Proposal for an Oriya Script Root Zone Label Generation Ruleset (LGR)

*LGR Version:* 3.0

*Date:* 2019-02-20

*Document version:* 2.11

*Authors:* Neo-Brahmi Generation Panel [NBGP]

# General Information/ Overview/ Abstract

The purpose of this document is to give an overview of the proposed Root Zone Level Generation Rules for the Oriya script. It includes a discussion of relevant features of the script, the communities or languages using it, the process and methodology used and information on the contributors. The formal specification of the LGR can be found in the accompanying XML document:

proposal-oriya-lgr-20feb19-en.xml

Labels for testing can be found in the accompanying text document:

oriya-test-labels-20feb19-en.txt

# Script for which the LGR is proposed

ISO 15924 Code:  Orya

ISO 15924 Key N°: 327

ISO 15924 English Name: Oriya (Odia)

Latin transliteration of native script name: oṛiā

Native name of the script: ଓଡ଼ିଆ

Maximal Starting Repertoire (MSR) version: MSR-4

# Background on Script and Principal Languages using it

Oriya (amended later as Odia) is an Eastern Indic language spoken by about 40 million people (3,75,21,324 as per census 2011(<http://censusindia.gov.in/2011Census/Language-2011/Statement-4.pdf>) mainly in the Indian state of Orissa, and also in parts of West Bengal, Jharkhand, Chhattisgarh and Andhra Pradesh. Oriya(Odia) is one of the many official languages of India. It is the official language of Odisha, and the second official language of Jharkhand. Eminent Linguists like John Beames, G. A. Grierson, L.S.S. O’Malley, Suniti Kumar Chatterjee, S. N. Rajaguru, John Boulton and others consider Oriya as one of the most ancient languages of India. In Indic family of languages, Oriya is closest to Sanskrit and least influenced by foreign languages. Only these two Indic languages (viz. Sanskrit and Oriya) received a classical tag due to their rich, uninfluenced and long literary history. According to National Mission for Manuscripts, after Sanskrit (11,66,743), Oriya (2,13,088) has the largest number of documented manuscripts in the India (<https://news.webindia123.com/news/Articles/India/20160318/2819026.html>).

Oriya (Odia)has been amended to Odia, and Orissa as Odisha; Odia and Odisha are now the preferred names in English as they are closer to their native names: ଓଡ଼ିଆ (oṛiā) [ɔɖiaː] and ଓଡ଼ିଶା (oṛiśā). Oriya (Odia) language is also used by populations of the neighboring states of Jharkhand, West Bengal, Chhattisgarh and Andhra Pradesh.

The modern Oriya (Odia) language is formed mostly from Pali words with significant Sanskrit influence. About 28% of modern Oriya (Odia) words have Adivasi origins, and about 2% have Hindustani (Hindi/Urdu), Persian, or Arabic origins. (Refer: Indian Literature by Language: Oriya Literature Book (ISBN 1156665574, 9781156665572) The earliest written texts in the language are about thousand years old. The first Oriya (Odia) newspaper Utkala Deepika was first published on 4 August 1866.

Among the Indo-European languages of India, only Oriya and Sanskrit have been recognized as classical languages; and of the six Indian languages that have been conferred classical language status, Oriya (Odia) was recognized most recently (in 2014)[[1]](#footnote-1). It forms the basis of Odissi dance and Odissi music.[[2]](#footnote-2)

In Orissa, Oriya script is used not only for writing Oriya language but also for Sanskrit and at least 21 other languages. These include Oriya, Desiya, Sadri, Sanskrit, Sambalpuri, Santali and Bodo. See Table 4 for a more complete list of languages. The script mainly differs from other scripts like Devanagari and Bangla by the absence of the Shirorekhaor the line above the character and also its more rounded shapes.

## The Evolution of the Script

The Oriya (Odia)script developed from the Kalinga script, one of the many descendants of the Brahmi script of ancient India(Rajaguru, S.N., Odia Lipira Kramabikash, Odia Sahitya Akademi, page 2). The earliest known inscription in the Oriya language, in the Kalinga script, dates from 1051. It descends from Odra-Magadhi Prakrit similar to Ardha Magadhi, prevalent in eastern India over 1,500 years ago.

The curved appearance of the Oriya script is a result of the practice of writing on palm leaves, which have a tendency to tear if written in straight lines.

The diagram below shows the major stages in the evolution of Oriya attesting its late divergence from among Northern Scripts derived from Brahmi script.



Figure 1: Pictorial depiction of Evolution of Oriya

## Periods of Odia History

Oriya language literature (Odia) ଓଡ଼ିଆ ସାହିତ୍ୟ (Odia Sahitya) is the predominant literature of the state of Odisha in India. Historians have divided the history of the Oriya literature into five main stages: Old Oriya(8th century to 1300), Early Middle Oriya (1300 to 1500), Middle Oriya (1500 to 1700), Late Middle Oriya (1700 to 1850) and Modern Oriya (1850 to present). See <http://indohistory.com/oriya.html> for more information.

## Use of Oriya language globally

The Oriya diaspora constitutes a sizeable number of speakers in several countries around the world, with the number of Oriya speakers globally to 55 million. More details are given <http://censusindia.gov.in/2011Census/Language-2011/Statement-4.pdf>

It has a significant presence in eastern countries such as Bangladesh, Indonesia, mainly carried by the sadhaba, the ancient traders from Odisha, who carried the language along with the culture during the old-day trading, and in western countries such as the United States, Canada, Australia and England as well. The language has also spread to Burma, Malaysia, Fiji, Sri Lanka and countries of the Middle East.

## Written Oriya(Odia) or the standard Oriya(Odia)

## It is used for official purpose. It has elements from different local Oriya dialects but it usually avoids words of foreign origin such as Arabic and Persian. It has also assimilated many tribal words prevalent in Odisha. Notable features

The Oriya script is a syllabic alphabet written left to right in horizontal lines, in which all consonants have an inherent vowel. Diacritics can appear above, below, before or after the consonant they belong to. These are used to change the inherent vowel and also to show the allophonic variants of the consonant. When they appear at the beginning of a syllable, vowels are written as independent letters. When certain consonants occur together, special conjunct shapes are used which combine the essential parts of each letter.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| The consonants and vowels in Oriya (Odia) are presented in Table 1 below.The chart below shows the way in which the International Phonetic Alphabet (IPA) represents Oriya pronunciations.**Vargya Consonants** | | **Avargya consonants** | | |
| [IPA](https://en.wikipedia.org/wiki/Help:IPA) | Oriya (Odia) | [IPA](https://en.wikipedia.org/wiki/Help:IPA) | Oriya (Odia) | |
| [b](https://en.wikipedia.org/wiki/Voiced_bilabial_stop) | ବ | [j](https://en.wikipedia.org/wiki/Palatal_approximant#Palatal) | ଯ | |
| [bʱ](https://en.wikipedia.org/wiki/Breathy_voice) | ଭ | e̯ | ୟ | |
| d̪ | ଦ | [ɾ](https://en.wikipedia.org/wiki/Alveolar_flap) | ର | |
| d̪ʱ | ଧ | [l](https://en.wikipedia.org/wiki/Alveolar_lateral_approximant) | ଲ | |
| [ɖ](https://en.wikipedia.org/wiki/Voiced_retroflex_stop) | ଡ | [l̪](https://en.wikipedia.org/wiki/Alveolar_lateral_approximant) | ଳ | |
| [ɖʱ](https://en.wikipedia.org/wiki/Breathy_voice) | ଢ |  |  | |
| [d͡ʒ](https://en.wikipedia.org/wiki/Voiced_palato-alveolar_affricate) | ଜ | [w](https://en.wikipedia.org/wiki/Voiced_labio-velar_approximant) | ୱୱ | |
| [d͡ʒʱ](https://en.wikipedia.org/wiki/Breathy_voice) | ଝ | [s](https://en.wikipedia.org/wiki/Voiceless_alveolar_fricative#Voiceless_alveolar_sibilant) | ସ | |
| [ɡ](https://en.wikipedia.org/wiki/Voiced_velar_stop) | ଗ | [ʂ](https://en.wikipedia.org/wiki/Voiceless_retroflex_fricative) | ଷ | |
| [ɡʱ](https://en.wikipedia.org/wiki/Breathy_voice) | ଘ | [ɕ](https://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_fricative) | ଶ | |
| [h](https://en.wikipedia.org/wiki/Voiceless_glottal_fricative) | ହ | [ɦ](https://en.wikipedia.org/wiki/Voiced_glottal_fricative) | ହ | |
| [k](https://en.wikipedia.org/wiki/Voiceless_velar_stop) | କ | [ŋ](https://en.wikipedia.org/wiki/Velar_nasal),[ɲ](https://en.wikipedia.org/wiki/Palatal_nasal#Palatal_or_alveolo-palatal),[ɳ](https://en.wikipedia.org/wiki/Retroflex_nasal),[n](https://en.wikipedia.org/wiki/Dental,_alveolar_and_postalveolar_nasals#Alveolar),[m](https://en.wikipedia.org/wiki/Bilabial_nasal),[◌̃](https://en.wikipedia.org/wiki/Nasalization) | ଂ | |
| [kʰ](https://en.wikipedia.org/wiki/Aspirated_consonant) | ଖ | [◌̃](https://en.wikipedia.org/wiki/Nasalization) | ଁ | |
| [ɲ](https://en.wikipedia.org/wiki/Palatal_nasal#Palatal_or_alveolo-palatal) | ଞ | [ɦ](https://en.wikipedia.org/wiki/Voiced_glottal_fricative) | ଃ | |
| [m](https://en.wikipedia.org/wiki/Bilabial_nasal) | ମ | **Vowels and Matras** | | |
| [n](https://en.wikipedia.org/wiki/Dental,_alveolar_and_postalveolar_nasals#Alveolar) | ନ | **IPA** | **Vowels** | **Matras** |
| [ɳ](https://en.wikipedia.org/wiki/Retroflex_nasal) | ଣ | [ə](https://en.wikipedia.org/wiki/Mid_central_vowel) | ଅ |  |
| [ŋ](https://en.wikipedia.org/wiki/Velar_nasal) | ଙ | [aː](https://en.wikipedia.org/wiki/Open_front_unrounded_vowel) | ଆ | ା |
| [p](https://en.wikipedia.org/wiki/Voiceless_bilabial_stop) | ପ | [ɪ](https://en.wikipedia.org/wiki/Near-close_front_unrounded_vowel) | ଇ | ି |
| [pʰ](https://en.wikipedia.org/wiki/Aspirated_consonant) | ଫ | [iː](https://en.wikipedia.org/wiki/Close_front_unrounded_vowel) | ଈ | ୀ |
| [ɾ](https://en.wikipedia.org/wiki/Alveolar_flap) | ର | [ʊ](https://en.wikipedia.org/wiki/Near-close_back_rounded_vowel) | ଉ | ୁ |
| [ɽ](https://en.wikipedia.org/wiki/Retroflex_flap) | ଡ଼ | [uː](https://en.wikipedia.org/wiki/Close_back_rounded_vowel) | ଊ | **ୂ** |
| [ɽʱ](https://en.wikipedia.org/wiki/Breathy_voice) | ଢ଼ | r̩ | ଋ | ୃ |
| [s](https://en.wikipedia.org/wiki/Voiceless_alveolar_fricative#Voiceless_alveolar_sibilant) | ସ | [eː](https://en.wikipedia.org/wiki/Close-mid_front_unrounded_vowel) | ଏ | େ |
| t̪ | ତ | [ɛː](https://en.wikipedia.org/wiki/Open-mid_front_unrounded_vowel) | ଐ | ୈ |
| t̪ʰ | ଥ | [oː](https://en.wikipedia.org/wiki/Close-mid_back_rounded_vowel) | ଓ | ୋ |
| [ʈ](https://en.wikipedia.org/wiki/Voiceless_retroflex_stop) | ଟ | [ɔː](https://en.wikipedia.org/wiki/Open-mid_back_rounded_vowel) | ଔ | ୌ |
| [ʈʰ](https://en.wikipedia.org/wiki/Aspirated_consonant) | ଠ |
| [t͡ʃ](https://en.wikipedia.org/wiki/Voiceless_palato-alveolar_affricate) | ଚ |
| [t͡ʃʰ](https://en.wikipedia.org/wiki/Aspirated_consonant) | ଛ |

Table 1: International Phonetic Alphabet Oriya Pronunciations

## Structured consonants

The structured consonants are classified according to the place and manner of articulation and are classified accordingly into five structured groups. These consonants are shown here with their IAST (International Alphabet of Sanskrit Transliteration)[[3]](#footnote-3) transcriptions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | [**voiceless**](https://wikivisually.com/wiki/Voiceless) | [**voiceless  aspirate**](https://wikivisually.com/wiki/Aspiration_(phonetics)) | [**voiced**](https://wikivisually.com/wiki/Voice_(phonetics)) | [**voiced  aspirate**](https://wikivisually.com/wiki/Aspiration_(phonetics)) | [**nasal**](https://wikivisually.com/wiki/Nasal_stop) |
| [**Velars**](https://wikivisually.com/wiki/Velars) | କ (ka)  0B15 | ଖ (kha)  0B16 | ଗ (ga)  0B17 | ଘ (gha)  0B18 | ଙ (ṅa)  0B19 |
| [**Palatals**](https://wikivisually.com/wiki/Palatals) | ଚ (ca)  0B1A | ଛ (cha)  0B1B | ଜ (ja)  0B1C | ଝ (jha)  0B1D | ଞ (ña)  0B1E |
| [**Retroflex**](https://wikivisually.com/wiki/Retroflex) | ଟ (ṭa)  0B1F | ଠ (ṭha)  0B20 | ଡ (ḍa)  0B21 | ଢ (ḍha)  0B22 | ଣ (ṇa)  0B23 |
| [**Dentals**](https://wikivisually.com/wiki/Dental_consonant) | ତ (ta)  0B24 | ଥ (tha)  0B25 | ଦ (da)  0B26 | ଧ (dha)  0B27 | ନ (na)  0B28 |
| [**Labials**](https://wikivisually.com/wiki/Labial_consonant) | ପ (pa)  0B2A | ଫ (pha)  0B2B | ବ (ba)  0B2C | ଭ (bha)  0B2D | ମ (ma)  0B2E |

Table 2: Structured Consonants

## Unstructured consonants

The unstructured consonants are additional consonants that do not fall into any of the above categories and include the following: ଯ (ja) U+0B2F, ୟ (ia)U+0B5F, ର (ra) U+0B30, ଲ (la) U+0B32, ଳ (ḷa) U+0B33, ଵ ଶ (sa) U+0B36, ଷ (sa) U+0B37, ସ (sa) U+0B38, ହ (ha) U+0B39.

## The implicit vowel killer Halant (Virama)

The *Halant* is used after a consonant to "strip" it of its inherent vowel. A consonant cluster cannot end with a Halant. With a few exceptions, most of the Oriya words are svaranta (i.e. ending with a vowel).

In some cases, a syllable containing a Halant may not have a visible Halant sign, where the Halant enables the different consonants to form a conjunct.

The *halant form of consonants*, i.e., the form produced by adding the Halant to the nominal shape, is used in syllables that have no inherent vowel or in conjuncts or consonant clusters.

In Oriya, consonant clusters are written in many ways:

1. In most cases the second component is in half form (without the rounded top) or reduced form and put under the first component e.g. ସ୍କ (U+0B38, U+0B4D, U+0B15),ସ୍ତ (U+0B38, U+0B4D, U+0B24), ବ୍ଧ (U+0B2C, U+0B4D, U+0B27), etc.
2. Sometimes the reverse case happens and the first component (esp. when it is ତ(0B24)) is reduced and is put below the second as in ତ୍ସ (U+0B24, U+0B4D, U+0B38), ତ୍ମ U+0B24, U+0B4D, U+0B2E, ତ୍କତ୍ପ (U+0B24, U+0B4D, U+0B15, U+0B24, U+0B4D, U+0B2A) etc.
3. Pre-base forms are also seen in ବ୍ଦଦ୍ଭ (U+0B2C, U+0B4D, U+0B26, U+0B26, U+0B4D, U+0B2D), but due to cursive writing, the pre-base components seem to be like new glyphs. In this case, the components of a conjunct are rendered side by side not like mentioned above in 1 and 2.

If no distinct shape exists, the full form will display with an explicit Halant. (same shape as the *Halant* form).

## Nukta ( ଼) (଼U+0B3C)

The nukta sign (. ଼) is used in Oriya language just like many other scripts used in South Asia. It can be commonly used with “ଡ” U+0B21, “ଢ” U+0B22.

In the [public comment](https://www.icann.org/public-comments/kannada-oriya-telugu-lgr-2018-08-08-en) version of the Oriya Script LGR, the NBGP had proposed allowing the use of nukta with କ0B15, ଖ0B16, ଗ0B17, ଚ0B1A, ଜ0B1C,ଫ0B2B. But based on public comment feedback, suggesting this use was not sufficiently common, and further analysis on the usage of nukta by NBGP, nukta is not included with କ0B15, ଖ0B16, ଗ0B17, ଚ0B1A, ଜ0B1C,ଫ0B2B.

## Visarga“ଃ” (U+0B03) and Avagraha “ଽ” (U+0B3D)

The Visarga (ଃ,U+0B03) is frequently used in Sanskrit and represents a sound very close to /h/. Example, ଦୁଃଖ/du:kh/ “sorrow” (U+0B26 U+0B41 U+0B03 U+0B16).

The Avagraha "ଽ" (U+0B3D) creates an extra stress on the preceding vowel and is used in Sanskrit texts. It is rarely used in other languages using Oriya script.

## Candrabindu (ँ - U+0B01)

Candrabindu denotes nasalization of the preceding vowel and consonants as in ଅଁଳା/ am̐ḷā / “name of seasonal fruit” (U+0B05 U+0B01 U+0B33 U+0B3E). Oriya users commonly use it for writing the words and sounds of Sanskrit language.

## Anusvara (ଂ - U+0B02)

Anusvara replaces a conjunct group of a Nasal Consonant+Halant+Consonant belonging to that particular varga, representing a homorganic nasal. Before a non-varga consonant the Anusvara represents a nasal sound. For example: ଏବଂ/ ēbaṁ / (U+0B0F, U+0B2C, U+0B02) (means: and), ସଂଖ୍ୟା / saṁkhyā / (U+0B38, U+0B02, U+0B16, U+0B4D, U+0B5F, U+0B3E) (means: number), etc.

## Matra sign (Dependent Vowel)

A dependent vowel sign is used to represent a vowel sound that is not inherent to a consonant. Dependent vowels are referred to as "matras". They are always depicted in combination with a consonant or with a consonant cluster. The rules specific to Oriya for combining matras are mentioned in Section 6 (Variants) and Section 7 (WLE Rules).

The following table explains the correlation between a vowel and its matra sign.

| **Vowel and its matra sign** | | | | | |
| --- | --- | --- | --- | --- | --- |
| Glyph | Unicode | [Name](https://www.compart.com/en/unicode/block/U+0B00?sort=name) | Glyph | Unicode | [Name](https://www.compart.com/en/unicode/block/U+0B00?sort=name) |
| ଅ | U+0B05 | Oriya Letter A |  |  |  |
| ଆ | U+0B06 | Oriya Vowel Letter Aa | ା | U+0B3E | Oriya Vowel Sign Aa |
| ଇ | U+0B07 | Oriya Vowel Letter I | ି◌ | U+0B3F | Oriya Vowel Sign I |
| ଈ | U+0B08 | Oriya Vowel Letter Ii | ୀ | U+0B40 | Oriya Vowel Sign Ii |
| ଉ | U+0B09 | Oriya Vowel Letter U | ୁ◌ | U+0B41 | Oriya Vowel Sign U |
| ଊ | U+0B0A | Oriya Vowel Letter Uu | ୂ◌ | U+0B42 | Oriya Vowel Sign Uu |
| ଋ | U+0B0B | Oriya Vowel Letter Vocalic R | ୃ◌ | U+0B43 | Oriya Vowel Sign Vocalic R |
| ଏ | U+0B0F | Oriya Vowel Letter E | େ | U+0B47 | Oriya Vowel Sign E |
| ଐ | U+0B10 | Oriya Vowel Letter Ai | ୈ | U+0B48 | Oriya Vowel Sign Ai |
| ଓ | U+0B13 | Oriya Vowel Letter O | ୋ | U+0B4B | Oriya Vowel Sign O |
| ଔ | U+0B14 | Oriya Vowel Letter Au | ୌ | U+0B4C | Oriya Vowel Sign Au |
| ଌ | U+0B0C | ORIYA LETTER VOCALIC L | ◌ୢ | U+0B62 | Oriya Vowel Sign Vocalic L |
| ୡ | U+0B61 | ORIYA LETTER VOCALIC LL | ◌ୣ | U+0B63 | Oriya Vowel Sign Vocalic Ll |

Table 3: Vowel and its Matra Sign

The vowels “ଌ”U+0B0C, “ୡ”U+0B61, “ୢ”U+0B62 and ”ୣ”U+0B63are hardly in use in modern days.

# Overall Development Process and Methodology

Under the Neo-Brahmi Generation Panel, there are many different scripts belonging to separate Unicode blocks. Each of these scripts is the basis for a separate LGR proposal; however Neo-Brahmi GP ensures that the fundamental philosophy behind building these various script LGRs is same across the different scripts being considered. NBGP decided to employ “Expanded Graded Intergenerational Disruption Scale” [EGIDS], which is designed to measure the status of the languages of the world in terms of endangerment or development. The EGIDS consists of 13 levels with each higher number on the scale representing a greater level of disruption to the intergenerational transmission of the language. NBGP decided to accommodate all the languages belonging to EGIDS Scale 1 to 4 for its analysis which represents languages in one form or the other are still in usage. Following are the descriptions[[4]](#footnote-4) of those scales and corresponding languages relevant for the Oriya (Odia) script LGR proposal.

The Oriya (Odia) script LGR proposal was published for public comment to allow those who had not participated in the NBGP to make their views known. The NBGP analyzed all comments received to finalize the proposal. The analysis of public comments can be accessed online given at [106].

| **EGIDS Scale** | **Definition** | **Relevant Languages and their family** |
| --- | --- | --- |
| EGIDS Scale 2 (Provincial) | The language is used in education, work, mass media, and government within major administrative subdivisions of a nation | Oriya (Indic) |
| EGIDS Scale 3 (Wider communication) | The language is used in work and mass media without official status to transcend language differences across a region. | Desiya (Indic)  Sadri (Indic) |
| EGIDS Scale 4 (Educational) | The language is in vigorous use, with standardization and literature being sustained through a widespread system of institutionally supported education. | Sanskrit (Indic)  Sambalpuri (Indic)  Santali (Austroasiatic) |
| EGIDS Scale 5 (Developing) | The language is in vigorous use, with literature in a standardized form being used by some though this is not yet widespread or sustainable. | Bodo parja (Indic)  Sora (Austro Asiatic)  Ho (Austro Asiatic)  Mundari (Austro Asiatic)  Juang (Austro Asiatic)  Koya (Dravidian)  Kisan (Dravidian)  Kuvi (Dravidian) |
| EGIDS Scale 6a (Vigorous) | The language is used for face-to-face communication by all generations and the situation is sustainable. | Kudmali (Indic)  Mirgan (Mirgan)  Bondo (Austro Asiatic)  Munda (Austro Asiatic)  Pengo (Dravidian)  Duruwa (Dravidian) |
| EGIDS Scale 6b (Threatened) | The language is used for face-to-face communication within all generations, but it is losing users. | Gadababodo (Austro Asiatic)  Kui (Dravidian) |

Table 4: EGIDS Scale Languages Considered under Oriya (Odia) LGR

Out of these languages, seven are Indic and thus can be easily written using a Brahmi based script like Oriya script.

## Guiding Principles

The NBGP adopts the following broad principles for the selection of code-points in the repertoire across the board for all the scripts within its scope.

### Inclusion principles:

#### Modern usage:

Every character proposed should be in the everyday usage of a particular linguistic community. Characters which have been encoded in the Unicode for transcription purposes only or for archival purposes will not be considered for inclusion in the code-point repertoire.

# 4.1.1.2. Unambiguous use:

Every character proposed should have unambiguous understanding among the linguistic about its usage in the language.

### Exclusion principles:

The main exclusion principle is that of External Limits on Scope. They comprise protocols or standards which are pre-requisites to the definition of Label Generation Rules. All further principles are in fact subsumed under these limitations but have been spelt out separately for the sake of clarity.

#### External Limits on Scope:

The code point repertoire for root zone being a very special case, up the ladder in the protocol hierarchies, the canvas of available characters for selection as a part of the Root Zone code point repertoire is already constrained by various protocol layers beneath it. The following three main protocols/standards act as successive filters:

i. The Unicode Chart:

Out of all the characters that are needed by the given script, if the character in question is not encoded in Unicode, it cannot be incorporated in the code point repertoire. Such cases are quite rare, given the elaborate and exhaustive character inclusion efforts made by Unicode consortium.

ii. IDNA Protocol:

Unicode being the character encoding standard for providing the maximum possible representation of a given script/language, it has encoded as far as possible all the possible characters needed by the script. However, the Domain name being a specialized case, it is governed by an additional protocol known as IDNA (Internationalized Domain Names in Applications). The IDNA protocol excludes some characters out of Unicode repertoire from being part of the domain names.

Example: Oriya script frequently uses “ଡ” (U+0B21), “ଢ” (U+0B22) as well as their respective forms with nukta“ଡ଼”, and “ଢ଼”. “ଡ଼” and “ଢ଼” as distinct letters are not encoded but their decomposed form i.e. “ଡ”, “ଢ” followed by Oriya sign nukta (U+0B3C) can be used.

iii. Maximal Starting Repertoire:

As the Root Zone LGR is used for creation of the root zone TLDs, which in turn are an even more specialized case of domain name labels, the Root Zone LGR procedure introduces additional exclusions for characters allowed by IDNA.

Example: Oriya Sign Avagraha "ଽ" (U+0B3D) even if allowed by IDNA protocol, is not permitted in the Root Zone Repertoire as per the [MSR].

Maximal Starting Repertoire also excludes invisible characters Zero Width Non-Joiner (U+200C) and Zero Width Joiner (U+200D). These are required in certain cases where a typical visual shape of an akshar is desired.

To sum up, the restrictions start off with admitting only such characters as are part of the code-block of the given script/language. This is further narrowed down by the IDNA Protocol and finally an additional filter in the form of Maximal Starting Repertoire restricts the character set associated with the given language even more.

#### No Fraction Marks:

The TLDs being identifiers, fraction markers present in Brahmi based languages such as given below will not be included.

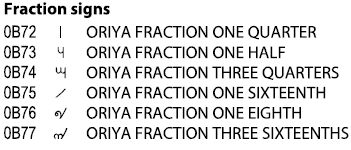


Figure 2: Fraction Marks in Oriya

#### No Symbols and Abbreviations:

Abbreviations, weights and measures and other such iconic characters like Isshar "୰" (U+0B70) will not be included.

#### No Rare and Obsolete Characters:

There are characters which have been added to Unicode to accommodate rare forms especially like Oriya LETTER VOCALIC RR"ୠ" (U+0B60) and Oriya LETTER VOCALIC LL"ୡ"(U+0B61)as well as their Matra forms )“ୄୄ“(U+0B44) and "ୣୣ" (U+0B63). All such characters will be excluded. This is in compliance with the Conservatism principle as laid down in the Root Zone LGR procedure.

# Repertoire

This Section provides the relevant Section of [MSR] applicable to the Oriya script on which Oriya code point repertoire for the Root Zone LGR is based on. Section 5.1 details the code-point repertoire that the Neo-Brahmi Generation Panel [NBGP] proposes to be included in the Oriya Root Zone LGR.

## Oriya Section of Maximal Starting Repertoire [MSR] Version 4

|  |  |
| --- | --- |
| Figure 3: Oriya Code Page from MSR-4 | **Color convention:**  All characters that are included in the [MSR]- Yellow background  **PVALID** in IDNA2008 but excluded from the [MSR]- Pinkish background  **Not PVALID** in IDNA2008 - White background |

## Code Point Repertoire

The table below lists all the code points included in the repertoire for Oriya script. For each of the code points, language references have been given in the last column.

| **Sr.No.** | **Unicode Code Point** | **Glyph** | **Character Name** | **Language with EGIDS** | **Category** | **References** |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 0B01 | ଁ | ORIYA SIGN CANDRABINDU | 2-Oriya | Candrabindu | [0],[101], [102], [103], [104], [105] |
| 2 | 0B02 | ଂ | ORIYA SIGN ANUSVARA | 2-Oriya | Anusvara | [0],[101], [102], [103], [104], [105] |
| 3 | 0B03 | ଃ | ORIYA SIGN VISARGA | 2-Oriya | Visarga | [0],[101], [102], [103], [104], [105] |
| 4 | 0B05 | ଅ | ORIYA LETTER A | 2-Oriya | Vowel | [0],[101], [102], [103], [104], [105] |
| 5 | 0B06 | ଆ | ORIYA LETTER AA | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 6 | 0B07 | ଇ | ORIYA LETTER I | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 7 | 0B08 | ଈ | ORIYA LETTER II | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 8 | 0B09 | ଉ | ORIYA LETTER U | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 9 | 0B0A | ଊ | ORIYA LETTER UU | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 10 | 0B0B | ଋ | ORIYA LETTER VOCALIC R | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 11 | 0B0F | ଏ | ORIYA LETTER E | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 12 | 0B10 | ଐ | ORIYA LETTER AI | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 13 | 0B13 | ଓ | ORIYA LETTER O | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 14 | 0B14 | ଔ | ORIYA LETTER AU | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 15 | 0B15 | କ | ORIYA LETTER KA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 16 | 0B16 | ଖ | ORIYA LETTER KHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 17 | 0B17 | ଗ | ORIYA LETTER GA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 18 | 0B18 | ଘ | ORIYA LETTER GHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 19 | 0B19 | ଙ | ORIYA LETTER NGA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 20 | 0B1A | ଚ | ORIYA LETTER CA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 21 | 0B1B | ଛ | ORIYA LETTER CHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 22 | 0B1C | ଜ | ORIYA LETTER JA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 23 | 0B1D | ଝ | ORIYA LETTER JHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 24 | 0B1E | ଞ | ORIYA LETTER NYA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 25 | 0B1F | ଟ | ORIYA LETTER TTA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 26 | 0B20 | ଠ | ORIYA LETTER TTHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 27 | 0B21 | ଡ | ORIYA LETTER DDA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 28 | 0B22 | ଢ | ORIYA LETTER DDHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 29 | 0B23 | ଣ | ORIYA LETTER NNA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 30 | 0B24 | ତ | ORIYA LETTER TA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 31 | 0B25 | ଥ | ORIYA LETTER THA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 32 | 0B26 | ଦ | ORIYA LETTER DA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 33 | 0B27 | ଧ | ORIYA LETTER DHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 34 | 0B28 | ନ | ORIYA LETTER NA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 35 | 0B2A | ପ | ORIYA LETTER PA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 36 | 0B2B | ଫ | ORIYA LETTER PHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 37 | 0B2C | ବ | ORIYA LETTER BA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 38 | 0B2D | ଭ | ORIYA LETTER BHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 39 | 0B2E | ମ | ORIYA LETTER MA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 40 | 0B2F | ଯ | ORIYA LETTER JA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 41 | 0B30 | ର | ORIYA LETTER RA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 42 | 0B32 | ଲ | ORIYA LETTER LA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 43 | 0B33 | ଳ | ORIYA LETTER LLA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 44 | 0B36 | ଶ | ORIYA LETTER SHA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 45 | 0B37 | ଷ | ORIYA LETTER SSA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 46 | 0B38 | ସ | ORIYA LETTER SA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 47 | 0B39 | ହ | ORIYA LETTER HA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 48 | 0B3C | ଼ | ORIYA SIGN NUKTA | 2-Oriya | Nukta | [0], [101], [102], [103], [104], [105] |
| 49 | 0B3E | ା | ORIYA VOWEL SIGN AA | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 50 | 0B3F | ି | ORIYA VOWEL SIGN I | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 51 | 0B40 | ୀ | ORIYA VOWEL SIGN II | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 52 | 0B41 | ୁ | ORIYA VOWEL SIGN U | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 53 | 0B42 | ୂ | ORIYA VOWEL SIGN UU | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 54 | 0B43 | ୃ | ORIYA VOWEL SIGN VOCALIC R | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 55 | 0B47 | େ | ORIYA VOWEL SIGN E | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 56 | 0B48 | ୈ | ORIYA VOWEL SIGN AI | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 57 | 0B4B | ୋ | ORIYA VOWEL SIGN O | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 58 | 0B4C | ୌ | ORIYA VOWEL SIGN AU | 2-Oriya | Matra | [0], [101], [102], [103], [104], [105] |
| 59 | 0B4D | ୍ | ORIYA SIGN VIRAMA | 2-Oriya | Halant | [0], [101], [102], [103], [104], [105] |
| 60 | 0B56 | ୖ | ORIYA AI LENGTH MARK | 2-Oriya | Matra | [2], [101], [102], [103], [104], [105] |
| 61 | 0B5F | ୟ | ORIYA LETTER YA | 2-Oriya | Consonant | [0], [101], [102], [103], [104], [105] |
| 62 | 0B71 | ୱ | ORIYA LETTER WA | 2-Oriya | Consonant | [6], [101], [102], [103], [104], [105] |

Table 5: Code Point Repertoire

### Code Points Excluded

The Following code points are excluded from the repertoire by NBGP.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Unicode Code Point** | **Glyph** | **Character Name** | **Language with EGIDS** | **Category** | **Reference** |
| 1 | 0B0C | ଌ | ORIYA LETTER VOCALIC L | 2-Oriya | Vowel | [0], [101], [102], [103], [104], [105] |
| 2 | 0B35 | ଵ | ORIYA LETTER VA | 2-Oriya | Consonant | [6], [101], [102], [103], [104], [105] |
| 3 | 0B44 | ୄ | ORIYA VOWEL SIGN VOCALIC RR | 2-Oriya | Matra | [9], [101], [102] [103] [104] [105] |
| 4 | 0B57 | ୗ | ORIYA AU LENTH MARK | 2-Oriya | Matra | [0], [101], [102] [103] [104] [105] |

Table 6: Code Point Excluded from Repertoire

Since the matra ୗ (U+0B57) ORIYA AU LENTH MARK is not in current use by the Oriya script community, it is decided by the NBGP to exclude it. Also, “ଌ” U+0B0C, “ୡ” U+0B61, “ୢ” U+0B62 and ”ୣ” U+0B63 are rarely used in modern days.

The character Va “ଵ”(0B35) is used in form of handwritten character by few linguistics or has recently been used in a few websites on the internet. But this code point is not very frequently used in mass educational institutions, printed in mass communication, like newspapers or magazines. Some textbooks in the schools and college explain the plosive "Ba" ବ(0B2C) and non-plosive "Va" ଵ(0B35) separately as "vargya" and "avargya" respectively.

The [public comment](https://www.icann.org/public-comments/kannada-oriya-telugu-lgr-2018-08-08-en) version of the Oriya Script LGR, NBGP had included the character Va “ଵ”(0B35) in the repertoire. However, the public comment feedback suggested that this use was not sufficiently common, and further analysis by NBGP concluded that "Va" ଵ(0B35) is not used in commonly printed books, magazines, etc. Therefore, it is excluded from the repertoire.

However, in coming years if this character is seen in frequent use, NBGP may reconsider including it in a later version of its LGR for the Oriya script.

### **Variables involved**

C → Consonant

M → Matra

V → Vowel

B → Anusvara

H → Halant

N → Nukta

C1 → Consonants with Nukta {ଡ0B21, ଢ0B22}

X → Visarga

D → Candrabindu

### **The Vowel Sequence**

The Vowel Sequence begins with a vowel which is followed by either of Anusvara (B), Candrabindu (D) or a Visarga (X) but never more than one.

In Oriya, thus the vowel sequence can be represented as V [B |D | X]

Examples:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Vowel | V | ଅ/a/  U+0B05 |  |
| Vowel + Anusvara | V[B] | ଅଂ/aṁ/  U+0B05 U+0B02 | ଅ ଂ  U+0B05 U+0B02 |
| Vowel + Candrabindu | V[D] | ଅଁ/aṃ/  U+0B05 U+0B01 | ଅଁ  U+0B05 U+0B01 |
| Vowel + Visarga | V[X] | ଅଃ/aḥ/  U+0B05 U+0B03 | ଅଃ  U+0B05U+0B03 |

Table 7

### **Consonant Sequence**

Consonant sequence begins with a consonant and may or may not be followed by a Nukta (N). Consonant with or without the Nukta (N) may again be followed by either of Matra (M), Anusvara (B), Candrabindu (D), Visarga (X) or a Halant (H) but never more than one of M, B, D, X, H. After the N, M and H, the consonant sequence can be extended as follows :

**1. A single consonant (C)**

(The consonant shall be treated as coterminous with the Consonant along with the Nukta sign wherever such a case is pertinent.)

Examples:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant | C | ଡ/ḍa/  U+0B21 | <single character> |
| Consonant + Nukta | C[N] | ଡ଼/ṛa/ | ଡ଼  U+0B21U+0B3C |

Table 8

2. A consonant is optionally followed by a dependent vowel sign/Matra [M], Anusvara [D], Candrabindu [B],Visarga [X] or Halant [H].

C [M|B|D|X|H]

Examples:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant + Matra | C[M] | କି/ki/ | କି  U+0B15 U+0B3F |
| Consonant + Anusvara | C[B] | କଂ/kaṁ/ | କଂ  U+0B15 U+0B02 |
| Consonant + Candrabindu | C[D] | କଁ/kaṃ/ | କଁ  U+0B15U+0B01 |
| Consonant + Visarga | C[X] | କଃ/kaḥ/ | କଃ  U+0B15U+0B03 |
| Consonant + Halant | C[H] | କ୍/k/  (Pure Consonant) | କ୍  U+0B15U+0B4D |

Table 9

3. A CM sequence can be optionally followed by D, B or X(CM)[D|B|X]

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant + Matra + Anusvara | CM[B] | କିଂ/kiṁ/ | କିଂ  U+0B15U+0B3FU+0B02 |
| Consonant + Matra + Candrabindu | CM[D] | କାଁ/kāṃ/ | କାଁ  U+0B15U+0B3EU+0B01 |
| Consonant + Matra + Visarga | CM[X] | କିଃ/kiḥ/ | କିଃ  U+0B15U+0B3FU+0B03 |

Table 10

A sequence of consonants (up to 4) joined by Halant[[5]](#footnote-5)(CH)C

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant + Halant + Consonant + Halant + Consonant + Halant + Consonant | CHCHCHC | ସ୍ତ୍ର୍ୟ/strya/ | ସ୍ ତ୍ ର୍ ୟ  U+0B38U+0B4DU+0B24U+0B4D U+0B30U+0B4D U+0B5F |

Table 11

However, the WLE rules proposed in Section ‎7 does not impose any restriction on the number of consonants that can be joined by a Halant.

**Subsets:**

The combination may be followed by M, B,D or X

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant + Halant + Consonant + Matra | CHC[M] | ସ୍କୀ/skī/ | ସ ୍ କ ୀ  U+0B38 U+0B4D U+0B15 U+0B40 |
| Consonant + Halant + Consonant + Anusvara | CHC[B] | ସ୍କଂ/skaṁ/ | ସ ୍ କ ଂ  U+0B38 U+0B4D U+0B15 U+0B02 |
| Consonant + Halant + Consonant + Candrabindu | CHC[D] | ସ୍କଁ/skaṃ/ | ସ ୍ କ ଁ  U+0B38 U+0B4D U+0B15 U+0B01 |
| Consonant + Halant + Consonant + Visarga | CHC[X] | ସ୍କଃ/skaḥ/ | ସ ୍ କ ୍ ଃ  U+0B38U+0B4DU+0B15U+0B4DU+0B03 |

Table 12

(CH)CM may be followed by a B, D or X

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence Description** | **Sequence** | **Example** | **Constituting characters** |
| Consonant + Halant + Consonant + Matra +Anusvara | CHCM[B] | ସ୍କୀଂ/skīṁ/ | ସ ୍ କ ୀ ଂ  U+0B38 U+0B4D U+0B15 U+0B40U+0B02 |
| Consonant + Halant + Consonant + Matra +Candrabindu | CHCM[D] | ସ୍କୀଁ/skīṃ/ | ସ ୍ କ ୀ ଁ  U+0B38 U+0B4D U+0B15 U+0B40U+0B01 |
| Consonant + Halant + Consonant + Matra +Visarga | CHCM[X] | ସ୍କୀଃ/skīḥ/ | ସ ୍ କ ୀ ଃ  U+0B38U+0B4DU+0B15U+0B40U+0B03 |

Table 13

These are the basic akshar formation rules on which the overall Oriya script LGR is based. As languages other than Oriya are considered, some additional language-specific characters and rules are introduced.

# Variants

## In-Script Variants

In Oriya script, there are no characters/character sequences that can be created by using the Oriya characters permitted as per the [MSR] and look identical. There are no in-script variants.

## Cross-Script Variants

A cross-script variant label, also sometimes referred to as "Whole Label confusable", is the variant case where one label in one script can be composed in such a way that it can resemble another entire label in a different script, to the point that it is effectively indistinguishable.

Every individual LGR developed by the NBGP provides a set of cross-script variant code points that it identifies with members of other related scripts.

The NBGP has ensured that not only the individual characters but also most of the akshar variations are taken into consideration during the cross-script variant analysis of Oriya with all the other scripts under NBGP. It was achieved by sharing a list of most of the akshar combinations with all the other script teams (‘most’ is used here as all the possible Consonant + Halant + Consonant +… cases cannot be practically covered. Case of all the Oriya “Consonant + Halant + Consonant” was included in the analysis).

Oriya script has a set of possible cross-script variants with the Malayalam and Myanmar scripts. Cases listed in Table 6 are cross-script variants between Oriya, Malayalam and Myanmar. This follows the NBGP Cross-script Variant inclusion policy available in Appendix D.

The NBGP has ensured that Oriya and Malayalam LGR teams propose the same set of cross-script variants by meeting face-to-face on many occasions as well as through mail communications. The same set of cross-script variants (with Malayalam) is supposed to be found in the Malayalam LGR documents.

The NBGP has ensured that Oriya and Myanmar LGR teams propose the same set of cross-script variants by meeting face-to-face as well as through mail communications. The following set of cross-script variants (with Malayalam and Myanmar) are commonly agreed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variant Set | Oriya | | Malayalam | | Myanmar | |
| CP | Glyph | CP | Glyph | CP | Glyph |
| 1. | 0B20 | ଠ | 0D20 | ഠ | 101D | ဝ |
| 2 | 0B47 | େ | --- | --- | 1031 | ေ |

Table 14: Variant Set between Oriya, Malayalam and Myanmar Script

The cases listed in Appendix B are visually confusable code points listed for reference, but they are not defined as variant code points.

# Whole Label Evaluation Rules (WLE)

This Section provides the whole label evaluation rules for text written in the Oriya script. The rules have been drafted in such a way that they can be easily translated into the LGR specification.

Below are the symbols used in the WLE rules for each of the "Indic Syllabic Category" as mentioned in Table 4: Code point repertoire.

Additional symbols define the appropriate subsets for various rules.

C → Consonant

M → Matra

V → Vowel

B → Anusvara

H → Halant / Virama

N → Nukta

C1 → Consonants with Nukta {ଡ0B21 DDA, ଢ0B22 DDHA}

X → Visarga

D → Candrabindu

**Rule1**: N(଼) must be preceded only by C1

For example:

ଡ(0B21)+଼(0B3C) = ଡ଼

ଢ(0B22)+଼ (0B3C) = ଢ଼

**Rule2**: B (ଂ) must be preceded by V, C, N or M

i) B may be preceded by V (examples: ଅଂଶ,)

ii) B may be preceded by C, (example: ସଂସାର)

iii) B may be preceded by N (example: ଡଂଗା)

iv) B may be preceded by M, (examples: ସିଂହ, ମାଂସ, ସୁତରାଂ)

**Rule3**: X (ଃ) must be preceded by C, V, N or M

i) X may be preceded by C, (example: ପ୍ରାୟତଃ, କ୍ରମଶଃ)

ii) X may be preceded by N (example: କାଢ଼ାଃ)

iii) X may be preceded by M, (examples: ଦୁଃଖ, ଦୁଃଖିତ)

iv) X may be preceded by V, (examples:ଅଃ, ଆଃ, ଇଃ, ଉଃ) commonly used when writing Sanskrit or when there is religious requirement

**Rule4**: D (ଁ) must be preceded by V, C, N or M

i) D may be preceded by V (examples: କଅଁଳିଆ, ନିଆଁ, ପାଇଁ, ଯେଉଁ,)

ii) D may be preceded by C (example: ମୁହଁ, ପହଁରା)

iii) D may be preceded by N (example: ପୋଢ଼ୁଁଆ)

iv) D may be preceded by M (examples: ନାହିଁ, ନାଁ, ଗାଁରେ)

**Rule5**: H (୍) must be preceded by C or N

i) H may be preceded by C, (example: ଠିକ୍, ଭୁଲ୍, ହଠାତ୍)

ii) H may be preceded by N (example:ଗାର୍ଡ଼୍, ୱାର୍ଡ଼୍)

**Rule6**: M must be preceded by C or N

i) M may be preceded by C (example: ମୁହଁ, ପହଁରା, ନୁହଁ)

ii) M may be preceded by N (example:ବଢ଼ିଆ,ଗଡ଼ୁ)

# Contributors

This proposal is prepared and submitted by Mr. Kuldeep Patnaik (Freelancer) and reviewed by Dr. Devasisa Jethy, Oriya linguistic analyst, translating medical science to Odia, coauthor of a book (Odia equivalents of scientific terms) from Central Institution of Indian Languages, Mysore.

Following NBGP members helped Mr. Kuldeep Patnaik to take crucial decision while working together for nine Indian languages including Oriya (Odia).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Position** | **Name** | **Organization** | **Country** | **Language Expertise** |
| **Co-Chair** | Ajay Data | [Data Xgen Technologies](https://www.xgenplus.com/) | India | Hindi, English |
| **Co-Chair** | Mahesh D. Kulkarni | C-DAC | India | Marathi, Hindi |
| **Co-Chair** | Udaya Narayana Singh | Visva-Bharati, Santiniketan, West Bengal | India | Bengali, Maithili, Hindi, English |
| Member | Akshat S. Joshi | C-DAC | India | Hindi, Marathi |
| Member | Atiur Rahman Khan | C-DAC | India | Bangla |
| Member | Dr Debasishya Jethy | Oriyalinguistic analyst | India | Odia |
| Member | Jay Paudyal | Consultant | India | Hindi |
| Member | Neha Gupta | C-DAC | India | Hindi |
| Member | Shanmugam R | C-DAC | India | Tamil |
| Member | Veena Solomon | (freelancer) | India | Malayalam |

Following is the list of other NBGP members with their language expertise.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Position** | **Name** | **Organization** | **Country** | **Language Expertise** |
| Member | Abhijit Dutta | Wikimedia | India | Bengali, Hindi |
| Member | Anivar A. Aravind | Indic Project | India | Malayalam |
| Member | Anupam Agrawal | Tata Consultancy Service | India | Hindi, Bengali |
| Member | Arvind Bhandari | Gujarat University | India | Gujarati |
| Member | Ashish Modi | [Data Xgen Technologies](https://www.xgenplus.com/) | India | Hindi |
| Member | Bal Krishna Bal | Kathmandu University | Nepal | Nepali |
| Member | BalaramPrasain | Tribhuvan University | Nepal | Nepali |
| Member | BASANTA KUMAR PANDA | Regional Institute of Education (NCERT) | India | Odia |
| Member | BhimDhoj Shrestha | Consultant | Nepal | Nepali, Newar |
| Member | Chitrita Chatterjee | Internet and Mobile Association of India (IAMAI) | India | Multiple languages represented by members of IAMAI |
| Member | DEBAJIT SHARMA | AnundoramBorooah Institute of Language Art and Culture | India | Assamese |
| Member | Dev DassManandhar | Consultant | Nepal | Nepali,Newar |
| Member | Dhanalakshmi KT | Northern Trust | India | Kannada |
| Member | Ganesh Murmu | Ranchi University | India | Santali |
| Member | GangadharPanday | Babul Films Society | India | Telugu |
| Member | Ghanashyam Nepal | Benares Hindu University& University of North Bengal | India | Nepali |
| Member | Girish Chandra Mishra | Language Technology Centre, Ravenshaw University | India | Odia |
| Member | Gurpreet Singh Lehal | Punjabi University Patiala | India | Panjabi |
| Member | Harish Chowdhary | NIXI | India | Hindi |
| Member | Hempal Shrestha | Nepal Entrepreneurs' Hub (NEHUB) | Nepal | Nepali, Newar |
| Member | JijoPappachan | DN. Domains | India | Malayalam |
| Member | K. C. Tikayat ray | Odia BhasaPratisthan | India | Odia |
| Member | KalyanVasudeo Kale | Formerly affiliated with University of Pune | India | Marathi |
| Member | Kuldeep Patnaik(Editor) | Freelancer | India | Odia |
| Member | Mukesh Saini | Essel Group | India | Hindi |
| Member | N. DeivaSundaram | NDS Lingsoft Solutions Pvt Ltd | India | Tamil |
| Member | NirajanParajuli | NREN | Nepal | Nepali |
| Member | Nishit Jain | C-DAC | India | Hindi |
| Member | PawanChitrakar | Gapsco | Nepal | Nepali |
| Member | Prabhakar Pandey | C-DAC | India | Hindi |
| Member | Prasad PK | A-one Publishers | India | Malayalam |
| Member | Prateek Pathak | ISOC Mumbai | India | Devanagari |
| Member | Raiomond Doctor | NLP Consultant | India | English, Hindi, Marathi, Gujarati |
| Member | Rajib Chakraborty | Society for Natural Language Technology Research | India | Bangla (Bengali) |
| Member | Rajiv Kumar | NIXI | India |  |
| Member | S.Maniam | International Forum IT for Tamil | Singapore | Tamil |
| Member | Santhosh Thottingal | Wikimedia foundation | India | Malayalam, Sourashtra, Tamil |
| Member | SarojaBhate | University of Pune | India | Sanskrit |
| Member | Shambhu Kumar Singh | National Translation Misson, Mysore | India | Maithili |
| Member | Shantaram S. WardeWalawalikar | Independent Researcher | India | Konkani |
| Member | Shashi Pathania | P.G.D. of Dogri, University of Jammu | India | Dogri |
| Member | Shubham Saran | NIXI | India |  |
| Member | SinnathambiShanmugarajah | University of Colombo School of Computing | Sri Lanka | Tamil |
| Member | SujithKartha | [Digitalkz.com](http://digitalkz.com/) | India | Malayalam |
| Member | SurajAdhikari | Mercantile Communications (and .np ccTLD) | Nepal | Nepali |
| Member | SwarnaPrabhaChainary | Guwahati University | India | Bodo |
| Member | U.B. Pavanaja | <http://vishvakannada.com/> | India | Kannada |
| Member | Uma Maheshwar G | CALTS, Univ. of Hyderabad | India | Telugu |
| Member | Uttam Shrestha Rana | NPNOG | Nepal | Nepali |
| Member | Vinay Murarka | Consultant; https://मेरा.भारत | India | Hindi |

Table 15: Contributors and NBG Panel

# References

[MSR] Integration Panel, "Maximal Starting Repertoire — MSR-4 Overview and   
Rationale", 7 February 2019,   
<https://www.icann.org/en/system/files/files/msr-4-overview-25jan19-en.pdf> (Accessed on 18 February 2019)

[NBGP] Neo-Brahmi Generation Panel

[Code Charts] The Unicode Standard 10.0 Character Code Charts <http://www.unicode.org/charts/PDF/U0B00.pdf>(Accessed on 12 January 2018)

[0] The Unicode Standard 1.1  
 Any code point originally encoded in Unicode 1.1

[6] The Unicode Standard 4.0  
 Any code point originally encoded in Unicode 4.0

[9] The Unicode Standard 5.1  
 Any code point originally encoded in Unicode 5.1

[101] Omniglot, "Oriya", <https://www.omniglot.com/writing/oriya.htm>  
(Accessed on 12 January 2018)

[102] Odia (Oriya) alphabet - Wikipedia <http://www.academia.edu/9999923/The_Oriya_Script_Origin_Development_and_Sources> (Accessed on 07 December 2018)

[103] Odia language - http://indohistory.com/oriya.html  
(Accessed on 07 December 2018))

[104] Oriya (Unicode block) – [Unicode.org](https://unicode.org/charts/PDF/U0B00.pdf),[(Unicode\_block)](https://en.wikipedia.org/wiki/Oriya_(Unicode_block))

[105] Odisha State Govt. Primary School [Grade 1 e-book “HasaKhela”](http://opepa.odisha.gov.in/website/Download/e-Text-Book/CLass%20I/Hasa%20Khela%20Part%20II/Haso%20Khelo-II-Page-112.pdf): by  
[Odisha Primary Education Programme Authority](http://opepa.odisha.gov.in/website/e-textbook.aspx) <http://opepa.odisha.gov.in/website/Download/e-Text-Book/CLass%20I/Hasa%20Khela%20Part%20II/Haso%20Khelo-II-Page-112.pdf>

[106] NBGP, Public Comment Feedback for Kannada, Telugu, Oriya script LGR Proposals, <https://docs.google.com/document/d/1m9MbBfNBQZAFc9SOYpt0lgeeyM3N-DsUP173J4Vb948> (Accessed 13 February 2019)

# Appendix A: Cross-script Confusable Code Points

Oriya script has a set of possible cross-script confusable code points with the Gujarati, Bengali, Telugu, and Kannada that do not rise to the level of cross-script variant.

## Oriya and Gujarati

The following characters are visually confusable. The NBGP discussed and concluded that they are similar code points but should not be considered as variant code points.

|  |  |
| --- | --- |
| Oriya | Gujarati |
| ଃ(0B03) | ઃ (0A83) |
| ପ (0B2A) | ઘ (0A98) |
| ଥ(0B25) | થ (0AA5) |

Table 16: Confusable code points between the Oriya and Gujarati scripts

## Oriya and Bengali

The following characters are visually confusable. The NBGP discussed and concluded that they are similar code points and should not be considered as variant code points.

|  |  |
| --- | --- |
| Bengali | Oriya |
| ও (0993) | ଓ (0B13) |

Table 17: Confusable code points between the Oriya and Bengali scripts

The following characters were discussed and the NBGP concluded that they are neither variant code points nor confusable code points.

|  |  |  |
| --- | --- | --- |
| Bengali | Oriya | Resolution |
| ঘ (0998) | ସ (0B38) | Distinguishable |

Table 18: Other resolutions between Oriya script and Bengali script

## Oriya and Telugu

The following characters were discussed and the NBGP concluded that they are not variant code points nor confusable code points

|  |  |  |
| --- | --- | --- |
| Oriya | Telugu | Resolution |
| ଠ (0B20) | ర (0C30) | Distinguishable |
| ଠ (0B20) | ఠ (0C20) | Distinguishable |

Table 19: Other resolutions between the Oriya and Telugu scripts

## Oriya and Kannada

The following characters were discussed and the NBGP concluded that they are not variant code points nor confusable code points

|  |  |  |
| --- | --- | --- |
| Oriya | Kannada | Resolution |
| ଠ (0B20) | ರ (0CB0) | Distinguishable |
| ଠ (0B20) | ಠ (0CA0) | Distinguishable |

Table 20: Other resolutions between the Oriya and Kannada scripts

# Appendix B: Oriya Dialects

There are different ways of speaking and meaning of words in local Oriya Language. However the script remains the same.**[[6]](#footnote-6)**

#### Standard Odia

**Kataki Odia** or *The Odia of Mughalbandi region* considered as Standard Odia due to literary traditions. It is spoken mainly in the eastern half of the state of Odisha, with little variation, in districts like Khurdha, Puri, Cuttack, Jajpur, Jagatsinghpur, Kendrapada, Dhenkanal, Angul and Nayagarh district.

#### Major forms, or dialects

Midnapori Odia:

Spoken in the undivided [Midnapore](https://en.wikipedia.org/wiki/Midnapore) District of West Bengal.

[***Singhbhumi Odia***](https://en.wikipedia.org/wiki/Singhbhumi_Odia):

Spoken in [East Singhbhum](https://en.wikipedia.org/wiki/East_Singhbhum), [West Singhbhum](https://en.wikipedia.org/wiki/West_Singhbhum) and [Saraikela-Kharsawan](https://en.wikipedia.org/wiki/Saraikela-Kharsawan" \o "Saraikela-Kharsawan) district of [Jharkhand](https://en.wikipedia.org/wiki/Jharkhand)

[***Baleswari Odia***](https://en.wikipedia.org/wiki/Baleswari_Odia):

Spoken in [Baleswar](https://en.wikipedia.org/wiki/Balasore_district" \o "Balasore district), [Bhadrak](https://en.wikipedia.org/wiki/Bhadrak" \o "Bhadrak) and [Mayurbhanj](https://en.wikipedia.org/wiki/Mayurbhanj) district of Odisha.

[***Ganjami Odia***](https://en.wikipedia.org/wiki/Ganjami_Odia):

Spoken in [Ganjam](https://en.wikipedia.org/wiki/Ganjam) and [Gajapati](https://en.wikipedia.org/wiki/Gajapati_district" \o "Gajapati district) districts of Odisha and [Srikakulam](https://en.wikipedia.org/wiki/Srikakulam) district of Andhra Pradesh.

[***Sambalpuri***](https://en.wikipedia.org/wiki/Sambalpuri_language) ***Odia:***

Spoken in[Bargarh](https://en.wikipedia.org/wiki/Bargarh_district), [Bolangir](https://en.wikipedia.org/wiki/Bolangir_district), [Boudh](https://en.wikipedia.org/wiki/Boudh_district), [Debagarh](https://en.wikipedia.org/wiki/Debagarh_district), [Jharsuguda](https://en.wikipedia.org/wiki/Jharsuguda_district), [Kalahandi](https://en.wikipedia.org/wiki/Kalahandi), [Nuapada](https://en.wikipedia.org/wiki/Nuapada_district), [Sambalpur](https://en.wikipedia.org/wiki/Sambalpur_district) and [Subarnapur](https://en.wikipedia.org/wiki/Subarnapur_district) districts of Odisha and by some people in [Raigarh](https://en.wikipedia.org/wiki/Raigarh_district" \o "Raigarh district), [Mahasamund](https://en.wikipedia.org/wiki/Mahasamund_district" \o "Mahasamund district), [Raipur](https://en.wikipedia.org/wiki/Raipur_district) districts of [Chhattisgarh](https://en.wikipedia.org/wiki/Chhattisgarh) state.

[***Desiya Odia***](https://www.ethnologue.com/language/dso):

Spoken in   
[Koraput](https://en.wikipedia.org/wiki/Koraput), [Rayagada](https://en.wikipedia.org/wiki/Rayagada" \o "Rayagada), [Nowrangpur](https://en.wikipedia.org/wiki/Nowrangpur" \o "Nowrangpur) and [Malkangiri](https://en.wikipedia.org/wiki/Malkangiri" \o "Malkangiri) Districts of Odisha and in the hilly regions of [Vishakhapatnam](https://en.wikipedia.org/wiki/Vishakhapatnam), [Vizianagaram](https://en.wikipedia.org/wiki/Vizianagaram) District of Andhra Pradesh.

[***Bhatri***](https://en.wikipedia.org/wiki/Bhatri_language):

Spoken in South-western Odisha and eastern-south Chhattisgarh.

[***Halbi***](https://en.wikipedia.org/wiki/Halbi_language):

Spoken in undivided Bastar district of [Chhattisgarh](https://en.wikipedia.org/wiki/Chhattisgarh). Halbi is a mixture of Odia and Marathi with influence of Chatishgarhi tribal languages.

[***Phulbani Odia***](https://en.wikipedia.org/wiki/Phulbani_Odia):

Spoken in [Phulbani](https://en.wikipedia.org/wiki/Phulbani), [Phulbani Town](https://en.wikipedia.org/wiki/Phulbani), Khajuripada block of [Kandhamal](https://en.wikipedia.org/wiki/Kandhamal_district" \o "Kandhamal district), and in nearby areas bordering [Boudh district](https://en.wikipedia.org/wiki/Boudh_district" \o "Boudh district) .This language gained momentum during the amalgamation of [Kandhamal(Phulbani)](https://en.wikipedia.org/wiki/Kandhamal" \o "Kandhamal), and [Boudh](https://en.wikipedia.org/wiki/Boudh" \o "Boudh), region into a single district [Phulabani](https://en.wikipedia.org/wiki/Phulbani" \o "Phulbani),

#### Minor non-literary and tribal forms or dialects

[**Sundargadi**](https://en.wikipedia.org/wiki/Sundargadi)**Odia** :

Variation of Odia Spoken in Sundargarh district of [Odisha](https://en.wikipedia.org/wiki/Odisha) and in adjoining pockets of [Jharkhand](https://en.wikipedia.org/wiki/Jharkhand) and [Chhattisgarh](https://en.wikipedia.org/wiki/Chhattisgarh).

[**Kalahandia**](https://en.wikipedia.org/wiki/Kalahandia)**Odia** :

Variation of Odia spoken in undivided [Kalahandi District](https://en.wikipedia.org/wiki/Kalahandi_District) and neighboring districts of [Chhattisgarh](https://en.wikipedia.org/wiki/Chhattisgarh).

**Kurmi**: Spoken in Northern Odisha and South west Bengal.

**Sounti**: Spoken in Northern Odisha and South west Bengal.

**Bathudi**: Spoken in Northern Odisha and South west Bengal.

**Kondhan**: A tribal dialect spoken in Western Odisha..

[**Laria**](https://www.ethnologue.com/language/hne): Spoken in bordering areas of Chatishgarh and Western Odisha.

[**Aghria**](https://en.wikipedia.org/wiki/Agharia): Spoken mostly by the ingenious people of Aghria caste in Western Odisha.

**Bhulia**: Tribal form spoken in Western Odisha.

[**Sadri**](https://www.ethnologue.com/language/sck): A mixture of Odia and Hindi language with major regional tribal influence.

[**Bodo Parja / Jharia**](https://www.ethnologue.com/language/bdv): Tribal dialect of Odia spoken mostly in Koraput district of Southern Odisha .

**Matia**: Tribal dialect of Odia spoken in Southern Odisha.

**Bhuyan**: Tribal dialect of Odia spoken in Southern Odisha.

[**Reli**](https://www.ethnologue.com/language/rei): Spoken in Southern Odisha and bordering areas of Andhra Pradesh.

[**Kupia**](https://www.ethnologue.com/language/key): Spoken by [Valmiki](https://en.wikipedia.org/wiki/Valmiki_(caste)) caste people in the Indian state of [Telangana](https://en.wikipedia.org/wiki/Telangana) and [Andhra Pradesh](https://en.wikipedia.org/wiki/Andhra_Pradesh), mostly in [Hyderabad](https://en.wikipedia.org/wiki/Hyderabad_district,_India), [Mahabubnagar](https://en.wikipedia.org/wiki/Mahabubnagar_District" \o "Mahabubnagar District), [Srikakulam](https://en.wikipedia.org/wiki/Srikakulam), [Vizianagaram](https://en.wikipedia.org/wiki/Vizianagaram), [East Godavari](https://en.wikipedia.org/wiki/East_Godavari_district) and [Visakhapatnam](https://en.wikipedia.org/wiki/Visakhapatnam_district) districts.

# Appendix C: Oriya Characters

Odisha State Government Primary School Grade 1 e-book “HasaKhela” [105] page 112 lists all the Oriya characters as shown in Figure 4.

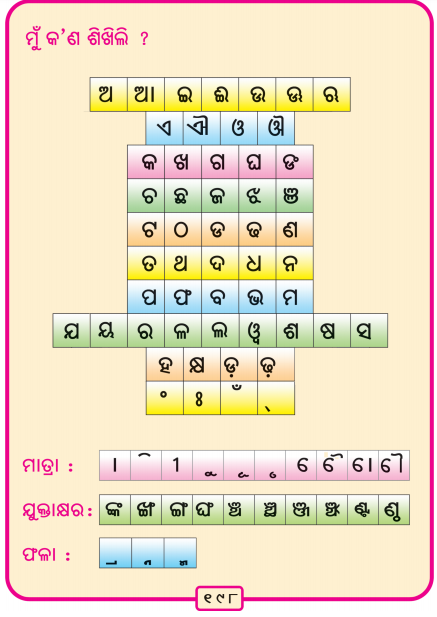


Figure 4: Odisha State Govt. Primary School Grade 1 e-book (Page 112)

# Appendix D: NBGP Cross-script Variant Inclusion Policy

If, in any two given scripts, all the potential cross-script variants consist of dependent (e.g. Vowel Signs, Anusvara, Visarga, Chandrabindu etc.) characters **ONLY**, then that entire set can be ignored and no cross-script variants be proposed between those two scripts.

If, in any two given scripts, there is **AT LEAST ONE** non-dependent (e.g. Consonant, Vowel etc.) cross-script variant character/sequence present, all the potential cross-script variants be considered and proposed between the two scripts.  
  
This cross-script analysis has been restricted to the scripts that have descended from the Brahmi as most of them share similar usage patterns. By and large, all of these scripts have a common set of characters that existed in Brahmi script and bear the same identities. However, as the scripts branched out from the Brahmi, depending on various factors, the shapes of the characters changed. This change in the shape was not uniform across all the characters and the scripts. Some characters shapes did change significantly whereas some of them still retained similarity. The cross-script similarity analysis also aims to identify such cases where the same character retained almost the same shape despite being part of the different scripts. These set of characters are variants of each other in true sense than merely of co-incidental visual similarity. 

**Case of Malayalam Myanmar, and Odia (Oriya):**  
This is the case of "Consonant Ttha" which happened to retain the same shape despite being part of different scripts, i.e., Malayalam, Myanmar and Odia. These characters are:

ഠ - MALAYALAM LETTER TTHA (U+0D20)  
ଠ - ORIYA LETTER TTHA (U+0B20)

Both the characters, look exactly alike and belong to a "Consonant" category. As they are consonants, each of them, even in the simplest form i.e. the characters themselves, are valid labels. As per the NBGP cross-script variant inclusion policy, this is a valid case for inclusion. Also, even if they are single characters, when the same character combines, theoretically they can form infinite[[7]](#footnote-7) number of cross-script variant labels between the scripts involved. Here are some samples of some of those labels:

|  |  |  |
| --- | --- | --- |
| **Malayalam** | **Myanmar** | **Oriya** |
| ഠഠഠ U+0D20 U+0D20U+0D20 | ဝဝဝ  U+101D U+101DU+101D | ଠଠଠ U+0B20 U+0B20U+0B20 |
| ഠഠഠഠ U+0D20 U+0D20U+0D20U+0D20 | ဝဝဝဝ  U+101D U+101DU+101DU+101D | ଠଠଠଠ U+0B20 U+0B20U+0B20U+0B20 |
| ഠഠഠഠഠ U+0D20 U+0D20U+0D20U+0D20U+0D20 | ဝဝဝဝဝ  U+101D U+101DU+101DU+101DU+101D | ଠଠଠଠଠ U+0B20 U+0B20U+0B20U+0B20U+0B20 |

Since, having such labels is a realistic possibility and the corresponding labels look almost exactly alike, NBGP has proposed them as blocked variants.

NBGP acknowledges the concern that this shape is quite generic and may have parallels in other scripts not under its ambit.  However, as NBGP does not have any exposure about actual usage of those characters in those particular scripts, NBGP desisted from including them in the analysis.  As NBGP has already considered all the related scripts under the cross-script variant analysis, the similarity of the characters belonging to NBGP scripts with other scripts not under the NBGP ambit, may be of a mere co-incidental visual nature.

Additionally, this concern is not limited to these two characters but for all the characters in all the scripts under the scope of the Root LGR procedure. Carrying out this analysis can practically be done only with the Generation Panels that exist while the NBGP is active. This still leaves out those scripts which may not have a Generation Panel established yet. Hence, carrying out this exercise in entirety is quite impracticable. This conundrum can be resolved if all the such cases are handled by the "String Similarity Assessment Panel" of ICANN.

1. Criteria for this status include: high antiquity of its early texts/recorded history over a period of 1500–2000 years; a body of ancient literature/texts, which is considered a valuable heritage by generations of speakers; a literary tradition that is original and not borrowed from another speech community; [↑](#footnote-ref-1)
2. The variety of Oriya dialects etc. is reviewed in Appendix B. [↑](#footnote-ref-2)
3. The International Alphabet of Sanskrit Transliteration (I.A.S.T.) is a transliteration scheme that allows the lossless romanization of Indic scripts as employed by Sanskrit and related Indic languages. IAST makes it possible for the reader to read the Indic text unambiguously, exactly as if it were in the original Indic script. Example:କ0B15 (ka), ଖ0B16 (kha) etc. [↑](#footnote-ref-3)
4. https://www.ethnologue.com/about/language-status [↑](#footnote-ref-4)
5. In case of Sanskrit, it can join up to 5 consonants. [↑](#footnote-ref-5)
6. Extracted from [Wikipedia](https://en.wikipedia.org/wiki/Odia_language#Major_forms_or_dialects), <https://en.wikipedia.org/wiki/Odia_language#Major_forms_or_dialects> [↑](#footnote-ref-6)
7. Though theoretically infinite, this number would be limited to the number of such labels whose equivalent punycode string would not exceed 63 characters including the ACE prefix "xn--". [↑](#footnote-ref-7)