

# Dzongkha Phonetic Set Description and Pronunciation Rules

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## Abstract

This paper describes the Dzongkha phonemic inventory that was defined during the Text Analysis process for Dzongkha Text-to-Speech System (TTS) prototype developed in collaboration with NECTEC, Thailand (Sherpa et al., 2008). About 56 unique phonemes were discovered covering four different classifications, viz., initial consonants, vowels, diphthongs and consonant clusters. These phonemes were transcribed using equivalent Latin representations. In the phonemic set, two tones were identified: first is the normal tone and the second one is the modification of the normal tone. The modified tone can be identified by a high or sharp tone. Following the importance of pronunciation of syllables and words, and its associated rules in TTS systems, some basic syllable-level pronunciation rules are also explored.

## 1. Introduction

Dzongkha is the official and the national language of Bhutan. It belongs to the Sino-Tibetan family of languages. The script used in writing Dzongkha is identical to the Tibetan script and is known as ‘Uchen’ script (van Driem and Tshering, 1998). The spoken form of Dzongkha is not only different from Tibetan but also the vocabulary set used are different from each other leaving very few exceptions. It can be rightly said that the relationship between the spelling of the written language and the actual pronunciation while speaking is not straightforward for both the languages as described by van Driem (1992).

In the phonetic set definition, it was found that spoken Dzongkha could be represented by 30 initial consonants, 5 clusters, 11 vowels and 10 diphthongs. Each of the phonemes are classified and defined along with some examples.

## 2. Phonemic Inventory Design

Each of the unique phonemes of the language is transcribed using relevant Latin string (Romanization) equivalent, as demonstrated in the following:

**a) Initial Consonants:** Thirty initial consonants can be accounted for in Dzongkha language. Table 1 depicts the list of thirty consonants in the traditional Dzongkha alphabetical order. Note that in the given example syllables, '0' indicates normal tone & '1' represents the high tone as described in part f) of Section 2.

IPA	Dzongkha Alphabets	Transcribed Phoneme Equivalent	Example Script	Romanized	Transcription based on the pronunciation
K	ཀ	<b>K</b>	དཀར་	d k r	k a r 0
Kh	ཁ	<b>Kh</b>	མཁར་	m kh r	kh a r 0
G	ག	<b>G</b>	དག་	d g hh	g a 0
N	ང	<b>Ng</b>	ངག་ སྒྲ་	ng g s ng n	ng a g 0 ng e n 1
tS	ཅ	<b>C</b>	བཅག་	b c g	c a g 0
tSH	ཆ	<b>ch</b>	ཚོག་	ch o g	ch o g 0
dZ	ཇ	<b>j</b>	མཇལ་	m j l	j e l 0
Ø	ཉ	<b>ny</b>	ཉལ་ སྟླ་	ny l s ny n	ny e l 0 n e n 1
T	ཏ	<b>t</b>	བཏར་	b t ng	t a ng 0
tH	ཐ	<b>th</b>	ཐབ་	th b	th a b 0
D	ད	<b>d</b>	གདོང་	g d o ng	d o ng 0
N	ན	<b>n</b>	ནོར་ སྟུམ་	n o r s n m	n o r 0 n a m 1
P	པ	<b>p</b>	པར་	p r	p a r 0
pH	ཕ	<b>ph</b>	ཕགས་	ph g s	ph a g 0
B	བ	<b>b</b>	བབ་	b b	b a b 0
M	མ	<b>m</b>	མིག་ མམགས་	m i g r m g p	m i g 0 m a p 1
Ts	ཅ	<b>ts</b>	གཅོང་	g ts ng	ts a ng 0
tsH	ཆ	<b>tsh</b>	ཚོལ་	tsh l	tsh e l 0
Dz	ཇ	<b>dz</b>	འཇོམས་	hh dz o m s	dz o m 0
W	མ	<b>w</b>	མ་ མང་	w w ng	w a 0 w a ng 1

Z	ཞ	zh	གཞུང་	g zh u ng	zh u ng 0
z	ཟ	z	ཟམ་	z m	z a m 0
ú	ཨ	hh	ཨོངས་	hh o ng s	hh o ng 0
j	ཡ	y	ཡལ་	y l	y e l 0
			གཡོག་	g y o g	y o l
..	ར	r	རིལ་	r il	r il 0
l	ལ	l	ལེན་	l e n	l e n 0
S	ཤ	sh	ཤིང་	sh i ng	sh i ng 0
s	ས	s	སངས་	b s ng s	s a ng 0
h	ཧ	h	ཧང་	h ng	h a ng 0
/	ཨ	@	ཨམ་	@ m	@ a m 0

Table 1. Initial consonant Inventory

The above table shows the transcription of the 30 initial consonants. Their corresponding phonetic representation is the equivalent Latin string counterparts. It is to be noted that the consonants contains the inherent vowel 'a'. Therefore, when there is no particular vowel, the vowel 'a' is appended to the root consonant of a syllable or word.

For example, the consonant letter ། is pronounced as 'k a 0' with an inherent vowel 'a', instead of a simple 'k'.

**b) Vowels:** Spoken Dzongkha has eleven vowels, including five basic vowels. See Table 2 below.

IPA	Vowel	Transcribed Phoneme Equivalent	Example Transcription Script	Romanized
a		a	ཨམ་ @ m	@ a m 0
i	ི	i	ཨིན་ @ i n	@ i n 0
u	ུ	u	གུ g u	g u 0
e	ེ	e	དེ d e	d e 0
o	ོ	o	ཨོམ་ @ o m	@ o m 0
ue		ue	གཡུལ་ g y u l	u e l 0

oe		oe	ཨོད་ y o d	y o e 0
aa		aa	ཨྱ་ a h h	@ a a 0
ii		ii	ཨྲི་ n h h i	n i i 0
uu		uu	བུལ་ b s d u w	d u u 0
oo		oo	ཨོལ་ b o l	b o o l 0

Table 2. Spoken Dzongkha vowel inventory

The vowels (excluding 'a') are written as diacritics, above or below the root letter or the main consonant letter. While pronouncing the vowels: **a** is pronounced like 'but', **i** is pronounced like 'fit', **e** is pronounced like 'May', **u** is pronounced like 'food' ().

Pronunciation of some vowels are modified when the root letter is combined with certain suffixes. Only a few number of suffixes and prefixes are available. While the prefixes before the root letters are not at all pronounced, certain suffixes are pronounced along with the root letters. And a handful of them modify the vowels associated with the root letter. Detail of vowel modification is given in Table 3 below.

V	Suffix										
	g	ng	n	b	m	r	l	p	d	s	h
o											
w											
e											
l											
a			e n				e l		e	e	
i											
u			ue n				ue l		ue	ue	
e											
o			e n				e l		e	e	

Table 3. Vowel Modification Table

The table depicts eleven suffixes. Suffixes **d**, **s**, & **hh** are not pronounced in a syllable while the rest are all pronounced. Very few vowels can be modified when combined with particular suffixes. Therefore suffixes **n**, **l**, **d** and **s**, with the vowels **a**, **u** and **o**, will modify the vowels in question.

For example, 'p l' is pronounced as 'p e l 0', not 'p a l 0' where by the vowel 'a' is modified to 'e' vowel.

c) **Diphthongs:** A total of ten diphthongs were identified for spoken Dzongkha as shown in Table 4.

IPA	Diphthong	Example Romanized Transcription Script
ai	ai	ཨའི་ @ hh i @ ai 0
au	au	ཨའུ་ @ hh u @ au 0
ae	ae	ཨའེ་ @ hh e @ ae 0
ui	ui	བུའི་ b u hh i b ui 0
oi	oi	མའི་ m o hh i m oi 0
ou	ou	ལྷོ་ l t o w t ou 0
eu	eu	རེུ་ r e hh u r eu 0
ei	ei	ལྷའི་ s d e hh i d ei 0
eo	eo	ཆེ་ ch e w ch eo 0
iu	iu	ཚེུ་ tsh i hh u tsh iu 0

Table 4. Mapping of Dzongkha Diphthongs

**Note:** It might be possible to find more diphthongs or vowels, for that matter, in the event of 'the growing text corpus' and its subsequent text analysis.

d) **Clusters:** Spoken Dzongkha has the following five consonant clusters. They are written with special letter conjuncts. For example, in cluster འྲ , letter 'r' is placed under the root letter 'g'.

IPA	Consonant Cluster	Example Romanized Transcription Script
d <sup>ː</sup>	dr	དྲ་ d g r dr a 0
t <sup>ː</sup>	tr	ཏྲ་ s k r tr a 0
tH <sup>ː</sup>	thr	ཏྲ་ th r thr a 0
lh	lhh	ལྷ་ l h lhh a 0
hr	hr	ཧྲ་ h r hr a 0

Table 5. Mapping of Dzongkha Clusters

**Note:** The letters are stacked over each other, i.e, the first (root) letter is usually stacked over the second letter.

e) **Final Consonants:** In Dzongkha there are only eight final consonants, see Table 6. They are the suffix letters that are actually pronounced along with the root consonant or letter.

IPA	Computer	Example Romanized Transcription Script
g	g	དག་ d g d a g 0
ng	ng	སྔ་ th u ng th u ng 0
n	n	ནོ་ d o n d e n 0
b	b	སྔ་བས་ s t b s t a b 0
m	m	འཚམ་ hh ch m ch a m 0
R	r	འཇུ་ hh j u r j u r 0
l	l	ལ་ ng l ng e l 0
p	p	གསར་ g s r p s a p 0

Table 6. Mapping of final consonants

f) **Tones:** Two tones were identified for the language, see Table 7 below. The low tone is the normal tone while the high tone (sharp) is the modification of the former tone. They are represented by '0' and '1' respectively. The high tone variation usually depends on the following:

- Combination of certain prefixes with the root letter
- Combination of certain head letter with the root letter (superscribed)
- The subjoined letter stacked under the root letter (subscribed)

But only a few head letters and a few subjoined letters when combined with particular root letters, will modify the tone of a syllable.

For example, the syllable ན་ is pronounced as 'n a ng 0' with normal tone. But by adding the head letter 's' to the the letter ན་ , the syllable is modified to 'n a ng 1'. ནླ་ is pronounced with a high tone.

Example	Romanized	Transcription
བང་	b ng	b a ng 0
དབང་	<b>d</b> b ng	<b>w</b> a ng 1
ནང་	n ng	n a ng 0
སྤང་	s n a ng	<b>n</b> a ng 1
བམ་	b m	b a m 1
ལྷམ་	<b>l</b> m	<b>l</b> a m 1

Table 7. Example syllables with Tones identified in Dzongkha Language

**Note:** In general, it can be noted that the combination of certain letters with the root letter affect the tone of the whole syllable or word.

### 3. Elements of a Dzongkha Syllable

A syllable is the basic unit of meaning or morpheme in Dzongkha. Syllables are normally delimited by a delimiter " | " known as the 'tsheg' bar or delimited by other punctuation. Because of this syllable delimiter there are no inter-word spaces in Dzongkha. One or more syllables form words. Each syllable contains a root letter (ming-zhi) and may additionally have any/or all of the following parts in the given order: prefix; head letter; sub-fixed letter; vowel sign; suffix and post-suffix. See Figure 1 below.

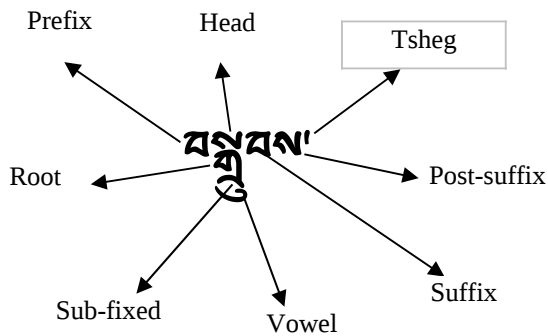


Figure 1. Elements of a Dzongkha Syllable

**a) Root letter:** The most vital letter in a syllable since it defines the sound of the syllable, it is the starting point for the sound of the syllable. Hence it is always pronounced first. Therefore identifying this letter is very important (<http://www.leartibetan.com>).

A letter in a syllable is always a root letter if:

1) It has a vowel,

e.g,

ཚོམ་	<b>ch oe s</b>	-pronounced as ' <b>ch oe 0</b> ' -root letter is ' <b>ch</b> ' with vowel ' <b>oe</b> '
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2) Or, it has a head letter (superscribed) or sub-fixed (subscribed) letter,

བསྟན་	<b>s ch oe s</b>	-pronounced as ' <b>ch oe 0</b> ' -root letter is ' <b>ch</b> ' with vowel ' <b>oe</b> '
ཞུམ་	<b>zh b m o</b>	-pronounced as ' <b>zh a m 0</b> ' -root letter is ' <b>zh</b> ' with sub-fixed letter ' <b>b</b> '

3) Or, in a two letter syllable with no explicit vowel, root letter is the first letter,

e.g,

ཤར་	<b>sh r</b>	-pronounced as ' <b>sh a r 0</b> ' -root letter is the first letter ' <b>sh</b> '
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4) Or, in a three letter syllable with no explicit vowel, root letter is usually the middle letter unless the last letter is the post-suffix letter. In which case sometimes the root letter is the first letter, or it is the second letter,

e.g,

རངས་	<b>r ng s</b>	-pronounced as ' <b>r a ng 0</b> ' -root letter is the first letter ' <b>r</b> '
མདུས་	<b>m d s</b>	-pronounced as ' <b>d e 0</b> ' -root letter is the second letter ' <b>d</b> ' with post-suffix ' <b>s</b> '

5) Or, in a four letter syllable with no explicit vowel, the second letter is the root letter.

e.g,

གསརས་	<b>g s r p</b>	-pronounced as ' <b>s a p 0</b> ' -root letter is ' <b>s</b> '
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**b) Head-letters:** Only three letters can be the head-letters. They are **r, l** and **s**.

1) The Ra-go letters:

ཀ་ ཁ་ ར་ ང་ ཅ་ ཉ་ ཏ་ ཐ་ ཋ་ ཌ་ ཌྷ་ ཎ་ ཏ་ ཐ་

-'r' can be allowed as head letter for only twelve letters; k, g, ng, j, ny, t, d, b, m, ts and dz.

-They are all pronounced the same as the root letters.

e.g, ཀ་ is pronounced as 'k a 0'.

2) The La-go letters:

ཀླ་ ཀྲ་ ཀྱ་ ཀླ་ ཀྲ་ ཀྱ་ ཀླ་ ཀྲ་ ཀྱ་ ཀླ་ ཀྲ་ ཀྱ་

-'l' can be allowed as a head letter for only ten letters; k, g, ng, c, j, t, p, b & h

-All except one are pronounced the same as the root letters. That is, ཀླ་ is pronounced as 'l h a 0'.

3) The Sa-go letters:

སྐ་ སྒ་ སྒྲ་ སྒྱ་ སྒྱ་ སྒྲ་ སྒྱ་ སྒྲ་ སྒྱ་ སྒྲ་ སྒྱ་ སྒྲ་

-'s' can be allowed as a head letter for only eleven letters; k, g, ng, ny, t, n, p, b, m and ts

-Most pronounced same as the root letters except for སྒྱ་ སྒྲ་ and སྒྱ་ , in this case each of the root letter's pronunciation is modified to that of a high tone.

**c) Sub-fixed (subscribed) letters:** Four letters; y, r, l and t are sub-fixed with few root letters as follows:

i) The Ya-ta letters: here the letter 'y' is the subscribed letter: རྩ་ རྩ་ རྩ་ རྩ་ རྩ་ རྩ་ རྩ་

རྩ་ and རྩ་ are pronounced as 'c a 0'

རྩ་ and རྩ་ are pronounced as 'ch a 0'

རྩ་ and རྩ་ are pronounced as 'j a 0'

ii) The Ra-ta letters: Here the letter 'r' is the subscribed letter.

འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་

འ་ འ་ འ་	tr a 0
འ་ འ་ འ་	thr a 0
འ་ འ་ འ་	dr a 0
འ་	nr a 0
འ་	mr a 0
འ་	shr a 0
འ་	sr a 0
འ་	hr a 0

Table 8: Pronunciation of the Ra-ta letters

**Note:** The ra-ta letters usually form clusters.

iii)The La-ta letters: Here the letter 'l' is the subscribed letter:

འ་ འ་ འ་ འ་ འ་ འ་

-All are pronounced as 'l a 1' except for 'འ་' which is pronounced as 'd a 0'

iv) Fifteen Wa-zur letters: Here the letter 'b' is the subscribed letter: འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་

འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་ འ་

-All are pronounced the same as the root letters.

**d) Prefixes:** These are unpronounced letters in the beginning of a syllable before the root letter. Though they are never pronounced, some of them modify the pronunciation of some root letters. There are five prefixes; g, d, b, m and h or ཀ་ ཏ་ ཐ་ ཋ་ ཌ་

ཐ་	m tsh o	-pronounced as 'ts o 0'
		-m is silent (this is because the root letter here is ts)

དབང་	<b>d b ng</b>	-pronounced as 'w a ng 1' -Here the root letter <b>b</b> 's pronunciation is modified to that of <b>w</b> 's and also the tone of the whole syllable is modified.
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**e) Suffixes:** These are the letters written after the root letters. Suffixes 'hh' and 's' are never pronounced. Pronunciation of the remaining suffixes depends on the combining root letters. That is, depending on the combining root letters those suffixes may or may not add their own sounds. There are ten suffixes; g, ng, d, n, b, m, hh, r, l and s or ག ས ཏ ན བ མ ཙ ཐ ལ ས

འཛིག་	<b>hh j i g</b>	-pronounced as 'j i g 0' -suffix <b>g</b> is pronounced along with root letter <b>j</b>
བཀག་	<b>b k g</b>	-pronounced as 'k a 0' -here suffix <b>g</b> is not at all pronounced

**Note:** As seen earlier, some suffixes are capable of modifying the vowel sound in a syllable. And all suffixes can combine with all thirty initial consonants (root consonants) to produce a word or a syllable.

**f) Secondary-suffixes:** These are letters that follow the suffix letters. They can also be called as post-suffixes. The letters 's' and 'd' are the post-suffixes for the language. They are not pronounced at all in a syllable.

ལྷགས་	<b>l c g s</b>	- pronounced as 'c a g 0'
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**Note:** Post-suffix 'd' is used rarely. When used it can combine with suffixes 'n', 'r', & 'l' only, whereas the frequently used post-suffix 's' can combine with only four suffixes, 'g', 'ng', 'p' and 'm' in a syllable.

#### 4. Conclusion and Future Work

This paper presented the phonemic analysis for Dzongkha language. It also covered the basic pronunciation rules for the language. With the idea that the sound system for the language is guided by certain pronunciation rules, it can be noted that arrangement of letters in a syllable or word greatly influences the pronunciation of that particular syllable or word. An extensive research on the language is required to discuss other possibilities that may influence the pronunciation of words.

There are possibilities that the language may have more than two tones as indicated by van Driem and Tshering (1998), which presents the opportunity for researchers to gather information and compare data using phonemic and acoustic analysis, to be certain of their existence. That is going to be one of our future endeavours.

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