to determine the provenance of the postnasal voicing rule. This rule and the nasal substitution rule work to rid the language of NC̥ clusters.

Postnasal voicing is found in many African languages which do not tolerate NÇ̥s. Tucker and Mpaayei (1955) and Payne (2008) observes a similar process in Maasai, a Nilotic language spoken in Kenya and Tanzania. This language only allows homorganic NÇ̬s. Whenever, the nasal is followed by a voiceless obstruent, not only place assimilation occurs, but the voiceless obstruent is voiced.

(284) Nasal assimilation and postnasal voicing in Maasai

a.	/in-pala/	→	[i**mb**ala]	'papers'
b.	/in-tai/	→	[i**nd**ai]	'you (PL)'
c.	/en-puruo/	→	[e**mb**uruo]	'smoke'
d.	/en-tulelei/	→	[e**nd**ulelei]	'sodom apple'
e.	/en-cata/	→	[e**ɲɟ**ata]	'small wood'
f.	/en-kila/	→	[e**ŋg**ila]	'small garment'
g.	/en-koo/	→	[e**ŋg**oː]	'advise him'

In Maasai, voiced plosives are found only after their homorganic nasals, whereas their voiceless counterparts have a wider distribution. The language also has implosives and prenasalized implosives. The confinement of the voiced plosives to postnasal position suggests that this language does not have these sounds at the underlying level. Voiceless plosives are converted into voiced plosives when they follow a nasal.

Mugane (1997), discussing nasal assimilation in Kikuyu, a Bantu language spoken in Kenya, also reports that this language only permits NÇ̬ sequences and when the nasal precedes a voiceless consonant, both place assimilation and postnasal voicing occur.

(285) Nasal place assimilation and postnasal voicing in Kikuyu

a.	/n-βuta/	→	**mb**uta	'lop me off'
b.	/n-ɣuucia/	→	**ŋg**uucia	'pull me'
c.	/n-rega/	→	**nd**ega	'refuse me'
d.	/n-ɣurana/	→	**ŋg**urana	'shall I marry'
e.	/n-rarama/	→	**nd**arama	'shall I roar'
f.	/n-kora/	→	**ŋg**ora	'find me'
g.	/n-tuura/	→	**nd**uura	'ache me'
h.	/n-cũna/	→	**ɲɟ**ũna	'lick me'

In (224a) - (224e), place assimilation is concurrent with fortition, a process whereby a continuant consonant becomes a stop. Postnasal fortition is found in many African languages, especially among the Bantu languages. Odden (1996) and Mielke (2008) also report a similar process in Kimatuumbi and Bukusu, respectively. The combination between nasals and continuants is disallowed not just in Bantu languages but also in many other languages outside the Bantu group. According to Padgett (1994), the assimilation of a nasal to the place of articulation of a continuant consonant results in nasalized continuants which are only found in a handful of languages[41]. Fortition is therefore a strategy to avoid these illicit segments and the outcome of this process is the formation of nasalized stops which

[41] Umbundu, a Bantu language spoken in Angola is one of those languages which have nasalized continuants: [ṽ, l̃, h̃, j̃, w̃].

are very common. The fortition process mainly targets voiced continuants and in many languages, nasals are dropped when they are followed by a voiceless continuant. This can be seen in the following additional data from Kikuyu and also in Chindali.

(286) Kikuyu nasal assimilation and nasal deletion (Peng 2008)

a.	/o-βuθu/	→	**mb**uθu	'rottenness/rotten'
b.	/ko-mo-jur-i-a/	→	ko-**ɲ-ɟ**ur-i-a	'to let him/me fill'
c.	/o-θɛru/	→	θɛru	'brightness/bright'
d.	/a-θɛk-ɛɛt-ɛ/	→	θɛk-eet-ɛ	'he/I have laught'

(287) Chindali nasal assimilation and nasal deletion (Vail 1972)

a.	/in-puno/	→	i**mb**uno	'nose'
b.	/in-tunye/	→	i**nd**unye	'banana'
c.	/in-kunda/	→	i**ŋg**unda	'dove'
d.	/in-βale/	→	i**mb**ale	'plate'
e.	/in-fuwa/	→	ifuwa	'hippo'
f.	/in-satu/	→	isatu	'python'

Turning a voiced continuant sound into a stop is a single process, whereas converting a voiceless continuant into a stop involves two processes, fortition and voicing. In (225) and (226), the combination nasal-voiceless continuant which is not allowed in both languages is resolved via deletion.

We have seen that many languages make use of postnasal voicing as a strategy to meet the requirement that NC clusters be made of a nasal and a voiced obstruent which share the same place of articulation. However, Yao, a Bantu language spoken in Mozambique, Tanzania and Malawi, presents quite an interesting pattern. The language also only permits homorganic NC̬s but, postnasal voiced consonants are deleted[42], whereas postnasal voiceless consonants are voiced (Hyman & Ngunga 1997).

(288) Nasal assimilation and postnasal voicing and deletion in Yao

a.	/ku-N-péleka/	→	kuu-**m**-**b**éleka	'to send me'
b.	/ku-N-túma/	→	kuu-**n**-**d**úma	'to order me'
c.	/ku-N-cápila/	→	kuu-**ɲ**-**ɟ**ápila	'to wash for me'
d.	/ku-N-kwéela/	→	kuu-**ŋ**-**g**wéela	'to climb on me'
e.	/ku-N-búúcila/	→	kuu-**m**-úúcila	'to be angry with me'
f.	/ku-N-lápa/	→	kuu-**n**-ápa	'to admire me'
g.	/ku-N-jíima/	→	kuu-**ɲ**-íima	'to begrudge me'
h.	/ku-N-góneka/	→	kuu-**ŋ**-óneka	''to make me sleep

In Yao, the laryngeal feature of the nasal always has to spread. This means that postnasal consonants have to get their voicing specification from the nasal. Voiceless consonants are therefore turned into their voiced counterparts, whereas voiced ones are effaced, after passing their place features to the nasal.

[42] /d/ constitutes an exception to postnasal deletion. For instance the phrase 'to pay me' which has the underlying form /ku-N-dípa/ surfaces as kuu-**n**-**d**ípa.

All the languages I have surveyed thus far behave like Eegimaa in that they only allow homorganic NC̬s and the nasal is the segment which does not have an independent place feature and always has to adopt the place feature of the obstruent. However, in Akan, a Kwa language spoken in Ghana, nasals assimilate to the place of both voiced and voiceless obstruents and interestingly, when the nasal is followed by a voiced obstruent, assimilation is bidirectional, meaning that the nasal assimilates to the place of the obstruent but the obstruent also becomes a nasal.

(289) Akan nasal assimilation and obstruent nasalization (McCarthy 1986, Dolphyne 1988)

a.	/RED-pam/	→	pi**mp**am	'sew'
b.	/RED-kaŋ/	→	ki**ŋk**aŋ	'count'
c.	/RED-tun/	→	tu**nt**un	'forge'
d.	/RED-san/	→	si**ns**an	'return'
e.	/RED-doŋ/	→	du**nn**oŋ	'soak'
f.	/RED-daŋ/	→	di**nn**aŋ	'apply to'
g.	/me-N-ba/	→	me**mm**a	'i don't come'
h.	/N-dʑe/	→	**ɲɲ**e	'not receive'

The nasalization of postnasal voiced obstruents is a process known as *Meinhof's Law*, in reference to the German linguist Carl Meinhof who was the first to report such a process in Ganda. The process is also known as *Ganda Law*. The law has various versions. In an earlier version, the law was formulated to ban the occurrence of two NÇs in the same words and converts the first NÇ into a geminate nasal of the same place of articulation as the nasalized voiced obstruent. In another version, the law applies even if the word contains only one NÇ.

It has long been argued and proven that NÇ sequences are the preferred type of NC clusters and that NC̥ clusters are banned in many languages. Akan is one of those languages which tolerate NC̥s and it should be pointed out that, though marginal, there do exist languages which only allow homorganic NC̥s. For instance in Shekgalagadi, a Bantu language mainly spoken in Botswana, nasal assimilation is accompanied by a devoicing process affecting voiced obstruents (Solé, Hyman & Monaka 2010).

(290) Place assimilation and postnasal devoicing in Shekgalagadi

a.	χʊ-N-pak-a	→	χʊ-**m**-**p**ak-a	‘to praise me
b.	χʊ-N-tʊt-a	→	χʊ-**n**-**t**ʊt-a	‘to respect me’
c.	χʊ-N-cʊ́b-á	→	χʊ-**ɲ**-**c**ʊ́b-á	‘to beat me’
d.	χʊ-N-kɛl-a	→	χʊ-**ŋ**-**k**ɛl-a	‘to show me’
e.	χʊ-N-bɔ́n-á	→	χʊ-**m**-**p**ɔ́n-á	‘to see me’
f.	χʊ-N-dʊʒ-a	→	χʊ-**n**-**t**ʊʒ-a	‘to anoint me’
g.	χʊ-N-ɟís-a	→	χʊ-**ɲ**-**c**ís-a	‘to feed me’
h.	χʊ-N-gát-a	→	χʊ-**ŋ**-**k**át-a	‘to like me’
i.	χʊ-N-zíts^{h}-a	→	χʊ-**n**-**ʦ**íʦ^{h}-a	‘to inform me’
j.	χʊ-N-ʒwɛ́l-a	→	χʊ-**ɲ**-**ʧ**wɛ́l-a	‘to tell me’

Some languages have a looser restriction on NC sequences than Eegimaa and all the languages I have discussed so far. For instance in Bemba, the only requirement for NC is that the two segments share the same place feature and the nasal always assimilates.

(291) Nasal place assimilation in Bemba

a.	N-pat-a	→	**mp**at-a	'I hate'
b.	N-fut-a	→	**ɱf**ut-a	'I pay'
c.	N-mas-a	→	**mm**as-a	'I plaster walls'
d.	N-tan-a	→	**nt**an-a	'I refuse'
e.	N-sal-a	→	**ns**al-a	'I choose'
f.	N-nak-a	→	**nn**ak-a	'I get tired'
g.	N-ʃit-a	→	**nʃ**it-a	'I buy'
h.	N-ʧáap-a	→	**nʧ**áap-a	'I wash'
i.	N-kúl-a	→	**ŋk**úl-a	'I grow'
j.	N-ɲu:ng-a	→	**ɲɲ**u:ng-a	'I sieve'

In (230c), (230f) and (230j), nasal place assimilation results in gemination[43]. It should be borne in mind that these are not cases of complete assimilation, to which I shall turn shortly, but still instances of place assimilation since the assimilating nasal only takes on the place feature of the following segment which just happens to be a nasal. The same phenomenon also occurs in Eegimaa, as shown in (231).

[43] In languages such as Kikuyu and Bukusu, nasals are deleted when they occur before another nasal.

(292) Eegimaa nasal place assimilation before nasals

a.	/na-RED-ɲʊm/	→	na.ɲʊ**ɲ**.**ɲ**ʊm	‘s/he liked’
b.	/na-RED-maŋ/	→	na.ma**m**.**m**aŋ	‘s/he wanted
c.	/gʊ-RED-ŋan/	→	gʊ.ŋa**ŋ**.**ŋ**an	‘they shouted’
d.	/gʊ--RED-nɔŋ/	→	gʊ.nɔ**n**.**n**ɔŋ	‘they did on purpose’
e.	/ɟɪ-kkan mɪɲ/	→	ɟɪk.ka**m** **m**ɪɲ	‘you made trouble’
f.	/ɛfaŋ mʊɟak/	→	ɛ.fa**m** **m**ʊ.ʝak	‘be smarter’

The place assimilation rule posited in (149) needs to be revised to account for the data in (231). The new rule is provided in (232).

(293) Eegimaa place assimilation rule

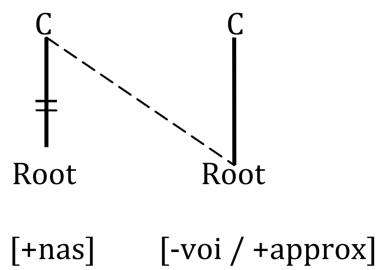
[+nas] → [α place] / _____[α place, +voi, -approx]

The new place assimilation rule excludes both voiceless and approximant consonants and the reason is that Eegimaa does not permit the combination between a nasal and either types of consonant. When the nasal is followed by a voiceless consonant or an approximant, complete assimilation occurs.

5.1.2 Complete assimilation

Complete assimilation, sometimes referred to as total assimilation, is the process whereby one segment acquires the features of and becomes identical to another segment. In the previous section, we saw that in Eegimaa, when a nasal is followed by another nasal, assimilation results in a sequence of two identical nasals and I argued that this is still place assimilation. Just like nasal assimilation before voiced obstruents, nasal assimilation before another nasal also only involves the spreading of the place feature of the following segment toward the nasal (regressive feature spreading). Complete assimilation on the other hand involves spreading of the root node (the features withing the root node and all the other features in the nodes dominated by the root nodes, i.e both the laryngeal and supralaryngeal nodes) of one segment toward another segment (Padgett 1995). The process is depicted in (233).

(294) Representation of complete assimilation



Complete assimilation in Eegimaa occurs when the nasal is followed by a voiceless obstruent or an approximant. Let us consider these two cases one after the other, starting with complete assimilation before a voiceless obstruent. As discussed earlier, many African languages resort to various strategies to ensure that NÇ̥ clusters do not surface. Languages such as Lumasaaba and Venda use nasal deletion as a way to avoid NÇ̥, whereas other languages such as Maasai spread the [+voice] feature of the nasal to the voiceless segment, thereby producing a sequence of two voiced consonants. In Eegimaa, complete assimilation is the strategy used to avoid NÇ̥s and this process is illustrated in (234).

(295) Eegimaa complete assimilation of nasals before voiceless obstruents

a. /gʊ-RED-kam/ → gʊ.xa**k**.**k**am ‘they chased’

b. /gʊ-RED-tɪɲ/ → gʊ.ȶɪ**t**.**t**ɪɲ ‘they ate’

c. /na-RED-sɛn/ → na.sɛ**s**.**s**ɛn ‘s/he gave’

d. /na-RED-fʊm/ → na.fʊ**f**.**f**ʊm ‘s/he broke’

e. /na-RED-paɲ/ → na.ɸa**p**.**p**aɲ ‘s/he asked the hand of[44]’

f. /na-RED-cɔŋ/ → na.ʃɔ**c**.**c**ɔŋ ‘s/he squatted’

g. /gʊ-RED-sim/ → gʊ.si**s**.**s**im ‘they bled’

h. /sɪ-RED-fɛn/ → sɪ.fɛ**f**.**f**ɛn ‘they grazed’

i. /ʊ-kkan cab/ → ʊk.ka**c** **c**ab ‘hurry up’

j. /ɛ-lɪŋ tɪr/ → ɛ.lɪ**t** **t**ɪr ‘it is really tight’

I have also shown that languages such as Kikuyu and Bukusu opt for different strategies for the resolution of NÇ̥ sequences, depending on whether the voiceless consonant is a stop or a fricative. In Eegimaa, complete nasal assimilation occurs in both cases. It should be noted that complete assimilation of nasal is not as common a resolution strategy as nasal deletion, postnasal voicing and nasal substitution, all of which are well documented in African linguistics.

Complete assimilation of nasal in Eegimaa is also found when the nasal is followed by an approximant.

[44] Buɸɐɲ (n), is the process by which a man formally asks for the hand of a woman in marriage. The woman’s parents are the one who are asked but the final decision rests exclusively on the woman herself.

(296) Eegimaa complete nasal assimilation before approximants

a.	/a-RED-lum/	→	a.lu**l**.**l**um	‘a White person’
b.	/RED-liŋ/	→	lɪ**l**.**l**ɪŋ	‘it is tight’
c.	/ε-RED-wʊŋ/	→	ε.ʊ**w**.**w**ʊŋ	‘it is large’
d.	/ε-RED-jɔŋεn/	→	ε.ɔ.ŋε**j**.**j**ɔ.ŋεn	‘it moulted’
e.	/bʊtʊm jɔn/	→	bʊ.tʊ**j** **j**ɔn	‘crocodile’s mouth’
f.	/nʊ-RED-labεn/	→	nʊ.la.βε**l**.**l**a.βεn	‘you boiled’

The ban on nasal-approximant (NÇ̣) sequences is also observed in Joola Fogny, a language closely related to Eegimaa. However, instead of complete assimilation, Joola Fogny resorts to nasal deletion to resolve NÇ̣ sequences.

(297) Nasal deletion before approximants in Joola Fogny (Sapir 1965)

a.	/na-laɲ-laɲ/	→	na.la.laɲ	‘they returned’
b.	/na-jɔkεn-jɔkεn[45]/	→	na.jɔ.kε.jɔ.kεn	‘s/he tires’
c.	/na-waɲ-a:m-waɲ/	→	na.wa.ɲa:.waɲ	‘I cultivated’

The restriction on NÇ̣ has also been observed in other languages. Flemming (2005) discusses nasal assimilation in various languages and reports that in Frisian and Lithuanian, the alveolar nasal [n] is deleted before an approximant. Indonesian is another language which does not allow NÇ̣ sequences and nasals are also deleted before approximants (Flemming, 2005).

[45] Sapir uses the symbol [y] to represent the palatal approximant [j].

We have seen the dual behavior of nasal consonants in Eegimaa, with place assimilation before voiced obstruents and complete assimilation before voiceless obstruents and approximants. The short survey presented in this chapter has revealed that the restrictions placed on NC sequences in Eegimaa are shared by many other languages and a whole range of phonological tools are used to ensure that NCs of certain configurations do not surface. In the following section, I will show how nasal assimilation in Eegimaa can be best accounted for using a constraint-based approach.

5.2 A constraint-based analysis

The type of consonants allowed in word medial position in Eegimaa has already been partially established in the previous chapter. I have argued that in this language, the only consonants allowed in this position are (1) a nasal homorganic to the following onset or (2) any consonant identical to the following onset. The data examined in that chapter clearly show that in Eegimaa, the reduplicant coda cannot be an obstruent with independent place and manner features and wherever the underlying obstruent coda of the reduplicant is to surface, it completely assimilates to the onset of the base. In this chapter, I have already shown that nasals do occur in word medial position. However, they never retain their underlying place feature and in many cases, they even have to sacrifice all their features. Therefore, we can assume nasal assimilation to be a strategy to satisfy the demands of the coda condition.

The requirements of the coda condition are obeyed, inducing nasals to undergo various changes which violate various identity features. For instance the fact that nasals share the place feature of the following onset violates IDENT-IO(Place), a constraint which requires each segment in the output to preserve the place specification of its input correspondent. Complete assimilation, as noted previously, involves many featural violations. For instance in (234a), the total assimilation of the nasal [m] to the velar [k] not only violates IDENT-IO(Place) but also violates IDENT-IO(nasal), IDENT-IO(voice), IDENT-IO(sonorant) . Therefore, the constraint IDENT-IO(F), similarly to IDENT-BR(F), will hereafter be used to refer to any constraints militating against any changes in the feature specifications of an input segment in its output correspondent.

(298) IDENT-IO(F): The feature specification of an input segment must be preserved in its output correspondent (McCarthy and Prince 1995).

The violation of feature identity in order to conform to the requirements of the coda condition is evidence that IDENT-IO(F) is a low-ranked constraint. Let us consider the illustrative tableaux in (238) and (239).

(299) Coda place-linked to the following onset

Input: /pan gʊ-lɔ/	CODA COND	IDENT-IO(F)
a. ☞ pa**ŋ g**ʊ.lɔ		*
b. pan gʊ.lɔ	*!	

(300) Coda identical to the following onset

Input: /gʊ-RED-tɪɲ/	CODA COND	IDENT-IO(F)
a. ☞ gʊ.tɪ**t**.tɪɲ		*
c. gʊ.tɪɲ.tɪɲ	*!	

In both tableaux, the winners violate IDENT-IO(F) to satisfy CODA COND, showing that in Eegimaa well-formedness is a priority. Howver, when Eegimaa nasal assimilation is viewed just as a strategy to satisfy the requirements of the coda condition, we miss the specifics regarding the dual behavior of nasals in the sense that such an approach does not adequately account for the fact that in some cases nasals partially assimilate, whereas in others they completely assimilate. Therefore, a different approach is needed and in the following section, I propose an alternative analysis whereby I argue that nasal assimilation is not induced by the coda condition but by a ban on certain sequences.

5.3 Alternative approaches

The requirement that NC sequences be made of homorganic sounds shows that in Eegimaa, IDENT-IO(F) should be dominated by a constraint, NPA, requiring nasals to have the same place specification as the following consonant. This constraint is defined in (240).

(301) NPA: Nasals have the same place feature as the following consonant (Padgett 1995)

NPA is a constraint which is phonetically motivated. Try saying the phrase *ten bikes* as fast as you possibly can. You are more likely to say [tɛm baɪks] rather than [tɛn baɪks]. The final consonant of the word *ten* is altered in rapid speech and this is due to the fact that, before you finish producing the word *ten*, the articulators, the lips in this case, are already completely set for the production of the first consonant of the word *bike* and this results in the sound [n] being released as [m]. In (241a), the final consonant of the word *pan* is released as [ŋ] due to the influence of the velar sound [g] in *gʊ.lɔ*. NPA strictly dominates IDENT-IO(F), and the ranking of these constraints is illustrated in (241).

(302) Nasal place-linked to the following onset: NPA >> IDENT-IO(F)

Input: /pan gʊ-lɔ/	NPA	IDENT-IO(F)
a. ☞ pa**ŋ g**ʊ.lɔ		*
b. pan gʊ.lɔ	*!	

In (241b), the alveolar nasal [n] and the velar stop [g] are nonhomorganic and this violates the requirements of the higher-ranked constraint (NPA). Candidate (241a) satisfies the NPA constraint and therefore is the optimal candidate, despite its violation of IDENT-IO (F).

There are multiple ways to satisfy NPA without having to violate IDENT-IO(F). One way is by inserting a vowel between the nasal and the following obstruent. The result of vowel epenthesis is that the nasal and the obstruent become onsets of two separate syllables. Another strategy which could be used to satisfy the requirements of NPA without having to violate IDENT-IO (F) is the deletion of one of the adjacent segments; either the nasal or the following segment. At first glance, vowel epenthesis and consonant deletion seem to be great repair strategies in the sense that both NPA and IDENT-IO (F) constraints are satisfied as shown in (242c-d) below. NPA is satisfied by virtue of there not being an NC cluster at all and IDENT-IO (F) is satisfied since each segment in the output preserves the features of its input correspondent. However, epenthesis and deletion also generate serious issues. In (242c) there is one segment in the output, the epenthetic vowel, which does not have an input correspondent and this violates DEP-IO. The results of the acoustic study presented in the previous chapter revealed that in Eegimaa nasal consonants are also underlyingly moraic. The ban on nasal deletion can therefore be assumed, and rightfully so, to follow from the requirement that the mora be always preserved. As we will see shortly, there is a context where the nasal is dropped. Such a deletion process only occurs when the nasal is followed by a geminate onset. But even in this case, the mora is not dropped. The first component of the geminate occupies the coda position previously held by the nasal and becomes the new host of the mora, just as we saw in the case of voiced obstruents and liquids when they occur in the reduplicant coda and followed by a geminate onset. Nasal deletion to avoid a violation of NPA and IDENT-IO (F) would incur a violation of MAX-IO$_{\mu}$ which, as we saw in the previous chapter, is a high-ranked constraint. The forms **panɪ gʊlɔ* and **pa gʊlɔ* which, respectively, result from epenthesis and deletion are all ill-formed. This shows that in Eegimaa both DEP-IO and MAX-IO$_{\mu}$ are high-ranked constraints. This is illustrated in the tableau in (242).

(303) Segment deletion and insertion banned by MAX-IOµ and DEP-IO

Input: /pan gʊ-lɔ/	NPA	DEP-IO	MAX-IOµ	IDENT-IO(F)
a. ☞ pa**ŋ g**ʊ.lɔ				*
b. pan gʊ.lɔ	*!			
c. pa.nɪ gʊ.lɔ		*!		
d. pa gʊ.lɔ			*!	

Candidates (242c) and (242d) perfectly satisfy NPA and IDENT-IO(F) but respectively violate the anti-insertion and anti-deletion constraints. These violations are fatal since both constraints are high-ranked. The optimal candidate (242a) satisfies NPA, MAX-IOµ and DEP-IO. A violation of any of these three constraints is fatal.

Let us examine the effect of NPA further. This constraint requires nasals to have the same place features as the following consonant. It perfectly accounts for partial assimilation which involves a change in the place features of the nasal. However, as we have already seen, the data show that when a nasal is followed either by a voiceless obstruent or by an approximant consonant, it completely assimilates to that consonant. For instance, in the word /gʊ-tɪɲ-tɪɲ/, which surfaces as [gʊ.tɪ**t.t**ɪɲ] 'they ate', the nasal sound [ɲ] takes on not just the place features[46], but also the root, laryngeal and manner features of the following consonant and both sounds become identical. The existence of many cases of complete assimilation shows that in Eegimaa, NPA is not enough to account for all the types of nasal assimilation.

[46] Palatal sounds have two places (coronal and dorsal) of articulation and are therefore defined as [+cor, +dor]. As for alveolar sounds, they have one place (coronal) of articulation and are defined as [+cor, -dor].

Therefore, additional constraints are needed to account for the many instances of complete assimilation.

Let us first consider the case of complete assimilation before a voiceless obstruent. In Eegimaa, the sequence nasal-voiceless obstruent (NC̥) is banned, suggesting that the following constraint is at work.

(304) *NC̥: No nasal-voiceless obstruent clusters (Pater 1996).

Pater (1996) notes that in many languages, nasal-voiceless obstruent (NC̥) clusters are banned while nasal-voiced obstruent (NC̬) sequences are allowed. The restriction on NC̥ sequences has a phonetic explanation which lies in the voicing mechanism itself. In connected speech, the production of one sound may influence or be influenced by the production of the following sound. In most world languages, nasals are produced with a voicing of the vocal cords. It means that during their production, the vocal cords are brought closer so that there is a narrow opening between them and when the air from the lungs flow though this narrow passage, the vocal cords vibrate. In the production of NC̥, what happens is that it is very hard for the vocal cords which are set for the production of a voiced sound to be completely adjusted, held apart from each other, for the production of a subsequent voiceless sound. Therefore, many languages completely disallow these types of clusters since they require more effort than their NC̬ counterparts. The production of NC̬ is relatively easier than that of NC̥ since with NC̬, the vocal cords are set to produce two voiced sounds and therefore no major adjustment is needed.

NÇ̬ clusters are considered unmarked since they are common cross-linguistically, while NÇ̥ clusters which are less common are said to be marked. In Eegimaa, as mentioned earlier, a nasal can only be followed by a voiced homorganic obstruent. The fact that nasal-voiceless obstruent sequences are not allowed in Eegimaa is clear evidence that *NÇ̥ is a high-ranked constraint. Tableau (244) illustrates the high-ranked status of this constraint. To keep my tableaux simple and easy to read, I will omit DEP-IO and MAX-IOμ from the subsequent tableaux and they will only be included when they are directly relevant to the discussion.

(305) Complete assimilation: *NÇ̥ >> IDEN-IO (F)

Input: /gʊ-RED-tɪɲ/	*NÇ̥	NPA	IDENT-IO(F)
a. ☞ gʊ.t̬ɪ**t**.**t**ɪɲ			***
b. gʊ.tɪɲ.tɪɲ	*!	*	
c. gʊ.tɪn.tɪɲ	*!		*

Candidate (244b) not only violates the requirement that nasals must assimilate to the articulation of the following consonant (NPA) but also the constraint banning any combination between a nasal and a voiceless obstruent (*NÇ̥). Therefore, this candidate cannot surface. Candidate (244c) is also ruled out by *NÇ̥. The optimal candidate, (244a) satisfies the two markedness constraints NPA and *NÇ̥. Earlier in this chapter, I offered a survey of few African languages which also demand NC clusters to share the same place of articulation. What transpired from the analysis of the data is that many African languages, just like Eegimaa, also forbid NÇ̥ sequences. This also suggests that in these languages, *NÇ̥ is ranked high. However, these languages differ from Eegimaa in terms of the strategies they use to resolve these sequences. In languages such as Lumasaaba and Venda, NC̥ sequences are repaired through nasal deletion, whereas in Maasai, and Yao, post nasal voicing is the repair strategy. In Kikuyu and Chindali, as shown in (225) and (226), postnasal voicing is also attested. Its application depends, however, on whether the voiceless obstruent is a stop or a continuant. When the voiceless obstruent is a stop, it gets voiced. When the nasal is followed by a voiceless continuant, postnasal voicing does not occur. Instead, the nasal is deleted. The data also show that in both languages, voiced fricatives are fortified when they follow a nasal. What this means is that in these languages, the constraint which proscribes the combination between a nasal and a continuant consonant (NC̳) is also ranked high.

(306) *NC̳: No nasal continuant consonant sequences.

In Kikuyu and Chindali, NC̥ and NC̳ sequences are repaired through postnasal voicing and postnasal hardening, respectively. In the case of NCs consisting of a nasal and a voiceless continuant, the repair mechanism involves turning the voiceless continuant into a voiceless stop and then turning this voiceless stop into a voiced stop. This strategy fails, suggesting that both languages do not allow multiple repairs, at least as far as NC resolution is concerned.

One more restriction on NC sequencing involves the combination nasal-approximant (NC̞) consonants. Phonetic studies have shown that sounds also differ in terms of the degree of sonority with which they are produced (Clement 1990, Ladefoged 2006, and Parker 2008). Sonority therefore plays a crucial role in sound perception. It also regulates the way syllables are structured and determines which sounds are allowable at syllable boundaries. In many languages, the sequence nasal-approximant is disallowed since it violates a syllable contact rule[47] which requires the coda of a syllable to be at least as sonorous as the onset of the following syllable (Kenstowicz 1994). In rapid speech, codas are often misperceived when they are followed by more sonorous onsets. Therefore, many languages require codas to be more sonorous than the following onsets. As shown in (246) below, approximants are more sonorous than nasals and consequently, the sequence nasal-approximant violates the sonority sequencing principle.

(307) Sonority hierarchy (Clements 1990)

vowels >> glides >> liquids >> nasals >> obstruents

Languages differ in their specific requirements for sonority sequencing. However, the restriction on nasal-approximant sequences has been observed in many languages. In Eegimaa, as shown in (235), a nasal cannot be followed by an approximant. The constraint which forbids NÇ̣ clusters is undominated. I am introducing here a new notation (Ç̣) for approximant consonants.

(308) *NÇ̣**:** No nasal-approximant consonant clusters.

Languages resort to different strategies to satisfy *NÇ̣. Some languages use deletion as a repair strategy, and as we shall see in section (4), Joola Fogny is one of them. In this language, nasals are deleted before liquids and glides. Other languages

[47] The syllable contact law which requires a coda to be more sonorant than the following onset actually follows from the sonority sequencing principle (see Gouskova 2004).

such as Eegimaa resort to complete nasal assimilation to satisfy *NÇ̩. The effect of *NÇ̩ in Eegimaa is illustrated in (248) below.

(309) Complete assimilation: *NÇ̩ >> IDENT-IO (F)

Input: /na-RED-lʊn/	*NÇ̩	*NÇ̥	NPA	IDENT-IO (F)
a. ☞ na.<u>lʊ**l**</u>.**l**ʊn				*
b. na.<u>lʊn</u>.lʊn	*!			

IDENT-IO (F) cannot protect nasals from assimilation. Candidate (248b) violates *NÇ̩ and therefore loses the competition. Note that in English (and also in French), the nasal in the prefix *in-* completely assimilates to the following liquid to avoid the highly marked nasal-liquid clusters (see Padgett 1995 for further discussion). Evidence is provided in the following data.

(310) English /in/ prefix: case of complete nasal assimilation before liquids

a.	in-literate	→	i**ll**iterate
b.	in-liberal	→	i**ll**iberal
c.	in-regular	→	i**rr**egular
d.	in-replaceable	→	i**rr**eplaceable

One may argue that the complete assimilation process exhibited in (249) is typical of the prefix *in-* since the sequence nasal-liquid is well attested in English. For instance the words *enlist* [ɪnlɪst], *unleash* [ʌnliʃ] and *unload* [ʌnloʊd] all have the sequence [nl]. Yet, it is a well documented fact that many languages do not tolerate

NÇ sequences. Bahasa Indonesian (Lapoliwa 1981) and Frisian (Tiersma, 1985) are also reported to be among those.

(311) NÇ resolution in Bahasa Indonesian

a.	/məŋlatih/	→	məlatih	'to train'
b.	/məŋrasa/	→	mərasa	'to feel'
c.	/məŋjakin/	→	məjakin	'to convince'

(312) NÇ resolution in Frisian

a.	/in-rɪnə/	→	ĩrɪnə	'to walk in '
b.	/in-lɪzə/	→	ĩlɪzə	'to lie in'
c.	/in-jaːn/	→	ĩjaːn	'to give in'

In Indonesian, nasal-nasal sequences are not allowed either. This can be seen in (252) where the nasal of the prefix məŋ- is dropped when the stem begins with a nasal consonant.

(313) NN resolution in Bahasa Indonesian

a.	məŋ-masak	→	məmasak	'to cook'
b.	məŋ-nikah	→	mənikah	'to marry'
c.	məŋ-ɲaɲi	→	məɲaɲi	'to sing'
d.	məŋ-ŋaco	→	məŋaco	'to chat'

In (252), the high-ranking of *GEM in Indonesian prevents the velar nasal from assimilating to a following nasal consonant. Furthermore, what transpires from the data in (250) and (252) is that Indonesian does not permit the combination between a nasal and a sonorant consonant. A constraint which bans the combination between a nasal and any sonorant consonant is enough to account for the nasal deletion process noted in Indonesian. Such a constraint is $*NC_{son}$.

(314) *GEM: No geminates.

(315) $*NC_{son}$: No nasal sonorant sequences.

Eegimaa allows NN sequences but such sequences always consist of geminates. This is shown in (231), repeated below as (255) for easy reference.

(316) Nasal-nasal sequences in Eegimaa

a.	/na-RED-ɲʊm/	→	na.<u>ɲʊ**ɲ**</u>**.ɲ**ʊm	's/he liked'
b.	/na-RED-maŋ/	→	na.<u>ma**m**</u>**.m**aŋ	's/he wanted
c.	/gʊ-RED-ŋan/	→	gʊ.<u>ŋa**ŋ**</u>**.ŋ**an	'they shouted'
d.	/gʊ-RED-nɔŋ/	→	gʊ.<u>nɔ**n**</u>**.n**ɔŋ	'they did on purpose'
e.	/ɟɪ-kkan mɪɲ/	→	ɟɪk.ka**m m**ɪɲ	'you made trouble'
f.	/ɛfaŋ mʊɟak/	→	ɛ.fa**m m**ʊ.ɟak	'be smarter'

It can be inferred from the data that in Eegimaa, both $*NC_{son}$ and *GEM are ranked below NPA. But let us take a closer look at these data. In each of the examples above, the coda and the following onset become identical and these may look like instances of complete assimilation. But per the definition offered earlier on what complete assimilation entails, these cases need to be considered as instances of place assimilation since place alternation is the only change involved.

Mention has been made earlier that in Eegimaa, the only scenario where a nasal consonant can be dropped is when it is followed be a geminate. Examples are offered in (256).

(317) Nasal deletion before geminates

a.	/nɪ-RED-ccam/	→	nɪc.cac.cam	'I paid'
b.	/nʊ-RED-ggɔɲ/	→	nʊg.gɔg.gɔɲ	'you dominated'
c.	/na-RED-ggan/	→	nag.gag.gan	's/he told'
d.	/na-RED-ɟɟam/	→	naɟ.ɟaɟ.ɟam	's/he is skillful'
e.	/gʊ-RED-bbaɲ/	→	gʊb.bab.baɲ	'they returned (went back)'
f.	/gʊ-RED-ffaŋ/	→	gʊf.faf.faŋ	'they locked'

The deletion of consonants before geminates has been argued to be motivated by a ban on complex onsets and complex codas word internally, and it has been shown that in Eegimaa this restriction is strictly obeyed. Exactly like in the cases regarding the deletion of voiced obstruents before geminates, the deletion of a nasal coda before a geminate does not affect the mora borne by the nasal. The first component of the geminate moves to the coda position to host the mora, whereas the second componant of the geminate still remains the onset of the following syllable. For an illustration of the crutial ranking between *COMPLEX and MAX-BR$_{\mu}$, please see tableau (209).

Summarizing the discussion of complete assimilation, let me note, once again, that in Eegimaa, completely nasal assimilation is driven by two distinct phonetic mechanisms (voicing and sonority) and therefore, two different constraints are needed to describe this process. The first constraint (*NC̥) forbids nasal-voiceless obstruent sequences and the second constraint (*NC̞) bans any combinations between a nasal and an approximant. As it has been shown in this chapter, both NC̥ and NC̞ clusters are dispreferred in many languages. I have surveyed some of the strategies used to repair these clusters. In Eegimaa, completely assimilation is used to resolve these clusters. In languages such as Maasai, Kikuyu, Chindali and Yao, the spreading of the [+voice] feature of the nasal to the following voiceless stop is exactly motivated by the need to avoid NC̥ sequences. However, postnasal voicing does not occur in Eegimaa since the voicing specification of the onset is always maintained. The voicing faithfulness in the onset can be attributed to a high-ranking constraint preserving the features of the onset. This constraint is IDENT ONSET; a positional faithfulness constraint which requires onsets in the output to retain the feature specifications of their input correspondents. This constraint also disfavors progressive assimilation since onsets in the output have to be featurally faithful to their input correspondents.

(33) IDENT ONSET: The features of an output segment in onset position must be faithful to its input correspondent (Lombardi 1999).

The voicing of the voiceless obstruent onset to avoid a violation of *NC̥ is certainly not the best strategy since it leads straight to a violation of the undominated IDENT ONSET constraint. The tableau in (257) is illustrative of the high-ranked status of IDENT ONSET in Eegimaa.

(318) Onset voicing banned by IDENT ONSET

Input: /gʊ-tɪɲ-tɪɲ/	*NC̞	*NC̥	NPA	IDENT ONSET	IDENT-IO (F)
a. ☞ gʊ.ƫɪ**t.t**ɪɲ					***
b. gʊ.tɪn.tɪɲ		*!			*
c. gʊ.tɪɲ.tɪɲ		*!	*		
d. gʊ.tɪɲ.ɟɪɲ				*!	**

In (257d), the onset of the third syllable is unfaithful to the underlying laryngeal specification of its input correspondent and this violation is fatal. Lombardi (2001) notes that IDENT ONSET always ensures regressive assimilation. She adds that progressive assimilation is only possible when this constraint is outranked by other constraints and according to Borowsky (2000) the constraint acting in favor of progressive assimilation is IDENT WORD-LARYNGEAL (IDWD-LAR). This constraint requires the output to retain all the laryngeal features of the base.

(319) IDWD-LAR: The laryngeal features of the base must be preserved.

Progressive assimilation in Eegimaa is only found in the case of vowel harmony. With consonants, assimilation is always a regressive process, which suggests that in this language, IDWD-LAR is ranked below IDENT ONSET.

(320) Progressive assimilation blocked by IDENT ONSET

Input: /gʊ-tɪɲ cab/	*NC̩	*NC̥	NPA	IDENT ONSET	IDENT-IO (F)	IDWD-LAR
a.☞gʊ.ƫɪ**c**. **c**ab				*	***	*
b. gʊ.tɪɲ. cab		*!				
d. gʊ.ƫɪɲ. ɟab				**!	*	*

If IDWD-LAR were ranked above IDENT ONSET, the surface candidate would be gʊ.ƫɪɲ.ɟab. But, this form is ungrammatical and the ungrammaticality is due to the change in the featural specifications of the onset of the third syllable. The optimal candidate satisfies the three markedness constraints and minimally violates the faithfulness constraint IDENT ONSET, but violates IDENT-IO(F), and IDWD-LAR. These latter two faithfulness constraints are low-ranked, since in Eegimaa featural specifications of codas always have to be violated in order to satisfy the high-ranked assimilation constraints.

Hyman (2001) offers the following preference hierarchy regarding NC combinations. His hierarchy shows that nasal-voiced stop sequences, which he notates as ND, are the preferred sequences, followed by nasal-voiced fricative (NZ) and nasal-voiceless stops (notated as NT). He argues that nasal-voiceless fricative (NS) sequences are the least preferred. The symbol ⊃ reads 'better than'.

(321) NC preference hierarchy

ND ⊃ NZ ⊃ NT ⊃ NS

We have seen in this chapter that some languages opt for nasal deletion before continuant sounds. Whether nasal deletion before voiceless fricatives is motivated by continuancy or just frication is a source of debate. Foley (1977) maintains that continuancy is actually what is driving nasal deletion. His position is not shared by Tuttle (1991) according to whom the loss of nasal consonants before voiceless fricatives is caused by two factors which are voicelessness and frication. An experiment conducted by Ohala and Busà (1995) reveals that nasals are harder to detect when they are followed by a voiceless fricative but clearly perceived when they are followed by a voiced fricative. Actually in their experiment, their participants were unable to detect the nasal when it precedes [s] and [θ] but are able to clearly hear it when it precedes [z] and [t]. Their results suggest that the [continuant] feature, at least in this case, does not motivate the nasal loss. The voicelessness by itself does not motivate the loss of the nasal either; otherwise the nasal would not have been perceivable before the sound [t]. The nasal loss is therefore attributable to a combined effect of continuancy and voicelessness.

In Eegimaa, ND is the only type of combination allowed. All the other combinations in the hierarchy are equally discouraged and words borrowed from other languages which happen to have any of those combinations follows an adaptation process whereby the NC sequence is turned into a CC geminate.

NÇ sequences are also not allowed in many languages. More research definitely needs to be done to see where this type of combination fits in the hierarchy above.

However, an NC preference hierarch in Eegimaa shows that NÇ as well as NZ, NT and NS are all banned.

(322) NC preference hierarchy in Eegimaa

ND ⊃ *NZ, *NT, *NS, *NÇ

5.4 Nasal assimilation in Eegimaa and Joola Fogny: a comparative study

One of the central claims made by OT is that all constraints are universal and that the difference among languages lies in the way they rank the constraints (Prince and Smolensky 1993). In Eegimaa, as shown above, the constraint which bans nasal-voiceless obstruent clusters is high-ranked and its violation is always fatal. But in the very closely related language, Joola Fogny, nasal-voiceless obstruent clusters are allowed. After an analysis of Eegimaa nasal assimilation and a discussion of the constraints which account for both partial and complete assimilation, I devote this section to a comparison between Eegimaa and Joola Fogny to see how these two languages differ in terms of their NC requirements and how the different ranking of constraints accounts for these differences. Let us examine the data below.

(323)	Inputs	Joola Fogny	Joola Eegimaa	
a.	/kʊ-RED-**f**aŋ/	kʊ.<u>fa**ɱ**</u>.**f**aŋ	gʊ.<u>fa**f**</u>.**f**an	'they surpassed'
b.	/nɪ.ra**m p**ɛ/	nɪ.ra**m p**ɛ	nɪ.rɛ**p p**ɛ	'I drank all'
c.	/na.RED.**s**ɛn/	na.<u>sɛ**n**</u>.**s**ɛn	na.<u>sɛ**s**</u>.**s**ɛn	's/he gave'

Joola Fogny allows both NÇ̥ and NÇ̬ sequences, the only requirement being that both sounds must share the same place feature and it is the nasal which is required to take the place feature of the obstruent. In Joola Fogny, voicing therefore does not influence the assimilation process. (263) below provides additional data which exhibit both NÇ̥ and NÇ̬ sequences on the surface, in Joola Fogny.

(324) Further data on nasal place assimilation in Joola Fogny

a.	/pan kujaw/	→	pa**ŋ.k**u.jaw	‘they will go’
b.	/kʊ-RED-kan/	→	kʊ.ka**ŋ.k**an	‘they did’
c.	/nɪ-RED-pɔɲ/	→	nɪ.pɔ**m.p**ɔɲ	‘I am full’
d.	/kʊ-RED-tɪŋ/	→	kʊ.tɪ**n.t**ɪŋ	‘they cut’
e.	/kʊ-RED-cɪn/	→	gʊ.cɪ**ɲ.c**ɪn	‘they inhabited’
f.	/kʊ-RED-bɛŋ/	→	kʊ.bɛ**m.b**ɛŋ	‘they met’
g.	/kʊ-RED-ɟʊm/	→	kʊ.ɟʊ**ɲ.ɟ**ʊm	‘they stood’
h.	/kʊ-RED-gam/	→	kʊ.ga**ŋ.g**am	‘they argued’

As in Eegimaa, this featural change can be interpreted as resulting from a domination of (NPA) over (IDENT-IO(F)). Tableau (264) illustrates this domination.

(325) Nasal place assimilation in Joola Fogny: NPA >> IDENT-IO(F)

Input: /kʊ-RED-kan/	NPA	IDENT-IO(F)
a.☞kʊ.ka**ŋ.k**an		*
b. kʊ.kan.kan	*!	

Candidate (264a), the optimal candidate, satisfies the requirements of NPA, since the nasal [ŋ] and the voiceless velar [k] are homorganic, but contains an NC̥ cluster. Note that in both Eegimaa and Joola Fogny, NPA outranks IDENT-IO(F). The existence of many cases of NC̥ sequences in Joola Fogny shows that in this language, the constraint which forbids such sequences is low-ranked.

(326) Nasal place assimilation in Joola Fogny: NPA >> *NC̥, IDENT-IO(F)

Input: /kʊ-RED-kan/	NPA	*NC̥	IDENT-IO(F)
a. ☞kʊ.ka**ŋ**.**k**an		*	*
b. kʊ.kan.gan	*!		*
c. kʊ.kan.kan	*!	*	

Candidate (265b) contains an NC̬ cluster and therefore satisfies *NC̥. However, the nasal does not have the same place feature as the voiced obstruent and this constitutes a violation of the high-ranked NPA which, in Joola Fogny, is crucially ranked above *NC̥. In Eegimaa, as previously discussed, both constraints are equally high-ranked and a violation of either is fatal.

Candidate (265b) also has one additional problem. If you look at the onset of the third syllable, you will certainly notice that it is altered and does not faithfully mirror its input correspondent. This is a violation of IDENT ONSET. In Joola Fogny, this constraint is also undominated and therefore output segments in onset position always preserve the feature specifications of their input correspondents.

(327) Progressive assimilation also banned in Joola Fogny

Input: /kʊ-RED-kan/	NPA	IDENT ONSET	*NC̥	IDENT-IO(F)
a.☞kʊ.<u>kaŋ</u>.**k**an			*	*
b. kʊ.<u>kan</u>.gan	*!	*		*
c. kʊ.<u>kaŋ</u>.gan		*!		**
d. kʊ.<u>kan</u>.kan	*!		*	

A quick comparison between the candidates reveals that the winning candidate has to satisfy both NPA and IDENT ONSET, which is exactly what the candidate in (266a) did. This shows that in Joola Fogny, both constraints are also equally ranked.

A crucial observation to be made while comparing nasal assimilation between Joola Fogny and Eegimaa is that in Joola Fogny, nasal assimilation is only partial while Eegimaa allows both partial and complete assimilation depending on which consonant follows the nasal. Complete assimilation is not permitted in Joola Fogny, which can be understood as following from a requirement that codas be nasal.

(328) **NASAL CODA**: A coda must be a nasal (Broselow: 2003).

In many languages, the type of consonants which can occur in coda position is subject to restriction. Some languages only allow a very specific type of consonant in coda position and Joola Fogny is one of those languages. In this language, only nasals are allowed in a word medial coda. Many other languages do not allow any codas at all. An example of such a language is Boumaa Fijian (Dixon 1988).

The interaction between NASAL CODA and NPA is quite obvious in the sense that the former requires codas to be nasals whilst the latter demands the nasal to be featurally linked to the next consonant and as we have just seen, place assimilation is highly valued in Joola Fogny. NPA therefore takes the demands of NASAL CODA one step further to require the coda to have the same place feature as the following consonant. As can be seen from tableau (268), both constraints have to be satisfied for a candidate to win. Although place assimilation does not violate NASAL CODA (the nasal feature is still preserved), complete assimilation does because the resulting segment is a consonant which is identical to the following onset.

(329) Only nasals are allowed in coda position in Joola Fogny

Input: /kʊ-RED-kan/	NPA	NASAL CODA	*NC̥	IDENT-IO(F)
a.☞kʊ.<u>kaŋ</u>.kan			*	*
b. kʊ.<u>kan</u>.kan	*!		*	
c. kʊ.<u>kak</u>.kan		*!		**

The candidate in (268c) satisfies NPA since complete assimilation involves both place and manner assimilation. However, this candidate is ruled out by NASAL CODA. We have seen that Eegimaa allows both homorganic nasals in word medial codas as well as any other consonant, provided that such a consonant is identical to the next onset. Obviously, in Eegimaa, NASAL CODA must be strictly dominated by both *NC̥ and *NC̝ since these two constraints are the ones responsible for complete assimilation. The fact that Joola Fogny allows NC̥ clusters also shows that in this language NASAL CODA dominates *NC̥. This is also illustrated in tableau (268) where the successful candidate violates both *NC̥ and IDENT-IO(F) to avoid violations of the higher-ranked NPA and NASAL CODA.

Eegimaa and Joola Fogny show a different ranking of NASAL CODA and *NC̥. In Joola Fogny, NASAL CODA is ranked above *NC̥, whereas in Joola Eegimaa it is the other way around. Tableaux (269) and (270) illustrate this difference. Note that for the purpose of this comparison, I deliberately chose to ignore the continuancy rule in Eegimaa which requires obstruents to become continuants after a vowel. This rule does not apply in Joola Fogny.

(330) Joola Fogny: NASAL CODA >> *NC̥

Input: /kʊ-RED-cɪn/	NPA	NASAL CODA	*NC̥	IDENT-IO(F)
a.☞ kʊ.<u>cɪ**ɲ**</u>.**c**ɪn			*	*
b. kʊ.<u>cɪn</u>.cɪn	*!		*	
c. kʊ.<u>cɪc</u>.cɪn		*!		

(331) Joola Eegimaa: *NC̥ >> NASAL CODA

Input: /gʊ-RED-cɪn/	NPA	*NC̥	NASAL CODA	IDENT-IO(F)
a. gʊ.<u>cɪ**ɲ**</u>.**c**ɪn		*!		*
b. gʊ.<u>cɪn</u>.cɪn	*!	*		
c. ☞ gʊ.<u>cɪ**c**</u>.**c**ɪn			*	**

*NC̥ is a low-ranked constraint in Joola Fogny but a high-ranked constraint in Eegimaa. Therefore, in Eegimaa, the candidate *kʊ.cɪɲ.cɪn*[48] which is the surface candidate in Joola Fogny is ruled out by *NC̥ and the candidate *gʊ.cɪc.cɪn* which fatally violates NASAL CODA in Joola Fogny is the winner in Eegimaa.

A phenomenon which is really noteworthy is the seemingly different effects of the anti-deletion constraint, MAX-IO$_{\mu}$ in Joola Fogny. We saw in (263a-g) that in Joola Fogny, the nasal place-assimilates to the following consonant. In these cases, deletion of the nasal to avoid a violation of feature faithfulness does not occur. So, MAX-IO$_{\mu}$ appears to be a high ranked constraint in Joola Fogny and this is illustrated in (271).

(332) Joola Fogny: no nasal deletion before a voiceless obstruent

Input: /kʊ-RED-kan/	NPA	NASAL CODA	MAX-IO$_{\mu}$	*NC̥	IDENT-IO(F)
a.☞kʊ.ka**ŋ**.**k**an				*	*
b. kʊ.kan.kan	*!			*	
c. kʊ.kak.kan		*!			
d. kʊ.ka.kan			*!		

Candidate (271d) is ruled out by the anti-deletion constraint and the optimal candidate satisfies the two markedness constraints, NPA and NASAL CODA, as well as the faithfulness constraint MAX-IO$_{\mu}$. So far we do not have evidence of crucial ranking between our two markedness constraints and MAX-IO$_{\mu}$ in Joola Fogny and if

[48] Note the difference in the subject marking between Joola Fogny and Joola Eegimaa. In Joola Fogny, the third person plural pronoun is *kɔ~bʊkɔ* (Sapir 1965) whereas in Eegimaa, this pronoun is *bʊgɔ*. These forms are free subject markers in both languages. Their corresponding bound subject markers are *kʊ-* in Joola Fogny and *gʊ-* in Eegimaa.

the discussion ended here, the reader would be left with the assumption that in this language these three constraints are equally high ranked. However, the data below from Sapir (1965) show that nasals are deleted before approximants, which suggests that MAX-IOμ must be dominated.

(333) Nasal deletion in Joola Fogny

a.	na-laɲ-laɲ	→	na.la.laɲ	'they returned'
b.	na-jɔken-jɔken	→	na.jɔ.ke.jɔ.ken	's/he tires'
c.	na-waɲ-a:m-waɲ	→	na.wa.ɲa:.waɲ	'I cultivated'

The sequences nasal-liquid and nasal-glide are all forbidden and since complete assimilation is also banned by the coda condition, the nasal has no other option than to elide. This provides evidence that in Joola Fogny, both NASAL CODA and *NÇ are ranked above MAX-IOμ. The tableau in (273) illustrates this ranking.

(334) Nasal deletion before an approximant in Joola Fogny: *NÇ >> MAX-IOμ

Input: /ku-laɲ-laɲ/	NPA	NASAL CODA	*NÇ	MAX-IOμ	IDENT-IO(F)
a.☞ ku.la.laɲ				*	
b. ku.laɲ.laɲ	*!		*		
c. ku.lan.laɲ			*!		*
d. ku.lal.laɲ		*!			**

If MAX-IOμ were ranked above *NÇ, candidate (273c) would be the winner, since the nasal actually assimilates to the place of the lateral approximant. The winning candidate satisfies NPA, *NÇ and NASAL CODA and violates MAX-IOμ. Thus, in this case, the violation of MAX-IOμ is legitimate since it is lower-ranked. The insertion of a segment to avoid the deletion of the nasal will also result in a violation of DEP-IO. In tableau (274), we have an illustration of the high-ranked status of DEP-IO in Joola Fogny.

(335) No insertion in Joola Fogny

Input: /ku-laɲ-laɲ/	NPA	DEP-IO	*NÇ̣	NASAL CODA	MAX-IOµ	IDENT-IO(F)
a.☞ ku.la.laɲ					*	
b. ku.laɲ.laɲ	*!		*			
c. ku.la.ɲi.laɲ		*!				
d. ku.lan.laɲ			*!			*
e. ku.lal.laɲ				*!		**

Earlier in this chapter, I have shown that in Eegimaa, nasals completely assimilate before voiceless obstruents and approximants because the sequences NÇ̥ and NÇ̣ are highly marked in this language. It has also been shown that in Joola Fogny NÇ̥ sequences are allowed. However, in both languages, NÇ̣ sequences are marked. The two languages resort to different strategies to satisfy the constraint banning NÇ̣ sequences. Eegimaa satisfies this constraint via complete assimilation while Joola Fogny uses nasal deletion, since complete assimilation results in a violation of the coda condition. Tableaux (275) and (276) demonstrate the different ranking of MAX-IOµ and NASAL CODA in both languages.

(336) Joola Fogny: NASAL CODA >> MAX-IOμ

Input: /ku-laɲ-laɲ/	NPA	*NÇ	NASAL CODA	MAX-IOμ	IDENT-IO(F)
a.☞ ku.la.laɲ				*	
b. ku.laɲ.laɲ	*!	*			
c. ku.lan.laɲ		*!			*
d. ku.lal.laɲ			*!		**

(337) Joola Eegimaa: MAX-IOμ >> NASAL CODA

Input: /ɛ-laɲ-laɲ/[49]	NPA	*NÇ	MAX-IOμ	NASAL CODA	IDENT-IO(F)
a. ɛ.la.laɲ			*!		
b. ɛ.laɲ.laɲ	*!	*			
c. ɛ.lan.laɲ		*!			*
d. ☞ɛ.la**l**.**l**aɲ				*	**

In Joola Fogny, NASAL CODA strictly dominates MAX-IOμ, whereas in Eegimaa it is MAX-IOμ which is ranked higher.

To summarize the discussion, I will highlight that the difference between Eegimaa and Joola Fogny in terms of nasal assimilation is attributable to the difference in the requirements of the coda condition in both languages. In Joola Fogny, a coda can only be a nasal homorganic to the following non approximant consonant. This requirement forces nasals to place-assimilate whenever they precede a non approximant consonant and to elide before an approximant. In Eegimaa, a coda can be either a nasal homorganic to the following voiced obstruent

[49] In Eegimaa, this word is a noun and refers to a variety of plant. We are more interested in the phonological process of assimilation rather than the semantic relation.

or any consonant identical to the following voiceless obstruent or approximant. To satisfy this requirement, nasals assimilate partially before voiced obstruents, since the language allows such sequences, and completely when the following consonant is not a voiced obstruent.

Joola Fogny allows both NC̥ and NC̬ sequences and bans NC̞ sequences, whereas in Eegimaa both NC̥s and NC̞s are banned and only NC̬s are permitted. The final ranking of the markedness constraints in both languages is provided in (277).

(338) Final ranking of markedness constraints

a. Joola Fogny

NPA, NASAL CODA, *NC̞ >> *NC̥

b. Eegimaa

NPA, *NC̥, *NC̞ >> NASAL CODA

The rankings above reveal both similarities and differences. In Joola Fogny as well as in Eegimaa, NPA, and *NC̞ are undominated. This certainly explains why in both languages nasals do not have independent place features and also the fact that neither language accepts *NC̞ sequences. The difference lies in the ranking of *NC̥ and NASAL CODA. In Joola Fogny, NASAL CODA is also undominated and therefore, this language only permits nasals as long as they have the same place feature as the following obstruent. Among the four markedness constraints I discussed, *NC̥ is the lowest-ranked in Joola Fogny and it is always violated to satisfy NPA and NASAL CODA.

However, in Eegimaa, *NC̥ is a high-ranked constraint and strictly dominates NASAL CODA. The fact that NASAL CODA is dominated by other constraints explains why this constraint is not enough to account for all the demands of coda conditions in this language.

5.5 Conclusion

The main objective of this chapter has been the discussion of the markedness constraints responsible for nasal assimilation in Eegimaa. One of the basic claims made in this chapter is that in Eegimaa, nasal assimilation results not from the coda condition but from a ban on certain sequences. I have shown that Eegimaa nasal assimilation is driven by three forces and I have used three constraints (NPA, *NC̥, and *NC̝) to account for this process. I have also claimed that in Eegimaa, complete assimilation is a process motivated not by one single phenomenon but by two distinct phonetically grounded forces. The analysis revealed that voicing and sonority are the two phenomena behind complete nasal assimilation in Eegimaa.

The interaction between markedness and faithfulness constraints has been apparent throughout the discussion. Nasal assimilation is always regressive because of a faithfulness constraint (IDENT ONSET) which requires onset to preserve all the features of their input correspondents.

This chapter has also provided more evidence in support of the argument according to which all constraints exist in the grammars of all languages but are ranked differently. Although Joola Eegimaa and Joola Fogny are closely related languages, they rank differently the constraint which bans nasal-voiceless obstruent clusters (*NÇ̻) and also the constraint which requires codas to be nasals (NASAL CODA). In Eegimaa, *NÇ̻ is a highly ranked constraint and therefore, its violation is forbidden. In Joola Fogny, this constraint is low-ranked since nasal-voiceless obstruent clusters are very frequent in this language. In Joola Fogny, NASAL CODA is a high-ranked constraint while in Eegimaa, this constraint is ranked below NPA, *NÇ̥, and *NÇ̞.

The comparison between Eegimaa and Joola Fogny is worth pursuing and the new challenge would be to provide an account for some of the communication hurdles, based on the different rankings of constraints.

6. Case study III: Vowel harmony

6.0 Introduction

Vowel harmony is a process whereby vowels in a word share one (or more) articulatory feature (Batibo 2000). This process is characteristic of the phonology of many African languages, especially those in the West Atlantic branch of the Niger-Congo phylum. Languages which exhibit vowel harmony divide their vowel inventories into different sets, depending on the harmonizing feature, and only vowels from the same set are allowed to co-occur. Eegimaa displays two types of vowel harmony: ATR harmony and backness harmony. Before getting into the proper discussion of Eegimaa vowel harmony and how it will be couched in OT, I will tour some of the approaches proposed for the description of vowel harmony to show where Eegimaa vowel harmony fits in.

6.1 Theoretical background

In the phonology literature, languages which display vowel harmony are grouped into three categories, depending on which part of the word controls vowel harmony. Some languages are described as having a *stem-controlled system*, others are said to have a *dominant-recessive system* while other languages are described as having an *affix-controlled system* (Krämer 2002, 2003).

6.1.1 Stem-controlled harmony

A language is described as having a stem-controlled vowel harmony system when the stem is the part of the word which hosts the harmonic feature (Bakovic

2000). In other words, the stem underlyingly contains a harmonic feature which, on the surface, spreads toward the affixes. An example of a language with a stem-controlled system is Degema, an endangered Niger-Congo language spoken in Nigeria.

(339) Stem-controlled harmony in Degema (Kari)

a.	mama	'yawn (v)'	→	ɪ-márá	'yawn (n)'
b.	síré	'run (v)'	→	i-síré	'run (n)'
c.	sí	'be good'	→	ʊ-sí	'beauty'
d.	dér	'be long'	→	u-dér	'length'
e.	tɛβtɛ́β	'be short'	→	ɛ-tɛβtɛβ	'ones that are short'
f.	godó	'be long'	→	e-godó	'ones that are long'
g.	kambí	'be small'	→	ɔ-kambí	'one that is small'
h.	o-ɗumɗúm	'be blunt'	→	o-ɗumɗúm	'one that is blunt'
i.	dúw	'be soft'	→	duw-esé	'cause to be soft'
j.	sín	'climb'	→	sɪn-ɛsɛ́	'cause to climb'

6.1.2 Dominant recessive harmony

In a dominant-recessive system, the harmonic feature may occur in the stem or the affix. The vowel harmony process found in Joola Fogny is dominant-recessive. The data below show that in this language, vowel harmony can be triggered by the stem or the affix. For instance, the occurrence of the [+ATR] vowel [i] in the suffix in (279c) and in the stem in (279d) causes all the vowels in each word to change to their [+ATR] counterparts.

(340) Dominant recessive harmony in Joola Fogny

a.	baɟ-ɛn	→	baɟɛn	'cause to have'
b.	baɟ-ul	→	bɐɟul	'have from'
c.	ɛ-lɛb-i	→	elebi	'it is heavy'
d.	a-liːn-ɔla	→	ɐliːnolɐ	'our opposite-sex sibling'
e.	fʊ-moːm-af	→	fumoːmɐf	'the trunk'
f.	ɪ-kik-ɪ	→	ikiki	'I shave you'

6.1.3 Affix-controlled harmony

Stem-controlled and dominant recessive systems have long been thought of to be the only types of vowel harmony systems which exist among languages. Some linguists even exclude the possibility of vowel harmony being exclusively controlled by an affix. Anderson (1980) notes that there are no systems among languages in which the vowel harmony process is solely controlled by suffixes. Krämer (2002:3), who acknowledges the existence of languages in which vowel harmony is exclusively controlled by suffixes, also adds that that there are no systems in which harmony is entirely controlled by prefixes.

'*Prefix controlled harmony is unattested so far, as is triggering by prefixes in dominant recessive harmony*' (Krämer 2002:3).

Krämer's claim echoes a long-held position in the vowel harmony literature. Hyman (2002) reports a 'limited' prefixed-controlled vowel harmony process in Kinande, a Bantu language spoken in the Democratic Republic of Congo. This system is indeed rare. However, contrary to prefix-controlled harmony, suffix-controlled harmony is well documented. Among languages which make use of this system is Turkana, an Eastern Nilotic language spoken in Kenya. As can be seen in the data in (280), in this language, the [ATR] value of the vowels in the root morpheme is entirely dependent on the [ATR] value of the vowel of the suffix.

(341) Suffix-controlled harmony in Turkana (Noske 2000)

a.	a-kɪ-dɔk	'to climb'	e-dok**-e:n**-e	's/he always climbs'
b.	a-k-ɪmʊj	'to eat'	a-k-imuj**-e:n**	'to eat regularly'
c.	a-dɛm-ar	'to takeaway'	e-dem**-e:n**-e	's/he always takes'
d.	a-kɪ-dɔk	'to climb'	e-dok**-e**	'way of climbing'
e.	a-k-ɪmʊj	'to eat'	e-k-imuj**-e**	'way of eating'
f.	a-dɛm-ar	'to take away'	e-dem**-e**	'way of taking
g.	a-ki-lep	'to milk'	a-lɛp-**ɔ**r	'to milk out'
h.	a-ki-gol	'to close'	a-gɔl-**ɔ**r	'to close out'
i.	a-ki-boŋ	'to return'	a-bɔŋ-ɔr	'to return to a place'

The prefix-suffix asymmetry observed in vowel harmony is also observed in other phonological phenomena and it is often attributed to what is known in the literature as stem-initial resistance effects (Hyman 2002). The initial segment of the stem tends to be more faithful to its underling correspondent than other segments and this explains why in assimilation processes, regressive assimilation is more common between the stem/root and the prefix, whereas between the stem/root and the suffix, assimilation may be bidirectional (Hyman 2005).

The three vowel harmony systems outlined above are all attested in the Senegalese languages. The vowel harmony system found in Wolof is a typical case of stem-controlled harmony since the stem and only the stem is the morpheme from where the harmonic feature spreads. Puular is an example of affix (suffix)-controlled harmony. The vowel harmony found in Eegimaa fits the dominant recessive description. The occurrence of a [+ATR] vowel either in the root or the suffix forces all vowels in the word to change to their [+ATR] counterparts.

6.2 ATR vowel harmony in Eegimaa

This is the most common and most productive type of vowel harmony in Eegimaa. As we mentioned in (95), repeated below as (281), in Eegimaa, vowels fall into two sets.

(342) ATR vowel sets

+ATR	-ATR
i	ɪ
u	ʊ
e	ɛ
o	ɔ
ɐ	a

These two sets are mutually exclusive, meaning that only vowels which belong to the same set are found within a word.

(343) Sample cases of ATR harmony in Eegimaa

a.	ɛmmɔrɛn	'to starve (trans)'
b.	abbʊsɛl	'a prince'
c.	bʊssana	'canoe'
d.	gɐfilol	'his/her stomach'
e.	gullinol	'his/her opposite sex siblings'
f.	emunduŋo	'hyena'

Note that [+ATR] is the stronger set. Which means that wherever a [+ATR] vowel occurs in a word, all the other vowels will change to their [+ATR] correspondents.

(344) Spreading of the [+ATR] feature

a.	/ba-ɟ**u**r-ɔl/	→	bɐɟurol	'his/her daughter'
b.	/sɪ-b**e**-ɔm/	→	siβeom	'my cows'
c.	/wa-**i**n-ɪl/	→	wɐinil	'their husbands'
d.	/ɛ-ban-ɐl**i**/	→	eβɐnɐli	'to finish early'
e.	/ba-ccam-ɐl**i**/	→	bɐccɐmɐli	'early payment'

Note that in Eegimaa, the vowels of the class markers are all underlyingly [-ATR]. Therefore, harmony is always triggered by a vowel in the stem or the suffix. There is one exception to the vowel harmony process. The vowel /a/ does not harmonize when it occurs in a word final syllable.

(345) Exception to Eegimaa ATR vowel harmony

a. a-kkuɟ-a/	→	ɐkkuʝa	'wrestler'
b. /ba-luɟ-a/	→	bɐluʝa	'extreme laziness'
c. /a-ssil-a/	→	ɐssila	'cook (n)'
d. /gʊ-ɟɟolo-aj/	→	guɟɟoloaj	'Jóola languages'
e. /ga-ssum-aj/	→	gɐssumaj	'peace'
f. /bʊ-gut-ak/	→	buɣuʈax	'maternity period'

In many languages, the vowel /a/ is reported to resist harmony. In the Turkana data in (280), [+ATR] feature does not spread to all the vowels in the word *a-k-imuj-e:n* 'to eat regularly'. The prefix *a-* does not undergo harmony. In this language, the vowel /a/ is also opaque to ATR harmony, the reason being that the language does not have a [+ATR] counterpart for /a/. Therefore, this vowel occurs with either set. More data showing the neutral status of /a/ in Turkana are provided in (285).

(346) Exception in Turkana ATR vowel harmony (Noske 2000)

a. a-lim-un	'to tell'
b. a-gol-un	'to close in'
c. ɛ-ram**-e:n**-e	's/he always beats'
d. ɛ-ram**-e**	'way of beating'
e. ɛ-cal**-e**	'noise, screaming'

In (285c) - (285e), the vowel /a/ does not just resist ATR harmony, it blocks it and consequently, the preceding vowel is not affected.

In Akan, although the vowels /a/ and /ɛ/ have [+ATR] correspondents, they occur with either set, thereby violating harmony (O'Keefe 2003).

(347) Exceptions in Akan ATR vowel harmony

a.	bisa	→	'ask'
b.	kura	→	'hold'
c.	sekan	→	'knife'
d.	pinkʲɛ	→	'come close'
e.	nʲinsɛen	→	'be pregnant'

In Eegimaa, there is however an exception to the exception in (284). There do exist situations in which final /a/ conforms to ATR harmony. When the preceding syllable already contains the vowel /ɐ/, the vowel /a/ undergoes harmony. In §5.4, I mentioned the existence of a constraint in Eegimaa which forbids a sequence of sillables containing the vowels /a/ and /ɐ/. Such a restriction which holds at the phonological level is also strictly observed at the phonetic level. This explains why in the words below, the suffixes -a, -aj and -ax which are not affected in (284), undergo vowel harmony.

(348) [+low, +ATR] in word-final syllable

a.	/a-lɐmb-a/	→	ɐlɐmbɐ	'traditional healer'
b.	/ʊ-kɐl-i-a/	→	uxɐllɐ	'drunkards'
c.	/sɪ-lɐk-aj/	→	silɐxɐj	'leavestalk'
d.	/fʊ-gɐt-ak/	→	fuɣɐt̬ɐx	'skein of cotton thread'
e.	/ga-gɐbɐl/	→	gɐɣɐβɐl	'water lily'

f.	/ba-kɐlɐ/	→	bɐxɐlɐ	'small rats'
g.	/ʊ-bɐkk-ɛn-a/	→	uβɐkkena	'rollers'

In (287g), vowel harmony fails to apply to /a/and to better understand why it does not apply, we need to consider a parameter known in phonology as *adjacency*. The concept of adjacency plays an important role in phonological analysis and many processes are reported to only apply when the trigger and the target are contiguous or, at the very least, located in contiguous syllables (Odden 1994, Berry 1998). In vowel harmony, the adjacency parameter is defined as follows:

(349) Adjacency parameter: Two vowels V_1 and V_2 are considered adjacent iff they are located in adjacent syllables.

From the definition above, it becomes clear why harmony does not reach the final vowel in (287g). In this particular case, the two low vowels are not adjacent. There is an intervening vowel and this erases the context suitable for [+ATR] feature to spread to the final vowel.

The hypothesis of *Tongue Root Advancing* has been put forward in the description of vowel harmony in African languages by Berry (1957), although it is given more strength by Stewart (1967). In his paper, Stewart argues against the *tongue raising hypothesis* which, at that time, was one of the dominant hypotheses used to describe vowel harmony in African languages. He points out that the absence of consistent tongue height in the production of vowels makes the tongue raising hypothesis inadequate to account for vowel harmony. Sapir (1965) uses the *tense / lax hypothesis* to describe vowel harmony in Jóola Fogny. Steward also finds this hypothesis problematic. He shows that in some languages, for instance Akan, back vowels which belong to [+ATR] tend to be lax and therefore, the tense / lax hypothesis cannot provide an accurate account for the type of vowel harmony displayed by many African languages. He argues that tongue root advancing hypothesis does account for all the phonetic phenomena associated with vowel harmony in many African languages. Today, this hypothesis is still widely popular in the description of vowel harmony, not just in African languages, but also in many languages outside Africa.

In languages which display ATR harmony, the two vowel sets are also further differentiated by height. The [+ATR] vowels are higher in the vowel space than their [-ATR] counterparts. This led some researchers to claim that in these languages, vowel harmony is motivated by both [ATR] and [height] features and consequently, the term *Cross-Height Vowel Harmony* (CHVH) is sometimes used to characterized this type of vowel harmony. Stewart (1971:198) provides clarifications on what can be considered as CHVH and in his terms, a vowel harmony system is cross-height if:

"*on the basis of the harmony, the vowels of the language in question can be divided into two mutually exclusive sets such that (i) the tongue positions of the vowels of one of the sets are high in relation to the tongue positions of their counterparts in the other set, but (ii) the tongue position of at least one member of the relatively high set is lower than the tongue position of at least one member of the relatively low set.*"

Eegimaa, like all the other West African languages with ATR harmony, fits perfectly the description above. However, it should be noted that in these languages, what is driving harmony is not the feature [high]. The height discrepancy between the vowels in each harmonizing set makes any account of vowel harmony on basis of tongue height really problematic. For instance in the word *gɐfilol* 'his/her stomach', the three vowels are produced at different height positions and therefore they are in height disharmony. But when it comes to the feature [ATR], they are all [+ATR]. Vowel harmony in West African languages is best captured via a ATR hypothesis and this is the approach assumed in the discussion of Eegimaa vowel harmony.

6.3 Backness vowel harmony in Eegimaa

Another type of vowel harmony found in Eegimaa is backness harmony. This process only holds between the vowels of the class markers and those of the root. High front vowels of class markers become high back when they are attached to a root morpheme whose first vowel is back. Sagna (2008) analyzes this process as 'height harmony'. I hope he meant backness harmony because there is no height harmony in the process he describes. The examples in (289) show agreement between the class marker and the first syllable of the root in terms of the feature [back].

(350) Sample cases of backness harmony

a. /fɪ-ɛɲ/	→	fɪɛɲ	'moon'
b. /fɪ-ɟɔɟ/	→	fʊʝɔʝ	'meeting'
c. /bɪ-llɛf/	→	bɪllɛf	'nest'

d. /bɪ-sol/	→	busol	'back'
e. /sɪ-be/	→	siβe	'cows'
f. /sɪ-mori/	→	sumori	'dreams'
g. /sɪ-ɟimor/	→	siɟimor	'forgetting'

Notice that backness harmony occurs concurrently with ATR harmony.

6.4 An OT account for Eegimaa vowel harmony

Vowel harmony is a feature agreement relation which holds between vowels within a word and OT provides tools for handling this agreement process. Bakovic (2003) proposes a general constraint which requires vowels to share the same feature.

(351) AGREE[±hf]: Adjacent segments must have the same value of [±hf] (Bakovic2003).

The constraint which require vowel to share the same [ATR] feature is a derivative of this general constraint.

(352) AGREE [αATR]: Adjacent segment must have the same value of [αATR].

It has been shown in the data that the occurrence of a [+ATR] in the root or the suffix forces all vowels in the word to become [+ATR]. This shows that AGREE [αATR] is ranked above IDENT-IO [F] which, in this case, wants outputs to keep the [ATR] specification of their input correspondents (IDENT-IO [αATR]).

(353) IDENT-IO [αATR]: The ART specification of a vowel in the input must be retained in the output.

An illustration of the ranking of AGREE [αATR] over IDENT-IO [αATR] is offered in the following tableau.

(354) AGREE [αATR] >> IDENT-IO [ATR]

Input: /sɪ-be/	AGREE [αATR]	IDENT-IO [α ATR]
a. ☞siβe		*
b. sɪβe	*!	

In (293a), the vowel of the class marker takes on the [+ATR] value of the vowel of the root and this goes against the requirement of the feature identity constraint. But this violation is less serious than a violation of AGREE [αATR]. The problem with (293b) is that the vowels of this candidate have different values for [ATR] and this violates AGREE [αATR].

I have shown in (284) that the vowel /a/ is opaque to harmony when it occurs in the final syllable of a word. The existence of such cases means that there is a constraint ranked above AGREE [αATR] which prevents the vowel /a/ from undergoing harmony only when it occur in word-final syllable. Such a constraint is *[+low, +ATR /___]$_{W\sigma}$], which I adapted from Bakovic (2003).

(355) *[+low, +ATR /___]$_{W\sigma}$]: A segment must not be simultaneously specified for [+low] and [+ATR] when it occurs in the final syllable of a word.

(356) Partial ranking of constraints for Eegimaa ART harmony.

*[+low, +ATR /___]$_{W\sigma}$] >> AGREE [αATR] >> IDENT-IO [αATR]

This ranking is illustrated in the tableau in (296).

(357) Vowel /a/ opaque to ART harmony

Input: /ga-ssum-aj/	*[+low, +ATR /__]$_{W\sigma}$]	AGREE [αATR]	IDENT-IO [αATR]
a. ☞ gɐs.su.maj		*	*
b. gɐs.su.mɐj	*!		**
c. gas.su.maj		**!	

If AGREE [αATR] were undominated, the feature [+ATR] would have been shared by all vowels in the word. But this is not the case.

I mentioned earlier that [+ATR] is the stronger set and therefore it controls Eegimaa ATR vowel harmony. However, none of the constraints above are able to prevent a candidate like *gas.sʊ.maj* from surfacing since all vowels share the feature [-ATR]. Therefore, we need the additional constraints below, which are also members of the general constraint IDENT-IO [F].

(358) IDENT-IO [+ATR]: A [+ATR] feature in the input must be preserved in the output.

(359) IDENT-IO [-ATR]: A [-ATR] feature in the input must be preserved in the output.

For [+ATR] to be able to govern vowel harmony, IDENT-IO[+ATR] must be ranked above AGREE [αATR] which, in turn, is ranked above IDENT-IO [-ATR]. It is worth pointing out that IDENT-IO[+ATR] and *[+low, +ATR /__]Wσ] are not interacting. In Eegimaa, there are no cases where the vowel /ɐ/ surfaces as [a]. It always surfaces as [ɐ] while the vowel /a/ may change to [ɐ] or fail to undergo harmony depending on where it occurs in the word. These two constraints are therefore ranked equally.

(360) Semi-final ranking of the constraints for ATR harmony

*[+low, +ATR /___]Wσ], IDENT [+ATR] >> AGREE [αATR] >> IDENT [-ATR]

Illustration of the ranking above is provided in (300).

(361) [+ATR] controlled harmony in Eegimaa

Input: /ga-ssum-aj/	*[+low, +ATR /__]Wσ]	IDENT-IO [+ATR]	AGREE [αATR]	IDENT-IO [-ATR]
a. gas.su.maj			**!	
b. gɐs.su.mɐj	*!			**
c. ☞ gɐs.su.maj			*	*
d. gas.sʊ.maj		*!		

The ranking in (299) also takes care of the directionality of ATR vowel harmony. By ranking IDENT [+ATR], AGREE [αATR and IDENT [-ATR] respectively one above the other, the implication is that wherever a [+ATR] vowel occurs in a word, the other vowels will have to agree with it.

The constraints discussed thus far perfectly account for all cases of ATR vowel harmony in Eegimaa except the data presented in (287). There, I have shown that the vowel /a/ does undergo vowel harmony in word-final syllable when the penultimate syllable contains the vowel /ɐ/. To account for these cases, we need a constraint which requires low vowels in adjacent syllables to have the same value for [ATR] and such a constraint will have to dominate *[+low, +ATR /__]$_{W\sigma}$] in order for [+ATR] in the stem to spread to the suffix. This agreement constraint also holds between low vowels in the stem and in the prefix and it is defined in (301).

(362) ADJSYLL-AGREE ([+low], [+ATR]): Low vowels in adjacent syllables must have the same value for [ATR].

The final ranking of the constraints involved in Eegimaa ATR harmony is provided in (302) and illustrated in the following tableau.

(363) Final ranking of constraints in ATR harmony

ADJSYLL-AGREE ([+low], [+ATR])>> *[+low, +ATR /___]$_{W\sigma}$], IDENT [+ATR] >> AGREE [αATR] >> IDENT [-ATR]

(364) Final /a/ harmony

Input: /a-lɐmb-a/	ADJSYLL-AGREE ([+low], [+ATR])	*[+low, +ATR /__]$_{W\sigma}$]	IDENT-IO [+ATR]	AGREE [αATR]	IDENT-IO [-ATR]
a. alɐmba	*!*			**	
b. ☞ ɐlɐmbɐ		*			**
c. ɐlɐmba	*!			*	*

We have also seen in §6.3 that backness vowel harmony is required between classifiers which contain a high front vowel and root morphemes the first vowel of which is a back vowel. I propose the following constraint to account for this type of harmony.

(365) AGREE [+back, CL&[$_{R\sigma}$___]: Class markers and the initial syllable of the root must have the same feature of [+back].

This constraint outranks IDENT-IO[-back] which demands each vowel in the output to keep the [-back] feature specification of its input correspondent.

(366) IDENT-IO[-back]: The [-back] feature of each input segment must be preserved in the output.

ATR harmony and backness harmony co-occur and a candidate cannot succeed if it violates either constraint responsible for the occurrence of these processes. This means that AGREE [+back, CL&[$_{R\sigma}$___] and AGREE [αATR] are equally ranked. Note also that IDENT-IO [-ATR] and IDENT-IO[-back] are equally low-ranked. Below is an illustration.

(367) Co-occurrence of ART and backness harmony processes

Input: /sɪ-mori/	IDENT-IO [+ATR]	AGREE [αATR]	AGREE [+back, CL&[Rσ___]	IDENT-IO [-ATR]	IDENT-IO [-back]
a. ☞su.mo.ri				*	*
b. sʊ.mɔ.rɪ	*!*				*
c. sʊ-mori		*!			*
d. sɪ.mo.ri			*!		

6.5 Conclusion

A final note on Eegimaa vowel harmony is that the co-occurrence of the two processes demands the coming together of different hypotheses to provide a comprehensive account of the phenomenon. Earlier researches on vowel harmony, especially in African languages, proved to be more concerned with which approach provides a better account that they finally failed to appreciate how complex the phenomenon could be. For instance Berry (1957) and Stewart (1967) who propose analyzing Akan vowel harmony in terms of agreement on [ATR] features overlook the roundness harmony which also occurs in this language (O'keefe 2003). Eegimaa and Akan are just two examples of African languages which exhibit what Krämer (2003) refers to as *multiple feature harmony* since the vowels in a word agree in more than one feature. Dagaare (a Gur language spoken in Ghana), Chumburung (a Guang language also spoke in Ghana), and Igbo (one of the major national languages of Nigeria) are among other African languages reported to have multiple feature harmony systems (van der Hurlst and van der Weijer 1995).

General Conclusion

The objective of the present research has been to provide a description of the most common morphophonological processes in Eegimaa. I started with a quick background survey and provided sociolinguistic information that shows that the language being described is endangered. This dissertation therefore contributes to the documentation of Eegimaa which, in addition to being an endangered language is also understudied.

The analysis of the word structure revealed a complex noun classification system, in addition to the various affixes which serve both inflectional and derivational functions. We have seen that in Eegimaa, various affixes can be adjoined to form a new word. However, in the word formation process, the sounds found at morpheme boundaries frequently undergo changes. These sound changes, at times, render the study of the phonology challenging. In my research, I decided to supplement the theoretical approaches to some of the phenomena under consideration with experimental analyses and this allowed me to have a better appreciation of those phenomena. It has often been claimed that length is phonemic in Eegimaa but, the results of the experiment conducted on that topic have shown that what is often viewed as a segmental contrast is in fact a structural opposition and that in Eegimaa, tautosyllabicity is not allowed. In the debate concerning whether a disjunctive phoneme should be posited in the analysis of vowel ~ zero alternation, I adopted a different approach in which this alternation is perceived as resulting from the presence of a diacritic feature or lack thereof in the underlying forms of the words displaying such alternation. The diacritic feature approach which is widely accepted in generative phonology provides a more straightforward account for some of the puzzling processes which lead phonologists to resort to abstractness as the only possible analysis.

Another puzzling issue taken up in this research is the various sound changes resulting from reduplication. The analysis has shown that all these changes are attributable to the moraic specification of the sounds. The Moraic Theory has allowed a unifying account for these changes. A position explicitly taken in this study is that the mora, viewed by some as an abstract concept, does have phonetic manifestations and therefore can be studied objectively.

The study of Eegimaa nasal assimilation has given a better insight as to why in this language, nasals undergo different processes depending on the following consonant. The analysis revealed that the different changes which nasals are subject to are actually due to a forbiddance of certain NC structures. NC̥, NC̞ being not allowed, complete assimilation is utilized as a mechanism to avoid these structures from surfacing, whereas NC̬ which are allowed always have to share the same place of articulation and nasal place assimilation is exactly the process which ensures such place sharing. An interesting aspect revealed in this study is the interaction of moraicity and sonority in Eegimaa nasal assimilation. The moraic status of nasals protects them from deletion. However, they cannot be retained before approximants since this would violate the syllable contact law in this language. A resolution comes though complete assimilation.

What transpires from all the case studies undertaken in this research is that Eegimaa has strict restrictions on possible sound combinations. The various sound changes observed in this language are therefore strategies to avoid inadmissible structures. We have seen that this language only allows moraic sounds in word medial coda. However, these sounds always have to assimilation to the following onset because the only consonant sequences permitted in this language are geminates and NC̬s. Vowels have also shown a similar systematic pattern of change due to the requirement in this language that within a word, all the vowels must have the same value for ATR, and in some cases, the vowels are required to have the same values for both ATR and backness features.

More often than not, linguists find themselves locked up in arguments over which approach best fits for accounting a particular phenomenon. This research has shown how different approaches can be called for to explain the same phenomenon. For instance, we have seen that Eegimaa has a multiple feature harmony system. In order to have a comprehensive picture of vowel harmony in Eegimaa both ATR and backness hypotheses are needed.

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