



# Design of Soundscape Music on Beluk Vocal in Digitizing Audio Archives

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**Abstract.** Beluk Vocal Art is one of the traditional arts of West Java which is still being preserved from generation to generation. However, this art is scarce to find. Beluk Vocal Art has a unique characteristic, namely a high singing or screaming voice, which is not only used as a means of communication but adapted to the development and needs of society, such as being used in religious, social and entertainment activities. From this, it can be seen that humans and their environment cannot be separated, where there is a connection with music, one of which is the soundscape in human life. The purpose of a soundscape includes two aspects: to raise awareness of sound, improve the condition of the surrounding environment, and generate listener associations, memories, and images associated with the soundscape. Thus, technology helps us to be able to develop traditional arts by the times so that these arts are preserved. Therefore, this research aims to preserve Beluk Vocal Art in the form of digital audio archives and design implementation in the format of a soundscape in Beluk Vocal Art. The method used is design-based research (DBR). The resulting product is digital audio archives and soundscape design, which reveal a deeper level of meaning inherent in the Beluk Vocal Art without eliminating the original sound of the Beluk Vocal Art.

**Keywords:** Soundscape · Beluk Vocal · Digitizing Audio Archive

## 1 Introduction

Digitalization and digital preservation are closely connected ideas, with digital preservation being a specific action of the underlying technology with the long-term objective of maintaining the longevity and easy accessibility of a digital record. Gradually, a new process related to file identification and entry of digital documents emerged due to digitalization. A well-designed digital archive will generate this metadata automatically and include information about original recording support, format and conservation status, playback equipment and standards, digital resolution, all equipment used, operators and performers, and other processes or activities involved [1].

According to ecological principles, humans and their environment cannot be separated, which is tied to music, one of which is the human soundscape. The soundscape is the total amount of natural and artificial sounds in a given environment [2]. The objective has two components: to increase environmental awareness and to enhance the state of the surrounding environment. Soundscapes are frequently defined by their extensive spectral content, combining the sounds of numerous acoustic occurrences.

As stated by Barry Truax [3], one of the goals of a soundscape in music is to orient the original recording into a time or place through an auditory experience. Soundscape music is a form of electroacoustic music characterized by recognizable sounds and environmental contexts intended to evoke listener associations, memories, and images associated with soundscapes. To convince the listener to identify a sound source, the soundscape composer must utilize the soundscape's inherent characteristics, which transmit the soundscape's distinctive message. Schafer [4] specifies a soundscape as consisting of three primary components: the dominant sound, the sound signal, and the sound mark, which includes the identification of time and location.

A compelling justification for audio preservation is to save the sounds of human culture for future generations. The spoken word, music, storytelling, and songs of various civilizations worldwide and throughout history are captured on ethnographic recordings. Through recordings, linguists can study the grammar and vocabularies of thousands of languages and dialects, both extant and living. In addition, recordings make it possible to hear accents, intonations, and inflexions that could not be accurately described before the development of audio recording technology in the nineteenth century [5].

Here, we may use technology to modernize historic art forms to preserve them. The storage of traditional music in digital audio is one of the achievements that have been made, as is the realization of works in which modernity and traditions exist in contemporary society intertwined.

The purpose of this study is to digitize audio archives in Beluk Vocal, with the final result being an audio soundscape. With the rapid advancement of technology, the digitization of audio is evolving, such as the creation of virtual instruments based on the ethnicities of other countries (such as VSTi Ethno World).

Therefore, this study focuses on digitizing audio archives by collecting recorded sound samples and implementing digital archives from recorded sound samples that can be edited and ordered back into virtual instruments without losing the instrument's essence and its environment.

The research focus is audio data on Beluk Vocal. Moreover, environmental factors can urge the community to recognize that some of these arts still exist and must be preserved by adapting existing technologies to the times. This article outlines the conceptual framework derived from study findings for maintaining traditional music to be utilized in the digitization of audio archives.

## 2 Methods

The method used is design-based research (DBR). The object of research is Vocal Beluk in Ciapus, Banjaran. In this study, three stages were carried out to obtain soundscape audio results on Vocal Beluk based on the DBR method. These stages include: (1) the soundscape environmental analysis stage by identifying the sound to be recorded based on the context of place and time; (2) the soundscape planning and design stage by making a design and soundscape design for Seni Beluk; and (3) soundscape implementation, namely implementing and soundscape design validation process. Four vocal Beluk artists assisted in this research from Ciapus, Banjaran, who recorded samples of their singing based on several *wawacan* (one of Sundanese literature) that Vokal Beluk usually sing.

The data to be collected in this research includes qualitative data obtained through documentation studies, literature, and collecting audio data archives through sampling and synthesis processes. In addition, observations were also made based on the acoustic environment, which will affect the audio data to be collected. The data were analyzed using triangulation techniques and categorized based on the acoustic environment.

### 3 Results and Discussion

#### 3.1 Audio Archive Digitization

The world's existing cultural, scientific and historical heritage must be appropriately documented in the professional literature. With broad regional, national and worldwide cooperation on digitizing audio, the national record of cultural heritage will be balanced. The physical decline of legacy audio and outdated technology, including a lack of functional audio playback devices and professional expertise for some legacy audio formats, threatens audio material in libraries, archives, and museums. Even once-commonplace audio carriers like audio cassettes, reel-to-reel tapes, and recordable CDs face a bleak future as they age. Providing archives and storage arrangements and proper physical preservation can extend the usefulness of aged audio material. However, physical preservation cannot prevent the severe damage to audio or obsolete formats that make some formats vulnerable. Reformatting it to digital file formats is the best way to preserve audio recordings for the long term, whether on grooved discs or cassette tapes [6].

Digitization is a process conducted based on digital preservation that serves to preserve documents recorded on analog supports. While digitalization and digital preservation are being defined, it is crucial to realize that digital support is used to create thousands of documents daily. It is the reason why the subject of digital preservation is so tricky, as it involves digital content and content produced initially using digital technology. Digital preservation encompasses conservation and intervention measures. Migration from outmoded to new support constitutes preservation. Prevention or damage is a conservation method that does not avoid obsolescence [7]. According to Wright, migration is a component of preservation, and the conservation of digital documents is a continuous type of digital preservation.

Digital preservation allows access and future use of digital documents created in the present or the past based on information conservation and security, ensuring long-term upkeep and usage [8]. Digital preservation was created as an ongoing and complicated worldwide job, considering information's physical and logical aspects and utilizing suitable and formal document descriptions [9]. In practice, digital preservation of sound documents is an ongoing way of preserving, managing, and handling sound documents while allowing permanent access to digital audio content (also known as essence or media), dissemination, reuse, and accompanying information.

On the other hand, Digitization is the transfer of content stored in analogue support to digital support, i.e. the process by which analogue signals are replaced by digital signals [10]. Digitization serves to protect valuable documents from manipulation and damage. It is the only way to ensure the viability of the audiovisual material [11]. Apart from being an analogue for transfer to digital platforms and conversion processes, Digitization is a strategy in file management [12]. Through the digitization process, specific content can

be converted, for example, an audio recording converted into a series of numeric values. According to the recommendations of experts and researchers [10, 13], Digitization is based on the following recommendations [14]:

1. Digitization without compressing data according to agreed quantification and sampling of digital signals.
2. The analogue signal from the document must be captured in high fidelity using appropriate recording and reproduction equipment.
3. Digitization must be carried out without changing the source material.
4. An alphanumeric code link between the media and metadata must be provided to identify the material.

The metadata schema development necessitated careful consideration of the possible and potential applications the resources may have for different sorts of users. In addition, it determines how the metadata facilitates access to and use of the contents after the project's funding period expires [15].

The challenge must be understood as an experiment in the digital preservation of sound files to ensure long-term digital preservation. Of these challenges, some of the most prominent challenges among them are obsolescence and migration [16], which says that the only prediction that can be made about information technology is that technology will continue to change. Thus, digital preservation is a solution for maintaining audio archives in solving the problem of damage or obsolescence of recordings produced in analogue in previous years. As technology advances and storage density levels increase, hardware devices often become obsolete. As computer processors and many software applications fall into disuse, users can no longer access many files that depend on those components. Therefore, any decision regarding digital preservation must include technological flexibility.

### 3.2 Soundscape

Soundscapes consist of the noises heard by individuals during their regular activities. Schafer's discovery of the soundscape is derived from the word landscape, coined by the Italian poet Petrarch in the 14th century after he climbed a mountain peak and observed a view he had never seen before. Michael Southworth's work titled "The Sonic Environment of Cities" is where Schafer obtained the term "soundscape." Therefore, it may be stated that a soundscape is a scene in the form of noises or sounds in daily human existence [17].

The soundscape is the entire volume of sound in a given environment, including natural and manufactured [18]. Natural noises include biophony (animal sounds, such as birds and whales singing) and geophony (non-biologically occurring sounds, such as wind, rain, leaves rustling and water flowing) [19, 20]. The term anthropophonies refers to sounds created directly by humans or indirectly through instruments [21]. Soundscapes are frequently defined by their extensive spectral content, combining the sounds of numerous acoustic occurrences. In the forest, for instance, the sound is comprised of birds, insects and animals, the rustle of leaves, the wind, and rain. Thus, a forest soundscape contains a wide range of frequencies and lacks a distinct pitch. Each acoustic event, such as a blast of wind or an animal sound, contributes to its loudness envelope.

These events overlap to maintain a consistent volume level without rapid fluctuations [18, 22].

As an illustration, the shell effect happens when shells are placed close to the ear. Surfaces function as ambient sound resonators that can accentuate particular frequencies. The outcome frequently resembles an uncertain clatter and, at times, a tuned soundscape.

According to R. Murray Schafer [18], a music composer and acoustic ecology researcher, a soundscape's objective is to increase sound awareness and improve the surrounding environment's condition. It is hypothesized that natural sounds are the primary source of human music. In society, the soundscape acts as the literal background sound. In doing so, the community's music grows to complement and enhance the soundscape. Since the 20th century, the definition of soundscape began to alter [23]. The soundtrack produced by the surroundings came to be recognized as music. Specifically, the sound-generating environment can be regarded as an instrument. More precisely, the sound-producing environment itself can be called an instrument [24, 25].

The World Soundscape Project [26] is an international research project focused on the soundscape and the auditory components of human-environmental connections. This study gave rise to soundscape composition, which uses recordings of soundscapes to create musical works. Truax [3] reviews soundscape production techniques, including raw source recordings (found sounds), mixing, layering, establishing multichannel spatial localization, temporal stretching, and equalization.

Numerous contemporary musical pieces blend conventional soundscape compositions with innovative technologies. For instance, the urban sounds utilized in numerous works consist of an interface that generates an electronic soundscape in real-time. Another illustration is sound recorded from an urban setting, processed with many digital effects, and mapped to environmental input factors. With the expansion of soundscape applications and the variety of purposes, the soundscape concept is divided into two parts, namely lo-fi (low fidelity), which is used in noise standards and hi-fi (high fidelity), used to express emotions. From an ecological point of view, a hi-fi soundscape is inhabited by many individual 'species' resulting from local conditions. These 'species' are rich in information that can be interpreted by local people who understand their contextual meaning [3]. Moreover, almost everything about technology promotes standardization and uniformity, from the micro-levels of hum and broad-band noise to the various influences that make up a soundscape 'lo-fi' in every city center, as well as its surroundings [18].

Soundscape composition aims to direct the original recording to a time or place through an auditory experience. Soundscape composition is a form of electroacoustic music with the characteristics of recognizable sounds and environmental contexts to evoke listener associations, memories, and imagination related to soundscapes. The soundscape is local and particular. To get the listener to identify a sound source, the soundscape composer must take advantage of the soundscape's built-in features, which can convey the soundscape's unique message. Schafer defines a soundscape with three main elements: the keynote sound, sound signal, and sound mark. Of the three main elements, sound marks play the most crucial role [3].

Schafer [18] says that once a sound mark is identified, it deserves to be protected because sound marks make the acoustic life of a community unique. What makes a sound

mark unique includes time identification and localization. The sound mark must have one crucial feature: time identification or localization. If the work can provide listeners with more detail, it will be easier to recognize. Their distinctive sound manifestations make a great impression on the listeners, highlighting the recording's original/expressive place or time. Whatever the sound, it must have a character of its own and recognizable temporal identity, or localization, without reference to local pronunciations, intonations, or sounds intertwined between humans and nature or simply expressions of life during a particular time. It can be perceived clearly only when the sound coordinates are defined as a soundscape space or time frame.

### 3.3 Conceptual Design

Through the digital audio archive and soundscape design process, audio data can be evaluated against a real acoustic or a simulated environment via synthesis. In stages 1 and 3 (Fig. 1), the soundscape of the natural environment can be evaluated and identified in the simulated acoustic environment through synthesis. If the location for soundscape implementation is unavailable, it can be evaluated using a simulated acoustic environment through the synthesis process. In addition, acoustic technology consisting of natural voice and synthesized sound can also be applied in the soundscape design stage if the location is available. The actual acoustic environment is evaluated through field study methods, and behavioural observations generally focus on short-term locations and times.

Sound recordings in an acoustic environment build a foundation for soundscape research by analyzing and understanding soundscapes in natural environments. This recording does not require good acoustic environmental characteristics to be captured for perceptual accuracy but only requires recording outs and outs without the surrounding environment. It is necessary to consider two aspects of the recording: timbre and spatial

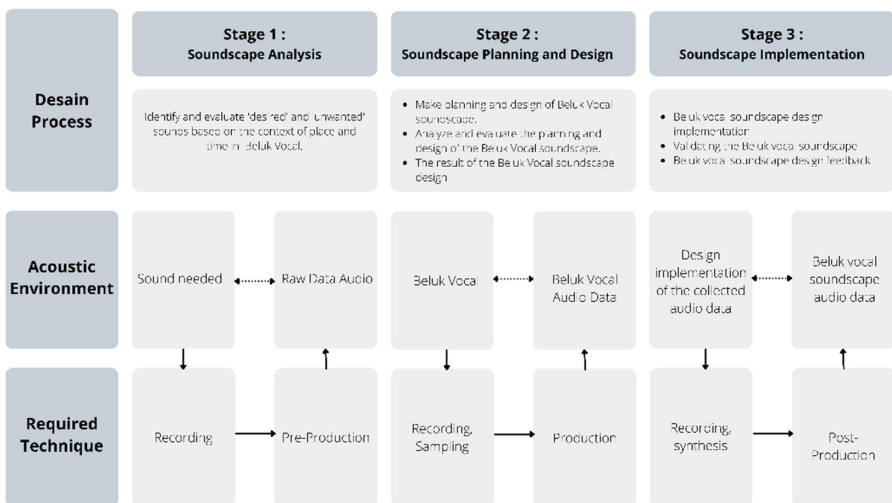


Fig. 1. Conceptual design

quality. In general, the timbre quality of a recording depends mainly on the instrumentation and acoustic properties of the microphone, such as frequency response, direction, impedance, sensitivity, equivalent noise level, harmonic distortion, SPL, and so on. In terms of spatial aspects, it is common to use multiple microphones better to capture the spatial characteristics of the acoustic environment.

This recording process is done in two microphone arrays. Compared to single-microphone recordings, stereo recordings can provide more spatial information on the sound field, including direction, distance, outflows, and surroundings. With this sound recording system, recording a sound field in a surround format is straightforward, although most surround sound comes from the mixing process.

In this study, there were several recording processes, namely in stage 1, and the recording was used to evaluate the existing soundscape. The data obtained at the interview stage of the outs and outs artists explained in detail about the outs and outs, the purpose of outs and outs and the location that suits the outs and outs of art needs. The results of interviews and data analysis found that beluk is usually sung in the forest, in resonance, or in the village environment when accompanying mothers and newborns, or as a performing art.

In stage 2, the recording is used to design a better soundscape. At this stage, it was carried out after the interview where the beluk artists sang one of the wawacan or stories contained in the beluk text.

Here the artist takes a sample of the recorded discourse as a sample after the interview process takes place. Here the artists sing randomly together.

In stage 3, the recording is recorded to validate the design soundscape after its implementation. In all these stages, it is essential for a soundscape recording to adequately represent the characteristics of the acoustic environment in question that will facilitate the reproduction of the acoustic environment. So at this stage, many use the synthesis process to help add results representing the surrounding environment's characteristics.

In this stage, several places were divided according to observations and interviews, namely outs in the forest, large hut-response Beluk, outskirts in the village environment,



**Fig. 2.** The process of recording audio of the Beluk Art Vocals.

and outs in the cave, as well as several other sound designs that adapt to the results of the existing sound recordings (Fig. 2).

Perceptually accurate reproducing of the acoustic environment is essential to achieving high ecological validity for soundscape evaluation in the editing process. It requires synthesizing and rendering different sound sources to create an immersive playback system.

At this stage, the audio is divided based on the discourse of each Beluk Artist by taking several phrases that adjust the part of the Beluk Artist singing it. Moreover, before that, researchers tried to remove noise thoroughly so that the Vocals Beluk would sound more focused without any other sound interference.

The process of recording Vocal Beluk is done outside a room that is not too big, and there tends to be a lot of noise from the surrounding environment, namely rice fields and ponds, as well as the residential environment of the village of Ciapus. The recording process was carried out using a condenser-type mic with a volume setting of around 70% and then placed in the middle on edge to get a stereo sound.

After all the samples have been recorded, the samples will be processed and edited using the FL Studio software. FL Studio is a Digital Audio Workstation (DAW) software that can process 'raw' sounding audio to make it more professional. All harp sounds that have been recorded are processed in the Mixing process (Fig. 3).



Fig. 3. Mixing process.



## 4 Conclusion

Digital sound, also known as essence or media, and metadata are the two essential components of digital preservation that must be considered. Format, resolution, support, and technological solutions that fulfil international standards are essential for sound preservation. Long-term, these non-standard versions must be more secure for migration, information interchange, and the forms they appear. Metadata is crucial information for utilizing and managing sound collections following a digital transformation. In addition to identifying and organizing information, metadata facilitates its retrieval. The creation of digital sound file metadata is based on information retrieved during the cataloguing, digitization, and management of sound files. A properly planned digital archive will automatically generate these metadata and include information about original recording support, format and conservation status, playback equipment and standards, digital resolution, equipment used, operators and performers, and any other processes and procedures involved.

The task must be viewed as an experiment in the digital preservation of sound files to ensure digital preservation over the long term. Obsolescence and migration are two of the most significant issues, as one of the forecasts regarding information technology are that it will continue to develop. Digital preservation is one approach for preserving audio archives in the face of damage or obsolescence of previously created analogue recordings. As technology evolves and storage densities improve, hardware devices are frequently rendered obsolete. As computer processors and several software applications become obsolete, users can no longer access many data that rely on them. Therefore, any preservation option must incorporate technological adaptability. In this regard, a long-term strategy for the digital preservation of sound recordings is essential. As a result, migration will be performed continuously.

According to the preceding explanation, a long-term and sustainable vision for the digital preservation of sound recordings is essential. However, the Beluk Vocal Art is difficult to identify because the number of artists is dwindling owing to old age, and they are nearly extinct. In addition, the Beluk Vocal Art is not well known in the community, making it challenging to locate a successor who can help resuscitate it. The lack of excitement of the younger generation to develop Beluk Vocal Arts is due to a lack of promotion, and the local government, particularly in Ciapus, must respond to Beluk Vocal Arts. As a result of these findings, it is necessary to continue the preservation of Beluk Vocal Arts not only through digitization but also through identifying successors and developing Beluk Vocal Arts so that they do not become extinct. It will also facilitate the preservation of digital audio archives.

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