

# Diachronic analysis of Cirebon city boundary changes utilizing geographic information system (GIS)

D Rosmalia<sup>1</sup>, Yuliani<sup>1\*</sup> and A G Sulindrah<sup>1</sup>

<sup>1</sup> Architecture Department, Faculty of Engineering, University of Pancasila, Jakarta, Indonesia

\*Corresponding author email: [41210071@univpancasila.ac.id](mailto:41210071@univpancasila.ac.id)

## Abstract

Cirebon is one of historic cityscapes that undergoes inevitable transformations shaped by social, political, and economic forces. Adapting to governance shifts, diachronic analysis via Geographic Information System (GIS) highlights the importance of comprehending the city evolution. This process, documenting historical elements, guides the pursuit of sustainable city life amidst morphological changes. This study utilizes GIS-based diachronic analysis to explore spatial change patterns in Cirebon City, focusing on elements and city boundaries, considering power periodization from the Cirebon Kingdom to the present. This historical research uses diachronic and synchronic analysis, documenting changes through ArcGIS 10.8 (released in 2020) software. The analysis spans four power periods: Cirebon Kingdom, VOC, Dutch colonial, and Indonesian Republic. The research findings demonstrate how the transformation of historical areas in Cirebon City unfolds through the dynamics of political power shifts within this region. This observation underscores the intricate interplay between historical evolution and political transitions. The study outcomes are envisioned to offer valuable knowledge for policy formulation and considerations by the Cirebon City Government, palace management, property owners, and infrastructure users. This information is crucial for preserving historical elements, including structures and cultural activities, fostering Cirebon's evolution into a sustainable city aligned with Sustainable Development Goals (SDGs) eleventh initiative.

## Keywords

Diachronic analysis, Cirebon city boundary, Geographic information system

## Introduction

Urban spatial transformation is an inevitable phenomenon that can occur in cities worldwide. Generally, this transformation is caused by various factors, ranging from social to political and economic aspects within a city. However, political factors, especially leadership changes, are the primary catalyst for urban change. Political influence can affect various aspects of a city, including administrative boundaries, the

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relocation of city centers, and alterations in urban elements such as buildings, parks, roads, vegetation, and other components [1], [2].

One of the cities in Indonesia with a traceable developmental history is Cirebon, part of the West Java province. Cirebon holds significant historical value and is known as the City of Saints (Wali) because it was founded by one of the prominent figures in the spread of Islam in Java, namely Syekh Syarif Hidayatullah or Sunan Gunung Jati. Cirebon is among the cities in Indonesia that belonged to the Kingdoms, with the existence of the Cerbon Kingdom, which experienced a period of prosperity, particularly from the 15th to the 17th century [3].

Throughout the development of Cirebon, from the era of the Cerbon Kingdom, through the colonial periods under the Vereenigde Oost-Indische Compagnie (VOC) and the Dutch colonial government, to the era of the Unitary State of the Republic of Indonesia (NKRI), significant changes have occurred. These primary and minor changes have led to the transformation of various elements within the city that were developed later. It is not uncommon for some urban elements to be intentionally destroyed or abandoned. The administrative boundaries of Cirebon have also undergone alterations, including both contraction and expansion of the city's territory. Table 1 illustrates the changes in the territorial boundaries of the Cerbon Kingdom based on leadership changes from the year 1479 to 1667. These changes occurred before the VOC entered the Cerbon Kingdom's territory [4], [5].

Table 1. Changes in the Territory of the Cerbon Kingdom

	Period 1479-1568	Period 1568-1645	Period 1645-1649	Period 1649-1667
Map				
Leadership Period	Syekh Syarif Hidayatullah	Panembahan Ratu	Panembahan Ratu	Panembahan Girilaya

Table 1 shows that the territory of Cirebon City will continue to undergo changes in accordance with shifts in political power influenced by different leadership periods. They indicate the likelihood of ongoing transformations in Cirebon City, even during the colonial era under Dutch rule or the period of the Republic of Indonesia (NKRI). Changes and the reasons behind these transformations in Cirebon City can be analyzed using a diachronic analysis method to comprehend the change processes and compare the conditions during each period [6]. This analytical approach can also be employed to understand the social, economic, and political conditions based on chronologically organized historical data, allowing for the identification of causal relationships in any given change [2], [7]. The generated data can serve as a reference for historical events and aid in anticipating potential changes in the future.

Spatial changes occurring in the elements shaping the city during each period will be illustrated using a Geographic Information System (GIS). Through the application of GIS,

information about city elements that emerge and disappear in each historical layer can be documented and organized using "layers," facilitating a clear visualization of changes. That becomes an advantage of GIS compared to other systems [8].

## Method

This research, conducted in 2023, is a historical-based study utilizing a qualitative descriptive method focused on urban changes depicted through GIS. Broadly, this study consists of three stages: data collection, diachronic analysis, and mapping of analysis results using Geographic Information System (GIS).

The first stage involves data collection through literature review and in-depth interviews with historical and cultural experts from Cirebon City. Interview findings are complemented by historical documentation such as ancient maps and vintage photographs portraying Cirebon City. The obtained data will be organized to create an initial overview of the social, economic, and political conditions of Cirebon City in specific periods.

The data analysis stage employs the diachronic analysis method to illustrate morphological changes, emphasizing historical morphology [2], [9]. This stage categorizes Cirebon City's historical periods into three main periods: (1) Cerbon Kingdom Era (1445 – 1677); VOC Colonial and Dutch Government Era (1681-1799 and 1808-1942); and NKRI Era (Year 1945-present). The periodization based on available photos, maps, and traceable urban elements' developments. Every urban element, including buildings from each period, is documented by digitizing the coordinates of each city element. Digitization is performed not only on standing buildings but also on those that are no longer extant. The digitized data obtained is processed using ArcGIS 10.8 software, released in 2020, to generate a map illustrating the distribution of urban elements (buildings) and administrative boundaries of Cirebon City in each period.

The analysis involves classification based on the establishment year of buildings, building coordinate positions, establishment history, and reference sources. An analysis of political, socio-cultural, and socio-economic aspects is conducted to identify the causes and the most influential aspects driving these changes. The final step involves GIS analysis utilizing four attribute parameters to visualize changes in map form [7], [10]. These GIS attribute analysis parameters are (1) Political leadership period, (2) City center, (3) Historical buildings, and (4) natural environmental elements, such as rivers, seas, and coastlines.

## Results and Discussion

### *Cerbon Kingdom Era (1445-1677)*

During the Cerbon Kingdom era, a significant shift occurred in the city center, initially in Witana (the northern part of Cirebon), which moved to Dalam Agung Pakungwati (the southern part of Cirebon). The spread of Islam drove this relocation, and the thriving

terasi and petis (shrimp paste) industries necessitated a larger area for their activities. Dalam Agung Pakungwati then became the center for governance and the propagation of Islam, marked by the construction of the Jalagraha Mosque during the reign of Prince Walangsungsang Cakrabuana. The Jagabayan Mosque was erected as a stopping point and guard post for those entering the Kingdom's territory.

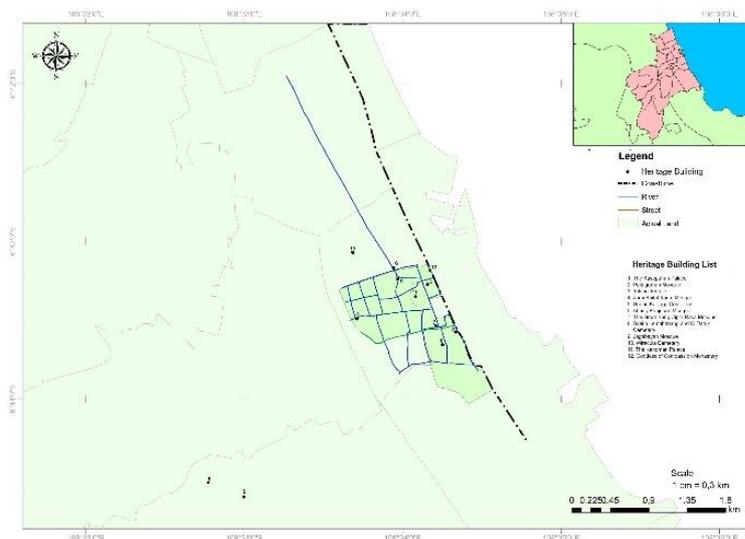


Figure 1. Re-draw of Cirebon City Map Period 1445-1677. (Source: Yuliani and Galih P.S)

As the Cirebon Kingdom rapidly expanded, the orientation of the Kasepuhan Palace underwent a significant change. Initially facing the Kasunan River (the southern side), it shifted to face the Alun-alun (the northern side) [9]. This alteration was due to changes in the coastline, river sedimentation, and the construction of Karanggetas Road, north of the Kasepuhan Palace. Consequently, walls surrounding the Kasepuhan Palace, known as the Kota Nagari, were erected. Re-draw of Cirebon City Map Period 1445-1677 shown in Figure 1.

### VOC Colonial and Dutch Government Era (1681-1799 and 1808-1942)

In 1681, VOC initiated the construction of a harbor facility in Cirebon to augment the burgeoning trade activities within the city. This infrastructural development significantly influenced the urban morphology of Cirebon, precipitating a relocation of the city center from the historical Keraton area to the newly established harbor. During the period spanning 1681 to 1799, the VOC focused primarily on expanding commercial endeavors in Cirebon, resulting in a relatively diminished emphasis on the preservation and attention to historical sites. The VOC administration concentrated its efforts on maintaining and constructing essential structures vital for the fundamental needs of the local populace, including the palace, tombs, and places of worship.

Following the formal dissolution of the VOC in 1799, Cirebon underwent a transition in leadership. In 1819, the city formally transitioned into the jurisdiction of the Dutch Colonial Government. This change in governance heralded an era of revitalization and developmental initiatives to enhance the overall urban fabric. Noteworthy projects during this phase included altering the transportation network from the Bacin River to

Bahagia Street and establishing the Sukalila Canal. Concurrently, the Dutch Colonial Government constructed various civic amenities, encompassing educational institutions, industrial complexes, and a railway station.

In 1906, the Dutch Colonial Government formalized the alteration in the administrative status of Cirebon, shifting its designation from a Royal City (Kota Kerajaan) to Gemeente Cheribon. This reclassification endowed Cirebon with an autonomous administrative structure. The conceptualization of Cirebon's urban development emphasized a city traversed by a railway line, thereby establishing the railway track as a defining administrative boundary of Cirebon during this period. Re-draw of Cirebon City Map Period 1681-1677 shown in FIGURE 2.

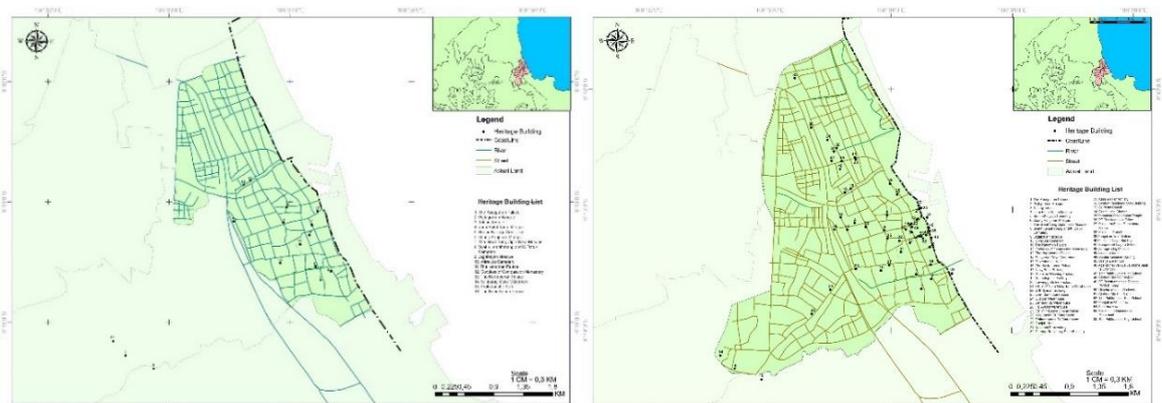


Figure 2. Re-draw of Cirebon City Map Period 1681-1677 (Left) and Period 1808-1942 (Right) (Source: Yuliani and Galih P.S)

### NKRI Era (1945 - now)

Following Indonesia's independence in 1945, Gementee Cheribon officially transitioned into Kota Cirebon under the leadership of the Republic of Indonesia (NKRI). Presently, Kota Cirebon is estimated to encompass an area of 3.7 hectares and is situated within the province of West Java. Over time, Kota Cirebon has evolved into a prominent center for trade and services, a destination for religious tourism, and a culinary hub on the island of Java. Former Dutch governmental structures have been repurposed into administrative offices for Kota Cirebon, exemplified by the transformation of the Burgemeester Cheribon Building into the Cirebon City Hall.

The construction of the Palimanan toll road in 2018 marked a turning point for Kota Cirebon's developmental trajectory—some of the 61 buildings designated as cultural heritage sites have incurred damage or succumbed to ruin. One notable example is the Grand Hotel Cirebon, which now stands as an empty lot.

The transformation of elements in Kota Cirebon becomes apparent through diachronic analysis and simulation of urban changes utilizing GIS methodology. GIS facilitates the analysis of urban elements that emerge or disappear in each period, spanning from the Cirebon Kingdom era to the present NKRI era. The components shaping Kota Cirebon continue to increase, leading to the continual expansion of the city's administrative boundaries. The quantity of urban elements, especially manufactured structures like

buildings, roads, docks, and canals, continuously grows and evolves in response to societal needs. The increasing population has implications for the demand for city facilities, which are becoming more numerous and complex. Re-draw of Cirebon City Map Period 1945-present shown in [Figure 3](#).

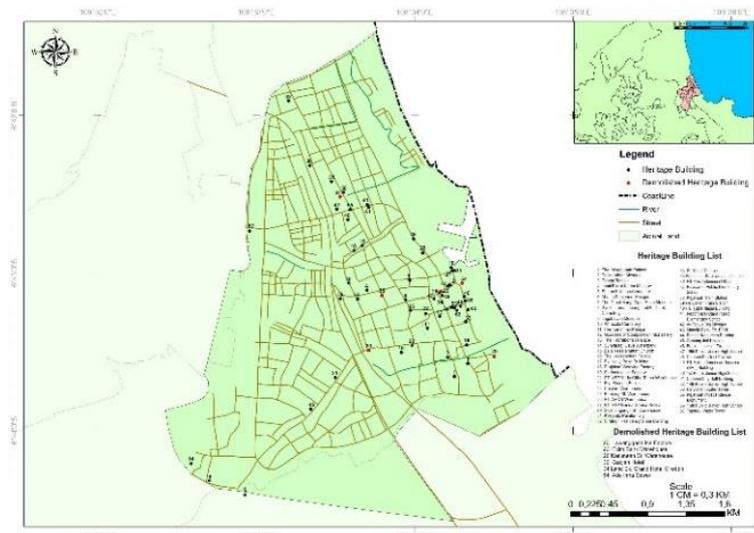


Figure 3. Re-draw of Cirebon City Map Period 1945-present (Source: Yuliani and Galih P.S)

## Conclusion

During the rule of the Cirebon Kingdom, the city's boundaries were demarcated by a wall known as Kuta Nagari. Additionally, 12 historical buildings supported the community's life during that era, including the Jagabayan post, which has since transformed into a mosque. In the colonial period, under the VOC and the Dutch government, administrative city boundaries began to be established to facilitate the regulation and decision-making regarding resources in the region. Changes in the city boundaries of Cirebon can serve as indicators of strengths and weaknesses from political, economic, and socio-cultural perspectives during specific governance periods.

By combining diachronic analysis using GIS, a comprehensive visual representation of the developmental phases of Kota Cirebon can be created. This approach offers a novel perspective on the historical evolution and the causal factors behind the city's spatial changes. The information from this research can be utilized in organizing, planning, and developing the city to transform Kota Cirebon into a sustainable urban center.

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