A CRITICAL ANALYSIS OF HAINAN'S URBAN RESILIENCE IN THE CONTEXT OF COVID-19

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ABSTRACT

"Urban Resilience" has received a great deal of interest recently on a global scale. Urban resilience is frequently utilized to assess the ability of a city to respond to diverse shocks. Urban economic resilience helps understand how quickly a city or region can recover from a global threat. When this thesis project was started, the COVID-19 outbreak was in its third year, and China was still enforcing a "zero-tolerance policy" that mandated a 14-day obligatory quarantine for everyone who had direct or indirect contact with an infected person. Understanding the geography of uneven urban economic resilience, the reasons why, and how some cities can bounce back from unexpected economic downturns while the economic growth of other cities stagnates is essential. This thesis is set in the context of the economic decline in cities that may have been brought on by or is closely related to COVID-19 with a case study in the Hainan province of China. In the empirical analysis, I looked at disposable income, GDP, and the number of tourist arrivals at night to investigate urban economic resilience. Numbers of people receiving minimum living allowance, numbers of residents and numbers of healthcare facilities are used to investigate social resilience. The projected results are that cities located on the south of Hainan Island and near the center of the island have relatively weaker urban economic resilience and social resilience compared to the major cities like Sanya and Haikou, and to enhance urban economic and social resilience, it is essential for cities to undertake necessary modifications to their economic and socio-spatial systems, with an emphasis on offering support to vulnerable groups. The findings of this study may be helpful to scholars and policymakers who need to understand how urban resilience may affect a city's economic growth and what issues should be watched as a city grows. In conclusion, this research sheds light on urban resilience in the Chinese setting.

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CHAPTER 1: INTRODUCTION

1.1 Overview

Globally, urban areas play a crucial role in the economic development of nations and regions (Sharifi & Allam, 2023). However, the rapid growth of urbanization and development has increased the vulnerability of urban areas to external challenges, such as economic, social, and more recent pandemic crises. This case study seeks to assess the economic and social resilience of urban areas in China's Hainan province, which has experienced rapid urbanization and economic growth between 1978 to 2011 (Zhang & Lin, 2012). The study will analyze the responses of various metropolitan areas in Hainan to challenges related to the COVID-19 pandemic and identify the key factors that might have contributed to their resilience. The study's findings will assist us in comprehending what urban resilience is in the Chinese context, and how to prevent future problems when a region is developed rapidly over time. Also, this study will provide policymakers with insights and recommendations on how to enhance the urban resilience of Hainan and similar regions, in areas including infrastructure investment and economic diversification. The study's findings will be useful for academics and practitioners interested in comprehending the dynamics of urban resilience in China and how to promote sustainable development.

Urban resilience as a concept has evolved significantly since its inception, with distinct phases before, during, and after the 2000s. Initially, in its early stages, urban resilience study primarily revolved around disaster management and recovery. In the early 2000s, the United Nations introduced the term "sustainable urban development," highlighting the critical importance of environmental sustainability within urban planning and development. This shift

was reflected in influential documents such as the “Millennium Development Goals” (2000) and “Agenda 21” (1992), contributing to the evolving discourse on urban resilience.

The mid-2000s marked a pivotal moment in the understanding of urban resilience, emphasizing the growing recognition of complexity and socio-economic factors. This perspective acknowledged that cities are intricate systems influenced by numerous interconnected elements.

Furthermore, during the late 2000s, discussions on urban resilience increasingly incorporated concepts of “equity” and “social justice.” These principles played a prominent role in shaping the discourse, emphasizing the importance of ensuring that resilience efforts benefited all segments of the urban population.

In this research, I examined urban resilience as the city or urban area’s capacity to endure and rebound from various shocks, stresses, and disturbances. This capacity involves maintaining essential functions while adapting to change and safeguarding the well-being and quality of life of its residents (Ribeiro & Gonçalves, 2019). It refers to a city’s ability to recover, adapt, and transform in the face of various threats, such as natural disasters, climate change, economic downturns, social conflicts, and infrastructure breakdowns (Serre & Heinlef, 2018).

Urban resilience has become an increasingly popular topic in recent years, as cities around the world face numerous challenges that require their ability to recover from sudden economic downturns. The Covid-19 pandemic lasted for more than three years and countries implemented various measures to combat it. In China, a zero-tolerance policy had been enforced since the virus was first found in Wuhan, and it continued to be enforced until January 8th, 2023. The Covid-19 pandemic serves as a critical context to understand the geography of uneven urban economic resilience and how it manifests in different cities and why. This study focuses on the

socioeconomic factors that affect urban economic resilience, including disposable income, the number of tourist arrivals overnight, and GDP. These three indicators are selected because GDP and disposable income are common economic indicators that can be easily communicated and presented in a map form, and the number of tourist arrivals is selected due to its responsiveness to shocks among all indicators that represent the tourism industry, a key industry in Hainan. By analyzing these factors, I aim to identify the impact of the pandemic on urban economic resilience in China. The findings suggest that while the urban economic resilience of large municipalities may have been enhanced during the pandemic, smaller cities have generally experienced poor urban economic resilience and more frequent lockdowns. Additionally, I explore urban social resilience based on numbers of people receiving minimum living allowance, numbers of residents, and numbers of healthcare facilities. This study highlights the need for cities to alter their economic and socio-spatial structures to support vulnerable groups and strengthen their economic and social resilience. One possible solution may be derived from examining the changes in purchasing habits caused by the pandemic and the impact on urban economic resilience.

1.2 What is urban resilience and how is it defined over time and in a global context

The definition of resilience has changed over time in response to our evolving understanding of cities and their complicated dynamics (Herman, Stewart, Diaz-Granados, Berger, Jackson, & Yuen, 2011). In the pre-21st century era, the concept of resilience mainly applied to the capacity of urban areas or communities to endure and recuperate from natural calamities, such as earthquakes. The primary focus was placed on the development of physical infrastructure and the enhancement of emergency response capabilities.

During the early 2000s, the conceptualization of urban resilience underwent an expansion that included the aspect of environmental sustainability. Resilience has been described as the ability of urban areas to effectively adjust and react to environmental adversities, encompassing factors such as climate change, pollution, and limited availability of resources.

In the mid-2000s, the concept of resilience began to encompass socio-economic dimensions. It is acknowledged that the resilience of a city in the face of shocks and stressors is contingent upon not just its infrastructure, but also the welfare of its inhabitants, unity in society, and economic stability.

During the latter part of the 2000s and the early years of the 2010s, there was a considerable transition towards a more inclusive and equity-focused approach to urban resilience. This direction of work underlined the significance of guaranteeing that vulnerable people do not bear a disproportionate burden from shocks and pressures (Ribeiro & Gonçalves, 2019). The concept of resilience has since been identified as a potential strategy for mitigating inequities within urban settings.

Throughout the decade of the 2010s, there was an increasing focus on the implementation of strategic measures aimed at anticipating and mitigating potential future uncertainties, encompassing both identifiable and unforeseen risks. The growing importance of community involvement and public participation has increased till the 2020s. Urban resilience was perceived not only as a centralized solution but also as a process that required active engagement and involvement from local communities (Merrow, Newell, & Stults, 2015).

The COVID-19 pandemic highlights the importance of urban resilience in the context of health emergencies. The integration of pandemic-related tactics, including healthcare capacity, remote work infrastructure, and public health measures, has been observed in the development of

resilience planning. Some scholars commonly believe that resilience is the capacity to return to a previous condition following a shock or disturbance (Cerasoli, Amato, & Ravagnan, 2023).

This perspective has now shifted to a more comprehensive and proactive perspective that emphasizes the capacity to learn, adapt, and transform. The Rockefeller Foundation's 100 Resilient Cities report states that resilience is the ability of a system, entity, community, or person to withstand shocks while still maintaining its essential functions. Resilience also refers to "the ability to recover quickly and effectively from catastrophe and the capability to endure greater stress" (Rockefeller Foundation, 2013).

In a global context, urban resilience study considers the distinctive challenges and characteristics of cities worldwide. Depending on their geographical location, socioeconomic conditions, governance structures, and levels of infrastructure development, cities face varying risks and vulnerabilities. Coastal cities, for example, are more susceptible to sea-level rise and extreme weather events, whereas rapidly growing cities in developing nations may encounter challenges associated with informal settlements, inadequate infrastructure, and poverty.

In recent years, the concept of urban resilience has received an enormous amount of attention due to the rise in urbanization and the recognition of cities as essential centers for economic growth, social development, and environmental sustainability. Focusing on areas such as disaster preparedness, infrastructure resilience, social cohesion, governance and planning, and sustainable development, many cities and organizations have developed frameworks and strategies to enhance urban resilience (Solecki & Zwickel, 2014).

Extensive study has been conducted about urban resilience, aiming to define and evaluate the idea by describing the critical assets and features required for a resilient urban system. There are multiple comparable definitions of the idea of urban resilience; nonetheless, it is important to

note that the concept of resilience lacks total clarity and objectivity due to variations in urban contexts (Ribeiro & Gonçalves, 2019). Table 1 is conducted to show the different definitions by different authors in different fields of study.

Table 1: Definitions of urban resilience

Areas of Study	Definitions	Author(s)
Environmental science	When a community's socio-ecological system can maintain a specific set of ecosystem services despite disturbances and changes, the system is resilient.	Ernstson (2008b)
Environmental science; social sciences	Urban resilience is the idea of applying resilience from technical systems to social systems, especially cities, and their capacity to bounce back and carry on with their primary operations—business, industry, government, and social interaction—in the face of disasters and other threats.	Hamilton (2009)
Environmental science; social sciences	"Resilient" systems are those that can withstand and even thrive in the face of adversity without undergoing any kind of transformation—a quality known as "safe to fail."	Ahern (2011)
Social sciences	The capacity of a city asset, site, or system to consistently deliver expected results is known as resilience.	Brugmann (2012)

1.3 Research hypothesis and questions

The COVID-19 pandemic has had a significant impact on cities around the world, including those in the province of Hainan in China, which has become known for its rapid economic growth and development. To evaluate the urban resilience of Hainan in the wake of the pandemic, a comprehensive economic and socioeconomic analysis can cast light on the province's observed changes and adaptations. The selection of Hainan as the focus of this study is based on China's comprehensive strategic plan for the region that was announced in 2018. The primary goal of this comprehensive strategic framework is to facilitate the transformation of the

island province of Hainan into a premier free-trade port of substantial global impact, with the intended timeframe for achieving this transformation set in the middle of the 21st century. By the year 2025, there is expected to be the launch of a free trade port system in Hainan, with a primary focus on the liberalization and facilitation of trading and investment. Moreover, it is anticipated that this system will continue to evolve and acquire a greater degree of development by the year 2035. It is anticipated by the authorities that Hainan, the largest Special Economic Zone in China, will play an essential part in making China into the global economic system.

Following the pandemic, Hainan has demonstrated evidence of increased urban resilience from an economic standpoint. The province has strategically concentrated on diversifying its economy beyond traditional sectors such as tourism and real estate, which have been severely impacted by the restrictions imposed by the pandemic. The government of Hainan has implemented policies to encourage investment in high-tech industries such as information technology, healthcare, and finance. This shift in economic emphasis has not only contributed to a more balanced and resilient economy but has also created employment and growth opportunities in emerging sectors. Hainan has demonstrated its adaptability to changing conditions by embracing digitalization and innovation, indicating a higher level of economic resilience post-pandemic.

According to Wang, Seyler, Han, & Pan (2021), the Hainan provincial government has implemented measures to enhance its social resilience considering the COVID-19 pandemic. The provincial government has made significant investments in enhancing its healthcare system, which includes the creation of specialized medical institutions and the recruitment of healthcare personnel. Furthermore, the implementation of these measures has not only enhanced people's

access to healthcare but has also strengthened the province's ability to effectively address forthcoming health emergencies.

Hainan has also focused attention on initiatives related to social welfare and aid for vulnerable groups impacted by the pandemic. Measures like unemployment aid, industry subsidies, and social safety nets have been implemented to alleviate the socioeconomic consequences of the crisis and promote social cohesion within the province.

In addition, Hainan's efforts to recover from the effects of the pandemic have centered around the promotion of ecologically friendly and sustainable growth. The provincial government has implemented initiatives aimed at preserving and restoring natural ecosystems, enhancing wooded areas, and supporting the adoption of renewable energy sources. These efforts not only provide a significant contribution to the ecological resilience of Hainan but also demonstrate its alignment with global sustainability objectives, thereby defining Hainan as an urban area that is both ecologically aware and robust.

Based on the factors mentioned above, the research hypothesis posits that economic and social resilience are integral components of urban resilience. Furthermore, it is hypothesized that Hainan will exhibit resilience in the context of the pandemic, considering both economic and social dimensions. To examine the hypothesis, an analysis will be conducted utilizing Geographic Information Systems (GIS) and relying on several economic and social indices.

The present economic and social research provides preliminary evidence in favor of the proposition that Hainan's urban resilience has experienced a notable augmentation after the outbreak of the COVID-19 pandemic (Xinhua, 2020), which demands further analyses.

1.4 Setting the context for the case study

The historical context of Hainan

In 1988, the Chinese central government made an announcement declaring Hainan as the country's fifth Special Economic Zone (following Shantou, Shenzhen, Zhuhai, and Xiamen). Situated in a tropical location with a 1,900-kilometer coastline, Hainan shares the same latitude as other popular tourist destinations in the world like Cancun and Dubai. The province is known for its superior air quality compared to other regions in China, and it has been referred to as the "health island" by the Chinese.

Existing studies generally support that Hainan's urban resilience has experienced a significant expansion after the outbreak of the COVID-19 pandemic from an economic perspective (Chu & Laube, 2023). The province's adoption of a strategic approach aimed at growing a diverse economy, allocating resources to high-tech businesses, enhancing healthcare infrastructure, implementing social welfare programs, and demonstrating an unshakable dedication to sustainable development all signify an enhanced capacity to withstand and adjust to potential future shocks and strains. To offer a more comprehensive evaluation of Hainan's urban resilience in the aftermath of the pandemic, it is necessary to conduct further study and engage in data analysis (Zhang, 2012).

Before Hainan was assigned to become a free trade province in 1988, Hainan was part of Guangdong province, The Guangdong government formed Hainan Li and Miao autonomous prefecture on the island in 1955. But this autonomous prefecture was renounced in 1987, and just one year later, Hainan was separated from Guangdong and became an independent province and thereafter the first special economic province (Michalk, 1986).

Hainan holds historical significance as a crucial stop on the old maritime Silk Road, and it now plays a pivotal role in the modern Silk Road of the twenty-first century according to China's One Belt and One Road Initiative (Peters, 2019). It serves as an entry point to the Pacific and Indian Oceans and boasts five natural Deepwater ports that are connected to an extensive network of ocean routes, facilitating international trade. Additionally, the province's three international airports offer over 300 routes that connect Hainan to destinations around the world, establishing strong global linkages. In line with its goal of becoming a world-class free trade zone, Hainan has implemented a visa-free policy for citizens of fifty-nine countries, further attracting international investment since April 2018 (Lu, 2018).

It is in this historical context that I examine Hainan's level of urban resilience with a hypothesis suggesting Hainan is becoming increasingly resilient as the world is going through the COVID-19 pandemic.

The geographical context: Hainan's location and division (cities and counties)

At the southernmost point of China, Hainan Province is bordered to the north by the Qiongzhou Strait and Guangdong Province, to the west by Vietnam across the Beibu Gulf, and to the east and south in the South China Sea by the Philippines, Brunei, Indonesia, and Malaysia (See Figure 1). Hainan Island, the Paracel Islands, Zhongsha, and Spratly Islands, as well as their surrounding water areas, are all included in the administrative region of Hainan Province. It is the nation's largest province. The province has a total land area of 35,400 square kilometers, which mostly consists of Hainan Island and the islands of Paracel Islands, Zhongsha, and Spratly Islands. Its marine area is around 2 million square kilometers. Hainan Island is situated between latitudes 18º 10′ and 20º 10′ north and longitudes 108º 37′ and 111º 03′ east. The island's outline is shaped like a huge oval pear, measuring 209 kilometers in length from northeast to southwest

and width from northwest to southeast. The second largest island in China, behind Taiwan, is around 108 kilometers in length and 33,900 square kilometers in area. The coastline stretches for a total of 1944 kilometers, with 68 large and small harbors. The surrounding area, which covers 2330.55 square kilometers or 6.8% of the land area, has a depth of between minus 5 and minus 10 meters (The People's Government of Hainan Province, 2021).

The Leizhou Peninsula in Guangdong and the northern part of Hainan Island are divided by the Qiongzhou Strait, which is eighteen nautical miles wide. It serves as a shipping passage between the South China Sea and the Beibu Gulf as well as a "sea corridor" connecting Hainan Island to the mainland. Around 650 nautical miles separate Sanya Port in the south of the island from Manila Port in the Philippines, and 220 nautical miles separate Haikou City in the north of the island from Haiphong City in Vietnam.

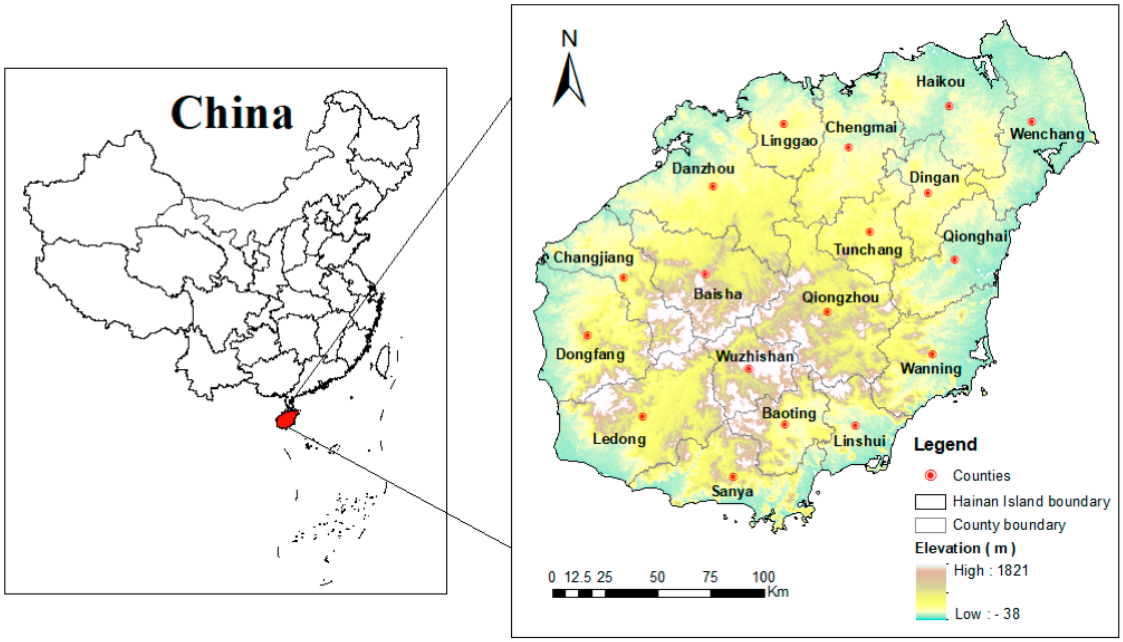
About three hundred nautical miles southeast of Hainan Island is the Paracel Islands and Zhongsha Islands in the South China Sea. Only Scarborough Island is above water, with most of the Zhongsha Islands being completely submerged. With a total land area of 8 square kilometers, the Paracel Islands consist of 22 islands, the largest of which is Woody Island, and it is 2.13 square kilometers. The Spratly Islands are a set of archipelagos with the most extensively dispersed reefs, dark sand beaches, and dark sands in the southern South China Sea. At under 2 square kilometers, the land area is China's southernmost territory.

Four prefecture-level cities—Haikou City, Sanya City, Sansha City, and Danzhou City—as well as fifteen county-level administrative units — five county-level cities, four counties, and six autonomous counties — Wuzhishan City, Wenchang City, Qionghai City, Wanning City, Dongfang City, Ding'an County, Tunchang County, Chengmai County, Lingao County, Baisha Li Autonomous County, Changjiang Li Autonomous County, Ledong Li Autonomous County,

Lingshui Li Autonomous County, Baoting Li and Miao Autonomous County, Qiongzhong Li and Miao Autonomous County, and Wangjiang Li Autonomous County—are under the jurisdiction of Hainan Province as of 2022.

Figure 1: An administrative boundary map of Hainan from Hainan Meteorological Service. Note: Figure 1 is published in Hainan meteorological service website to demonstrate an overall map of Hainan Island. (Hainan Meteorological Service)

Figure 2: Map of Hainan Island together with the county boundary and relative elevation change. Note: Figure 2 is a map showing Hainan Island's geographical location in China. (Chu, Oloo, Chen, Xie, Blaschke, 2020. (Assessing the Influence of Tourism-Driven Activities on Environmental Variables on Hainan Island, China)



The Development of Special Economic Zone

Since the founding of the People's Republic of China in 1949, thirty years have passed since Deng Xiaoping, the country's chief architect, proposed an innovative plan to begin a new chapter in China's development by opening the nation to international contacts after 30 years of self-imposed isolation. The Economic Reform and Open Policies, which were introduced in 1978 had made China change dramatically.

As part of the bundle of Economic Reform and Open Policies, the idea of a Special Economic Zone refers to a designated area that could be set on a county, a city, or even an entire province. This term is well-known by most Chinese population especially the country's baby boomers (population born between 1946-1954) and Generation X (population born between 1965-1976) (Ting, Lim, Run, Koh, & Sahdan, 2018). Some people who lived through that time

seized the opportunities provided by the Special Economic Zones and became China's first generation of "new rich" since the reform.

Guangdong was Deng Xiaoping's first inspection destination following his return to power in November of 1977. In Guangdong, Deng Xiaoping had his sights set on Shenzhen, a small fishing village next to the river directly across from Hong Kong. Back then, the daily income of local farmers was only 1 yuan, (approximately 1.8 USD) whereas the daily income of farmers in Hong Kong was over 60 Hong Kong dollars (12.87 USD). At the time, he had two critical questions: how Hong Kong quickly gained wealth and benefit people on that land and how could China quickly catch up with the rest of the world's development (Juan, 2020).

The third plenary session of the eleventh central committee of the party was held on December 18, 1978, which pushed China into an era of reform and opening. In April 1978, the Guangdong and Fujian Provincial Party Committees urged the central government to "go one step ahead" in reform and opening and to take advantage of favorable conditions such as proximity to Hong Kong and Macao to implement special policies to attract foreign investment and expand exports. Deng Xiaoping announced, "Let's just call it a special zone, just like the Shaanxi-Gansu-Ningxia border, it used to be a special zone" (Vogel, 2011).

In July 1979, the party's central committee decided to establish export special zones in Shenzhen, Zhuhai, Shantou, and Xiamen, which were then renamed "Special Economic Zones" with richer connotations; on August 26, 1980, the 15th session of the firth national people's congress approved the establishment of special economic zones in Shenzhen, Zhuhai, Shantou, and Xiamen (Vogel, 2011).

China's reform began with a pragmatic approach. Chinese government acted under the phrase "crossing the river by feeling the stones" ever since the reform. When Deng Xiaoping

chose to revisit the special zone of Shenzhen in 1984, Shenzhen had changed from a fisherman's village to one where most of the people built their houses in Western-style buildings. The city could build a construction unit in three days. Then Deng wrote that "Shenzhen's development and experience prove that the establishment of the special economic zone was correct" (Vogel, 2011). Later the same year, China opened up 14 additional coastal cities, including Tianjin and Dalian, and then opened up three coastal economic zones in the Yangtze river delta, Pearl river delta, and Xiamen in Fujian; and four years later, Hainan Special Economic Zone was added in 1988. Two years later, China's first national-level high-tech park was established in "Zhongguancun"; in April, a major central government decision was made to open and develop Shanghai Pudong District.

The economic structure and dynamics of Hainan: Toward state-driven development in a global economy

There are three types of industries: primary, secondary, and tertiary. The primary industry is the extraction of raw resources, which includes mining, agriculture, and fishing. Manufacturing, such as automobile and steel production, is a secondary industry. Tertiary industries are services such as education and healthcare. The basic economic foundation of Hainan was rooted in agriculture. However, with the arrival of investment, the economy of Hainan has shifted to rely largely on the industry and tourism sectors.

Agriculture, Fishery, Forestry, and Animal Husbandry are the four main sectors of Hainan Province's Primary industry. As a result of Hainan's geographic location, animal husbandry, and fishery are the two main contributors to the primary industry. Raising pigs and poultry is the most advantageous activity. And marine aquatic products predominate over freshwater aquatic products in the fishery section.

There are heavy and light manufacturing, construction, and other industries. Light manufacturing includes the production of clothing, footwear, and toys that do not require a significant amount of assistance from large and weighty machinery. On the other hand, heavy manufacturing entails large equipment and expansive land, as well as typically inflated costs, high revenues, and large-scale production. The main sectors of Hainan's industrial activities include the manufacturing of sugar, the production of cane-based products, the mining of iron minerals, lumber production, salt production, and the manufacturing of rubber tires. These industries are strategically situated in geographic areas. For example, Haikou has predominantly directed its efforts towards the advancement of rubber manufacturing, while Hainan serves as the primary rubber manufacturing hub in China. A diverse array of rubber-based commodities, including but not limited to tires, conveyor belts, and latex gloves, are manufactured. The food industry, "Yeshu" Brand Natural Coconut Juice, also referred to as "椰樹牌"天然椰子汁, is widely recognized as one of the most reputable brands in the Chinese market (Hsieh & Zhong, 1990).

The term "tertiary industry" usually refers to the services sector of an economy, encompassing various service-oriented enterprises such as healthcare providers, educational institutions, financial services, hairdressing establishments, and personal training facilities, among others. The tertiary sector can be broadly categorized into two segments: profit-making and non-profit. The expansion of healthcare facilities in Hainan is evident in the tertiary sector, encompassing the rise of tourism, hotels, and other service industries (HKTDC, 2020).

1.5 An overview of Hainan's economy

The data covering the years from 2016 to 2021 has been chosen for Table 2 to represent the Gross Domestic Product in various economic sectors. The most recent available data is

sourced from the year 2021, and for the sake of strengthening the persuasiveness of the data sets, I have chosen to include data up to the year 2016.

Table 2: Gross Domestic Product in Economic Sectors

Gross Domestic Product in Economic Sectors (Billion)

Year	Primary	Secondary	Tertiary	Total GDP
2016	92.474	92.474	226.151	409.02
2017	96.284	96.284	253.835	449.754
2018	98.596	98.596	287.159	491.069
2019	107.901	107.901	316.808	533.084
2020	112.598	113.598	335.802	556.624
2021	125.444	123.88	398.196	647.52

Source: Hainan Statistical Yearbook - 2022

As the Hainan government recorded, at the end of 2021, primary industry was valued at 125.444 billion yuan or approximately 17.4 billion USD; secondary industry was valued at 123.88 billion yuan or nearly 17.18 billion USD; and tertiary industry was valued at 398.196 billion yuan, or approximately 55.23 billion USD, at the exchange rate that 1 US dollar was equivalent to 7.2 Chinese yuan.

The province's GDP increased by 11.2% to 647.52 billion yuan in 2021. Primary industry worth was 125.444 billion yuan, an increase of 3.9%; secondary industry contributed value was 123.880 billion yuan, an increase of 6.0%; and tertiary industry added value was 398.196 billion yuan, an increase of 15.3%.

The total output value of agriculture, forestry, animal husbandry, and fishery in the province for the entire year increased by 5.1% from the previous year to 201,479 billion yuan. From the perspective of domestic industries, the output value of the planting industry increased by 5.8% to 105.137 billion yuan. The harvested area of vegetables (including vegetable melons) increased by 1.5% to 3.9435 million mu, and the yield increased by 2.8% to 5.8892 million tons. The fruit harvest area increased by 4.4% to 3.1098 million hectares, while the yield increased by

6.0% to 5.2552 million tons. The value of forest output decreased by 6.7% to 11.637 billion Chinese yuan. Rubber output increased by 2.8% to 6.0809 million tons. The output value of animal husbandry increased by 8.4% to 32,749 billion yuan. The pork production increased by 45.8% to 305,200 tons. The volume of poultry meat decreased by 2.4% to 322,900 tons. The output value of fisheries increased by 3.6% to 43.54 billion yuan. The total output of aquatic products increased by 0.1% to 1.6696 million tons. The output value of agriculture, forestry, animal husbandry, fisheries, and auxiliary activities increased by 9.5% to 8,417 billion yuan.

The province's industrial-added value increased by 9.6% from the previous year to 68.36 billion yuan. Among them, the added value of industries with a size above the specified threshold rose by 10.3%. According to light and heavy industries, light industry-added value increased by 6.6%, while heavy industry-added value increased by 12.2%. The added value of state-owned enterprises rose by 14.4%, the added value of joint-stock enterprises rose by 7.3%, and the added value of foreign and Hong Kong, Macao, and Taiwan-invested enterprises rose by 15.8%.

In terms of added value, the oil and natural gas extraction industry increased by 385.0%, the agricultural and sideline food processing industry increased by 29.8%, the papermaking and paper product manufacturing industry decreased by 3.4%, the petroleum processing industry decreased by 0.7%, and the chemical raw material and chemical product manufacturing industry increased. The manufacturing of pharmaceuticals decreased by 4.7%, the manufacturing of non-metallic mineral products increased by 7.5%, the manufacturing of automobiles increased by 121.0%, and the production and supply of electricity and heat increased by 13.0%.

The annual operating income of industrial enterprises in the province increased by 21.2% compared to the prior year, the profit margin of operating income was 8.1%, and the total profit increased by 72.5%.

The province's construction industry was 56.067 billion yuan for the entire year, a 2.4% increase from the previous year. There are 291 construction companies with quality certifications to construct, 31 new companies included. The annual housing construction area that meets the construction standards in this province decreased by 6.8% to 17.0028 million square meters, while the completed housing construction area increased by 58.9% to 4.7584 million square meters. The total profit of the province's qualified construction enterprises increased by 56.1% to 2.196 billion yuan, while the tax paid decreased by 1.7% to 1.94 billion yuan.

The economy of Hainan had a significant downturn during the initial phase of the pandemic spanning from 2019 to 2020, with a substantial deceleration in the gross rate when compared to previous years as indicated in the provided data. The observation that the GDP growth rate in Hainan from 2020 to 2021 is similar to the pre-pandemic growth rate suggests a gradual recovery of economic stability in the region. This discovery demonstrates the presence of economic resilience in Hainan, which exhibited a certain degree of elasticity during the global pandemic. The tourism sector played a significant role in Hainan's economic expansion; nevertheless, the industry suffered considerable harm due to the pandemic and travel restrictions imposed in China. The ability of the economy to regain its previous standing under these circumstances is impressive.

In the chapter that follows, a review of the dynamic factors influencing urban resilience will be performed, with a focus on the pre-COVID and the COVID-19 pandemic periods. This review will be approached from the vantage points of changing policy frameworks affecting flows of goods and population, internal migration, industries, and trade.

CHAPTER 2: SHIFTING CONTEXTS AND INFLUENCING FACTORS OF URBAN RESILIENCE: BEFORE AND DURING THE COVID-19 PANDEMIC

During the pandemic, most domestic and international travel was prohibited to prevent the spread of COVID-19. China implemented a series of quarantine regulations regarding COVID. Even Chinese society had complaints, but the policies persisted for a considerable time. There are many kinds of factors that can be used to measure urban resilience, with the most common perspectives being environmental, social, economic, and institutional factors that characterize urban and other complex socio-ecological systems. In this thesis, I will analyze the urban resilience of Hainan from an economic and social perspective.

2.1 Policies and impacts on flows of goods and population

Before the pandemic in 2020, nothing was out of the ordinary; people flew in from all over China and the globe without additional documentation to prove that they were in good health. After January 8, 2023, the Chinese government no longer requires forced quarantine for those traveling to China from other countries. The Chinese government takes the pandemic extremely seriously. At the very beginning phase of the pandemic, due to the uncertainty of where covid originated and how it spread through human society, as well as rumors that COVID-19 originated from bats, the Chinese government reinstated its prohibition on the trade of all wild animals along with other chilled marine and livestock products shipped to China.

Special Economic Zones were created to facilitate global trade, but during the pandemic, the businesses involved in global trade were paused. The government implemented several policies, the most important of which was random sampling. The port would collect a sample from each shipment and analyze its surface for the presence of potential COVID-19 virus. Once the result turned positive, the entire container would be marked “not qualified” and nothing from

it would be allowed to pass through the port. Additionally, anyone who had contact with the person who had been in close contact with the product must be quarantined for two weeks to ensure they did not contract the virus.

According to the economic industry analysis presented previously, the tertiary sector has contributed the most to Hainan's economic growth. In the first year of the pandemic, however, the tourism industry and other service industries were slowed by China's travel registration requirements.

Table 3: Number of Overnight Arrivals – Hainan

Number of Overnight Arrivals - Hainan

City	2021	2020	2019	2018	2017	2016
Haikou	4750166	5521419	9102901	9395634	8499263	7652502
Sanya	11724117	10627959	16815430	16236138	15144815	13631625
Wuzhishan	347385	327678	511200	602840	516944	456137
Wenchang	449669	479986	1258328	1348453	1251961	1119143
Qionghai	1110618	885609	1300163	1788738	2077664	1999625
Wanning	1180940	1058791	3752233	3560108	3291966	3115617
Dingan	196216	188579	303549	780547	664334	616232
Tunchang	136477	170994	240039	246827	242519	211393
Chengmai	273882	287914	829155	881569	858966	757997
Lingao	159240	135888	161655	155996	155219	135461
Danzhou	2010820	1683295	1754667	1616109	1352815	1151434
Dongfang	345384	278531	310433	469281	464676	367204
Ledong	172149	164229	208862	187862	264890	258849
Qiongzhong	276300	324896	495903	486566	455205	400198
Baoting	489476	417864	818036	840073	780658	702703
Lingshui	1407240	1260641	2180874	2052954	1729712	1415828
Baisha	410892	393128	178385	164950	147805	129411
Changjiang	187175	164113	710604	688961	665054	627344
Total	25628146	24371514	40932417	41503606	38564466	34748703

Source: Hainan Statistical Yearbook – 2022

Table 3 above presents data on the number of individuals who arrived as overnight visitors. The onset of the pandemic can be traced back to December 2019. Upon analyzing the data presented in the table covering 2019 to 2020, an obvious decline in visitor numbers becomes

evident. Furthermore, it is observed that the volume of tourist arrivals in Hainan in 2021 did not recover to its pre-pandemic level recorded in 2019.

2.2 In-migration to Hainan: Policies, trends, and impacts

Internal migration may appear to be a concept that does not come across in our daily lives but does when living in it. People frequently travel in China, dating back to the well-known enormous out-migration to the northeast (to Manchuria) under the Qing Dynasty, when the royal government encouraged civilians to migrate and assigned them varied positions based on their skills. Then, in a relatively recent era between the 1960s and 1980s, two migratory episodes relating to internal migration are seen and documented. The first event is the reverse migration of young, educated residents who were sent to rural communities during the Cultural Revolution and have since returned to urban areas (White & Liang, 1996). The second event is a substantial increase in China's "floating population," and their continued mobility across the country since 1978. Much earlier, Hukou (family registration system) was established in the 1950s; distinct Hukou addresses indicate individuals' origins; based on one's address, the person's Hukou status can be classified as "rural" or "urban." Individuals who lack a local Hukou in their places of residence are frequently referred to as "floating population" or "temporary population" (Shen, 2012).

China began a series of economic reforms in 1979, with the central government initiating price and ownership incentives for farmers, allowing them to sell some of their crops on the open market. Additionally, the government set up four Special Economic Zones along the coastal region to attract global investment and improve exports and imports of high-tech commodities into China. Later in the reform, provincial and municipal governments were granted economic

authority over numerous firms, allowing them to operate and compete according to free market principles.

Meanwhile, citizens were encouraged to create their own companies to take advantage of the Special Economic Zones, and governmental pricing controls on a variety of products were lifted as another tactic to attract international investment. Eliminating trade barriers increased competitiveness and drew FDI (Foreign Direct Investment) inflows; trade liberalization was a critical factor in China's economic success, and labor is the foundation of that success.

Table 4: Annual Growth Rates of Temporary Population 1982-2005(%) (Shen, 2012, based on Population Census Office of State Council and Department of Population Statistics of NBS, 1985, 1993; Population Census Office of State Council and Department of Population, Social, Science and Technology Statistics of NBS, 2002; Leadership Team Office of State Council for National Onne Percent Population Sampling Survey and Department of Population and Employment Statistics of NBS, 2006.)

Annual growth rates of temporary population 1982–2005 (%).

Periods	1982–1990	1990–2000	2000–2005	1982–2005
Eastern	25.9	14.8	7.7	16.7
Central	24.5	4.1	6.0	11.1
Western	25.1	10.0	3.5	13.3
China	25.2	10.7	6.5	14.4

Sources: Population Census Office of State Council and Department of Population Statistics of NBS, 1985, 1993; Population Census Office of State Council and Department of Population, Social, Science and Technology Statistics of NBS, 2002; Leadership Team Office of State Council for National One Percent Population Sampling Survey and Department of Population and Employment Statistics of NBS, 2006.

Table 5: In-migration rate in provincial unites of China 1985-2005(%) (Shen, 2012, based on National population Sampling Survey, 2006)

In-migration rate in provincial units of China 1985–2005 (%).

Province	1985–1990	1990–1995	1995–2000	2000–2005
China	1.0	0.9	2.7	3.1
Eastern region				
Shanghai	5.0	5.0	13.7	17.5
Beijing	6.2	5.4	14.4	15.1
Guangdong	2.0	2.8	14.3	13.7
Zhejiang	0.8	1.1	6.1	10.9
Tianjin	2.8	2.3	5.1	9.0
Fujian	0.8	1.0	4.2	5.8
Jiangsu	1.2	1.3	2.7	4.6
Hainan	2.3	1.4	3.0	2.5
Liaoning	1.4	1.0	1.8	1.7
Shandong	0.7	0.6	1.0	1.1
Hebei	0.9	0.8	1.2	1.0
Central region				
Jiangxi	0.6	0.3	0.7	1.3
Anhui	0.6	0.3	0.6	1.2
Hubei	0.8	0.5	1.2	0.9
Hunan	0.5	0.3	0.6	0.8
Jilin	1.0	0.6	1.0	0.8
Shanxi	1.1	0.5	1.2	0.7
Heilongjiang	1.0	0.6	0.9	0.5
Henan	0.6	0.3	0.5	0.3
Western region				
Xinjiang	2.3	3.3	6.0	3.1
Inner Mongolia	1.2	1.2	1.4	1.7
Guizhou	0.6	0.4	0.8	1.5
Qinghai	2.6	1.0	1.6	1.4
Ningxia	2.0	0.9	2.4	1.4
Yunnan	0.7	0.5	1.8	1.1
Sichuan	0.4	0.3	1.0	0.9
Guangxi	0.3	0.3	0.7	0.9
Shaanxi	0.9	0.5	1.2	0.7
Gansu	0.9	0.6	0.8	0.5

Annual growth rates of temporary population from 1982 to 2005 are shown in Table 4 above. Dr. J. Shen categorized Chinese provinces into three major zones in his research. Between 1982 and 2005, the floating population increased nationally, and the number of floating populations was distributed among the regions. As an outcome of the time-space geography of

growth, certain places have become attractive migration destinations first, and a greater number of migrants migrate to eastern regions than to central and western regions.

Table 6: Out-migration Rate in provincial units of China 1985-2005(%) (Shen, 2012, based on National population Sampling Survey, 2006)

Out-migration rate in provincial units of China 1985–2005 (%).

Province	1985–1990	1990–1995	1995–2000	2000–2005
China	1.0	0.9	2.7	3.1
Eastern region				
Fujian	0.8	0.7	1.9	2.4
Zhejiang	1.5	1.2	2.2	2.2
Beijing	1.2	0.9	1.3	2.2
Shanghai	1.0	0.8	1.0	2.2
Hainan	1.6	1.4	1.8	2.0
Guangdong	0.4	0.3	0.6	2.0
Jiangsu	0.9	0.6	1.8	1.9
Hebei	1.1	0.6	1.4	1.5
Shandong	0.6	0.4	1.0	1.3
Tianjin	0.8	0.6	1.1	1.1
Liaoning	0.8	0.5	1.0	1.0
Central region				
Anhui	1.0	1.2	5.1	6.7
Jiangxi	0.8	1.2	7.0	6.2
Hunan	0.9	1.1	5.5	5.6
Hubei	0.6	0.6	3.9	5.0
Henan	0.7	0.8	2.6	3.9
Heilongjiang	1.7	1.6	2.7	2.8
Jilin	1.4	1.1	2.0	2.1
Shanxi	0.8	0.4	1.1	1.1
Western region				
Guizhou	1.0	1.1	3.7	5.1
Sichuan	1.2	1.2	5.1	5.0
Guangxi	1.4	1.2	4.4	4.9
Shaanxi	1.1	0.7	2.1	2.3
Gansu	1.3	1.0	2.2	2.0
Inner Mongolia	1.4	1.1	2.0	1.8
Qinghai	2.3	1.5	2.6	1.7
Yunnan	0.8	0.6	1.0	1.5
Ningxia	1.2	1.1	1.6	1.2
Xinjiang	1.8	0.9	1.2	1.0

The rates of in-migration and out-migration by provincial unit are provided in Tables 5 and 6. As seen in Table 5, most provinces in the eastern region have a greater rate of in-migration than the national average, while most provinces in the other two regions have rates that are lower than the national average. Furthermore, as shown in Table 6, most provinces in the central and western regions have an out-migration rate that is higher than the national average. And the

opposite for the easter region. According to Dr. Shen's statistics, this tendency continued until 2005. According to Tables 5 and 6, people migrate out of the central and western regions throughout time and become part of the floating population. Most of this group is thereafter absorbed by the eastern region.

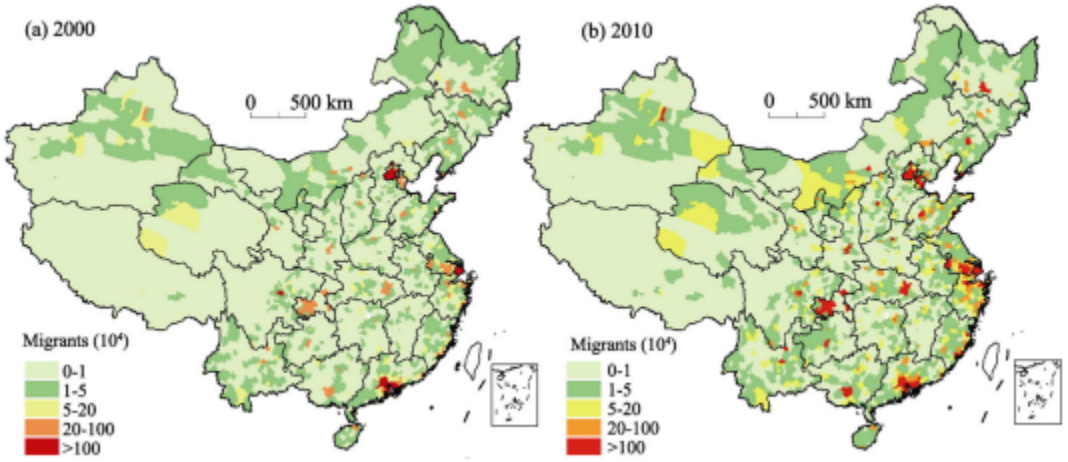
Table 7: Floating Populations by Region in China (Liu, T., Qi, Y., Cao, G. et al. 2015, based on National Census 2000 and 2010)

		Eastern	Central	Western	Nation
Floating population (million)	2000	51.10	12.38	15.53	79.01
	2010	109.87	26.62	34.07	170.56
	Growth rate (%)	115.0	115.1	119.4	115.9
Share in the national total (%)	2000	64.7	15.7	19.7	100.0
	2010	64.4	15.6	20.0	100.0
	Change (%)	–0.3	–0.1	0.3	0.0
Floating/*hukou* ratio (%)	2000	11.1	3.0	4.4	6.4
	2010	22.1	5.8	8.8	12.7
	Change (%)	11.0	2.8	4.4	6.3

Sources: National Census 2000 and 2010

Additionally, Table 7 shows the floating population in China by region gathered by Dr. Liu Tao (2015) in his research. Eastern regions are home to most of the floating population, accounting for more than half of the total floating population. Figure 3 shows the spatial distribution of China's floating population. One can see from the choropleth map that several highly concentrated areas exist in Beijing, Shanghai, and Guangdong (figure 3, a), and concentrated areas were expanding outwards. Once they attempt to settle in a highly concentrated area but face budget restrictions, migrants would likely seek alternative housing and meet their basic needs around the area. Sichuan, Anhui, and Zhejiang all had areas with the potential to become extremely migrant-concentrated. After a decade (Figure 3, b), more regions are classified as migrant-concentrated zones. Apart from the eastern region already mentioned and maybe alternate places around Shanghai, Beijing, and Guangdong, certain areas in Anhui, Zhejiang, and Sichuan have also become extremely concentrated with floating populations.

Figure 3: Spatial distribution of floating population in China (Liu, T., Qi, Y., Cao, G. et al. 2015). Note: Figure 3 is a set of maps that illustrate the spatial distribution of floating population changes in China in 2000 and 2010. (Spatial patterns, driving forces, and urbanization effects of China's internal migration: County-level analysis based on the 2000 and 2010 censuses)



Towards the end of the pandemic, as the travel restrictions were lifted, people started to move again. According to the government report published in 2022 by the "National Bureau of Statistics", at the end of 2021, the national population (including provinces, autonomous regions, municipalities directly under the Central Government, and active military personnel, excluding Hong Kong, Macao, and Taiwan residents and foreigners living in 31 provinces, autonomous regions, and municipalities directly under the Central Government) was 1,412.6 million, an increase of 480,000 from the end of the previous year. In terms of urban and rural composition, the urban permanent population was 914.25 million, an increase of 12.05 million from the end of the previous year; the rural permanent population was 498.35 million, a decrease of 11.57 million; the urban population accounted for 64.72% of the national population (urbanization rate), an increase of 12.05 million from the end of the previous year. An increase of 0.83 percentage points (National Bureau of Statistics, 2022).

Population and migration dynamics in rural Hainan are worth noting. As Table 8 shows, the number of people living in rural places in Hainan also went down during the pandemic. The native people of Hainan were very excited about the Areca nut business. The island is known for

agriculture, which is a big part of its economy. They can plant the nuts themselves or rent their land to businesses that grow them. Overall, China's rural population fell in 2021. This was expected to happen in Hainan as well; the rural population fell from 2020 to 2021, in part because fewer elder leisure migrants from northern China were able to travel. People often say that the Island is the "fourth province" of Northeast China for people who live in the northeast. The weather is the main reason why people from the north want to move there. It's clean and nice there. In the winter, they like to move to the country in Hainan and then return to where they came from. People have always liked living in the country of Hainan because it's cheap to rent and a great place to get away from the cold or for a long vacation. The information in Table 8 comes from the official statistical yearbook of 2022 and shows the number of people living in rural areas from 2016 to 2021. The numbers show that although rural population had increased prior to the pandemic, fewer people were living in rural areas in 2021. It could mean that there aren't enough resources to support leisure migrants for the first time in five years. It can also possibly indicate that social resilience isn't as strong as before, particularly since the onset of the pandemic.

Table 8: Population of usual residents at year-end - Rural Population

The population of usual residents at year-end - Rural Population

City/Unit (10,000)	2021	2020	2019	2018	2017	2016
Haikou	50.57	52.65	49.40	49.18	49.51	49.85
Sanya	30.46	30.83	18.58	18.63	19.17	19.69
Wuzhishan	4.44	4.47	4.50	4.47	4.55	4.67
Wenchang	21.75	22.04	26.50	26.31	26.63	27.11
Qionghai	26.58	26.69	25.07	24.89	25.53	26.24
Wanning	31.84	32.23	28.56	28.34	28.71	29.69
Dingan	16.93	16.96	16.11	15.98	16.13	16.39
Tunchang	13.93	14.04	14.30	14.18	15.36	14.59
Chengmai	19.54	19.78	21.69	21.55	21.94	23.65
Lingao	21.03	20.97	24.47	24.28	24.62	25.01
Danzhou	44.07	44.12	44.92	44.65	45.73	45.93
Dongfang	18.72	18.75	22.51	22.32	22.57	22.92
Ledong	32.08	32.09	29.62	29.34	29.71	30.22
Qiongzhong	12.51	12.53	10.51	10.42	10.70	11.04
Baoting	10.18	10.19	9.17	9.09	9.19	9.32
Lingshui	21.34	21.48	17.92	17.76	17.97	18.27
Baisha	13.14	13.15	10.88	10.78	10.90	11.06
Changjiang	9.10	9.14	10.42	10.34	10.51	10.73
Total Population	398.21	402.11	385.14	382.51	389.43	396.38

Source: Statistical yearbook of Hainan - 2022

2.3 Small and medium-sized businesses in Hainan: Policies and impacts

The Hainan Government has implemented a series of policies aimed at attracting investors, with a particular focus on small and medium-sized enterprises. These measures may have played a role in the observable population growth in Hainan during the pandemic. An important influencing factor of economic resilience is the preferential policies toward small and medium-sized firms from the Hainan Government since 2009. Since 2023, to further optimize the business environment of small and medium-sized enterprises, promote the healthy development of small and medium-sized enterprises, and protect the legitimate rights and

interests of small and medium-sized enterprises by the “Law of the People’s Republic of China on the Promotion of Small and Medium-sized Enterprises” and relevant laws and regulations, as well as the actual situation of this special economic zone, the Hainan government has implemented 180 pilot policy documents to promote the support to small and medium-sized businesses (See “180 pilot policy documents have been implemented, and the policy and institutional system of Hainan Free Trade Port has been gradually constructed” by The State Council of The People’s of Republic of China, 2023).

The new policies since 2023 encompass areas such as financial support, entrepreneurship support, innovation promotion, market development, and social services (The State Council of The People’s of Republic of China, 2023). Each representative regulation is unique. First, it is stated in “funding support” from the “Regulations on promoting the development of small and medium-sized enterprises in Hainan Special Economic Zone” that the construction of a credit guarantee system will be supported. The use of special funds for the growth of small and medium-sized businesses is open and transparent, and systems such as government announcements, social recommendations, and expert evaluations will be implemented (The State Council of The People’s of Republic of China, 2014).

Second, it is stated in “Entrepreneurship Support” that the registered capital installment payment system can be implemented by small and medium-sized businesses. The initial capital contribution injected within one month of registration should not be less than 10% of the total registered capital. The capital contribution injected within one year cannot be less than 50% of the total registered capital. Injection, the formation of an investment company must occur within five years of registration (The State Council of The People’s of Republic of China, 2014).

The Hainan regulations also state that, according to state regulations, the following small and medium-sized enterprises are eligible for tax incentives: small and medium-sized enterprises established by registered unemployed persons, disabled persons, demobilized soldiers who choose their jobs, and college and technical secondary school graduates; High-tech small and medium-sized enterprises that are supported and encouraged by provincial and provincial development policies; small and medium-sized enterprises that are supported and encouraged by provincial and provincial development policies. The people's government of an ethnically autonomous county may choose to reduce or exempt the local portion of the enterprise income tax payable by small and medium-sized businesses in the ethnically autonomous area (The State Council of The People's of Republic of China, 2023).

Third, people's governments at or above the county level are urged in "Innovation Promotion" to continuously increase funding for SMEs' technological innovation and to establish special funds for SMEs' technological innovation to support SMEs through venture capital, loan discounts, grants, and technological advancement initiatives. According to the "Enterprise Income Tax Law of the People's Republic of China", it requires the implementation of preferential tax policies, such as tax reductions and exemptions for investment income or proportional deductions from taxable income for investment income, for venture capital firms investing in small and medium-sized high-tech businesses.

According to the regulations, if the research and development expenses incurred by small and medium-sized enterprises for the development of new technologies, new products, and new processes do not form intangible assets and are included in the current profit and loss, 50% of the research and development expenses shall be deducted based on actual deduction by the "Enterprise Income Tax Law of the People's Republic of China" and its implementation rules.

It's encouraged to improve the capacity for independent innovation and the level of intellectual property protection by encouraging and guiding small and medium-sized businesses to actively apply for, protect, and implement patents and trademarks. When small and medium-sized businesses apply for domestic and foreign invention patents, the relevant administrative departments are required to provide guidance and financial assistance by applicable regulations.

Fourth, it is suggested in "Market Development" that people's governments at or above the county level support small and medium-sized enterprises to participate in the reorganization, restructuring, and transformation of state-owned enterprises and collective enterprises, and can provide them with appropriate subsidies in various ways. For small and medium-sized enterprises with difficulties in reorganizing state-owned enterprises or acquiring property rights from state-owned enterprises, if there is a temporary difficulty in fund payment, payment can be made in installments with the approval of the operating company authorized by the state-owned assets supervision and management department, but the initial payment cannot be less than 10% of the total purchase price. The total period of installment payment shall not exceed three years and shall be no less than 30%, the interest shall be paid after taxes at the same rate as the bank's working capital loan interest rate for the same period.

Fifth, small and medium-sized businesses are encouraged to conduct employment skill training and technical personnel training as part of "social services." The portion of the current year's employee education expenses that do not exceed 2.5% of total compensation and salaries can be deducted before corporate income tax. Small and medium-sized businesses that invest in organizing recruited unemployed to train in training institutions and sign employment contracts with recruited unemployed for more than a year are eligible to file for vocational training subsidies from the unemployment insurance agency.

Financial support, entrepreneurship support, innovation promotion, market development, and social services help small and medium-sized businesses start up. The Hainan province government encourages small and medium-sized businesses to start up, and with tax reduction and late start policies, it's tempting for firms with cash flow issues to use the time to fix their finances.

2.4 Hainan and global and regional trade: Policies and impacts

The Chinese government has announced several policies regarding the Special Economic Zone's import and export operations since 2020. "Free flow through the first line and efficient control at the second line" is an essential concept (The State Council of The People's of Republic of China, 2020).

The "free flow through the first line" strategy refers to allowing companies to bring products directly into the designated area based on the import manifest. Using the entry products filing list, they are then able to complete declaration procedures with the appropriate customs authority. This strategy seeks to simplify entry and exit filing lists, streamline international transit, consolidation, and distribution procedures, and implement the "entry quarantine with appropriately relaxed import and export inspections" model.

The "Second-line Secure and Efficient Control" strategy entails optimizing checkpoint management, enhancing electronic information interconnection, and strengthening supervision using cross-referencing entry and exit lists, ledger management, real-time cargo verification at checkpoints, and risk assessment. This improves oversight and seeks to integrate the second-line supervisory model with the first-line supervisory model, promoting an inspection and quarantine supervisory model that permits "convenient entry and exit" while rigorously preventing quality and safety risks.

Additionally, some policies would affect global trade and attract international business, which involve exemption from import duties, import value-added tax, and consumption tax for enterprise-owned imported production equipment; Imported operational vehicles and vessels are exempt from import duties, import value-added tax, and consumption tax; Exempt from import duties, import value-added tax, and consumption tax on imported primary materials and auxiliary materials; Exempt from import duties, import value-added tax, and consumption tax for island residents' imported purchases; Increase the yearly quota for offshore duty-free purchasing to RMB 100,000 per person (approximately $13,888) and expand the product categories eligible for duty-free status; Businesses in the tourism, modern services, and high-tech industries are exempt from paying corporate income tax on new foreign direct investment income before 2025.

Table 9: International Trade in Goods in Hanan 2016 - 2021

International Trade in Goods

Year	Exports	Imports	Total Trade
2016	1405123	6108090	7513213
2017	2956490	4070550	7027040
2018	2977608	5504150	8481758
2019	3437144	5621884	9059028
2020	2770189	6581225	9351414
2021	3274716	11410770	14685486

Source: Hainan Statistical Yearbook - 2022

Table 9 shows the international trade in goods from 2016 to 2021, based on data extracted from the Hainan statistical yearbook. In the year 2020, exports decreased by 19.4%, The objective of the international trade policy is to attract foreign investment, increase exports, and

diversify the economy beyond its traditional sectors. This can lead to increased economic activity, employment creation, and an improvement in the local population's standard of living. The policy could facilitate increased trade between Hainan and other nations, increasing exports and imports. This can help stimulate economic growth and provide opportunities for international trade enterprises. Foreign investors seeking favorable trading conditions in Hainan may be attracted by the international trade policy. This influx of foreign capital can facilitate the growth of new industries and infrastructure. Adding new industries means more variety, and a city's economy will be stronger if its economy is more diverse, stronger diversity also means better economic resilience.

CHAPTER 3: EXPLORING URBAN ECONOMIC RESILIENCE IN HAINAN

Urban resilience is the capacity of a city's systems, businesses, institutions, communities, and individuals to survive, adapt, and thrive, no matter what chronic stresses and acute shocks they experience (Cerasoli & Amato, 2023).

Cities are vulnerable to a range of shocks and stresses, including natural disasters, pandemics, economic downturns, and social unrest. Understanding the factors that contribute to urban resilience can help policymakers, planners, and community leaders develop strategies to build more resilient cities, improve quality of life, and ensure long-term sustainability. Moreover, with the increasing urbanization of the global population, the need to study urban resilience becomes even more critical.

Economic resilience is critical to an area's long-term health and the ability of a region's adaptability to respond to potential economic shocks and financial crises. In the following, I analyze disposable income, gross domestic product per capita by cities, and the number of tourist arrivals overnight.

3.1 Data and methods: Descriptive analysis and GIS mapping

Descriptive analysis techniques are utilized to summarize and characterize the primary features, characteristics, and patterns of a dataset or collection of data. These methods offer an easy-to-understand summary of the data without making any assumptions about the core connections or forming conclusions. Before moving on to more advanced analyses, descriptive analysis is typically the first stage in data analysis and is useful for understanding the fundamental properties of the data.

To enhance the representation of economic resilience in Hainan, a Geographic Information System will be utilized to create maps for each studied variable. These maps will

visually demonstrate the varying changes that have occurred over time in different cities within the region.

Each map will be made based on the data collected from the statistical yearbook of Hainan and GIS boundary maps based on county/city. The data are manually typed and converted to an Excel sheet and then imported to GIS. Except for GDP and disposable income, all the other four resilience indicators are classified by natural breaks. GDP and disposable income used quantile breaks, considering both value ranges might have changed over time and the quantile classification method is a technique that distributes observations equally across each class. This approach also isn't skewed toward any direction.

Although secondary data such as economic statistics are not perfect and there are multiple minor data errors such as currency unit inconsistency, Chinese economic statistics from yearbooks are by far one of the most reliable secondary data sources available to scholars. In this case, given the limited availability of data sources, the scope of the study, and the inability to travel to collect first-hand data, Chinese yearbook data provides a rare set of most reliable data for comparison over time and across space. Because yearbooks usually publish data from the year before and the yearbooks are usually released in the end of the following year (causing a two-year lapse), this study was able to include data until 2021.

3.2 Economic indicators

Economic resilience is a crucial aspect of a region's long-term health and its capacity to adapt and respond to potential economic shocks and financial crises. It refers to the ability of an area's economy to withstand and recover from disruptions while maintaining stable growth and ensuring the well-being of its population. In this report, I focus on several key indicators to

analyze the economic resilience of different cities: disposable income, gross domestic income per capita, and the number of tourist arrivals overnight.

The diversity of industries, the gross domestic product, and the disposable income are some of the most important factors in measuring economic resilience. As stated previously, there are three industries: primary, secondary, and tertiary. In addition, these three sectors include agriculture, construction, and both light and heavy industry. The Hainan statistical yearbook categorizes wholesale and retail trades, transportation and storage, hotels and catering, financial intermediation, real estate, and other services under the tertiary industry.

3.3 Disposable income

Disposable income is the amount of money households have available to spend or save after taxes and other necessary expenses. It represents the financial flexibility and freedom individuals have in making choices about their consumption and savings. In the context of economic resilience, higher disposable incomes provide households with a greater ability to withstand and navigate economic shocks and uncertainties.

Theoretically, higher disposable incomes enable households to have a cushion against unexpected events such as job loss, medical emergencies, or unforeseen expenses. When faced with an economic downturn or crisis, households with higher disposable incomes are better equipped to maintain their consumption patterns and continue contributing to the local economy. Their consumption power and ability to sustain demand for goods and services can help mitigate the negative impacts of the crisis on local businesses and support overall economic growth.

Analyzing trends in disposable income across various areas of a city or region may provide insight into the economic resilience of various neighborhoods or communities. Consistently high levels of disposable income may be indicative of greater resistance to

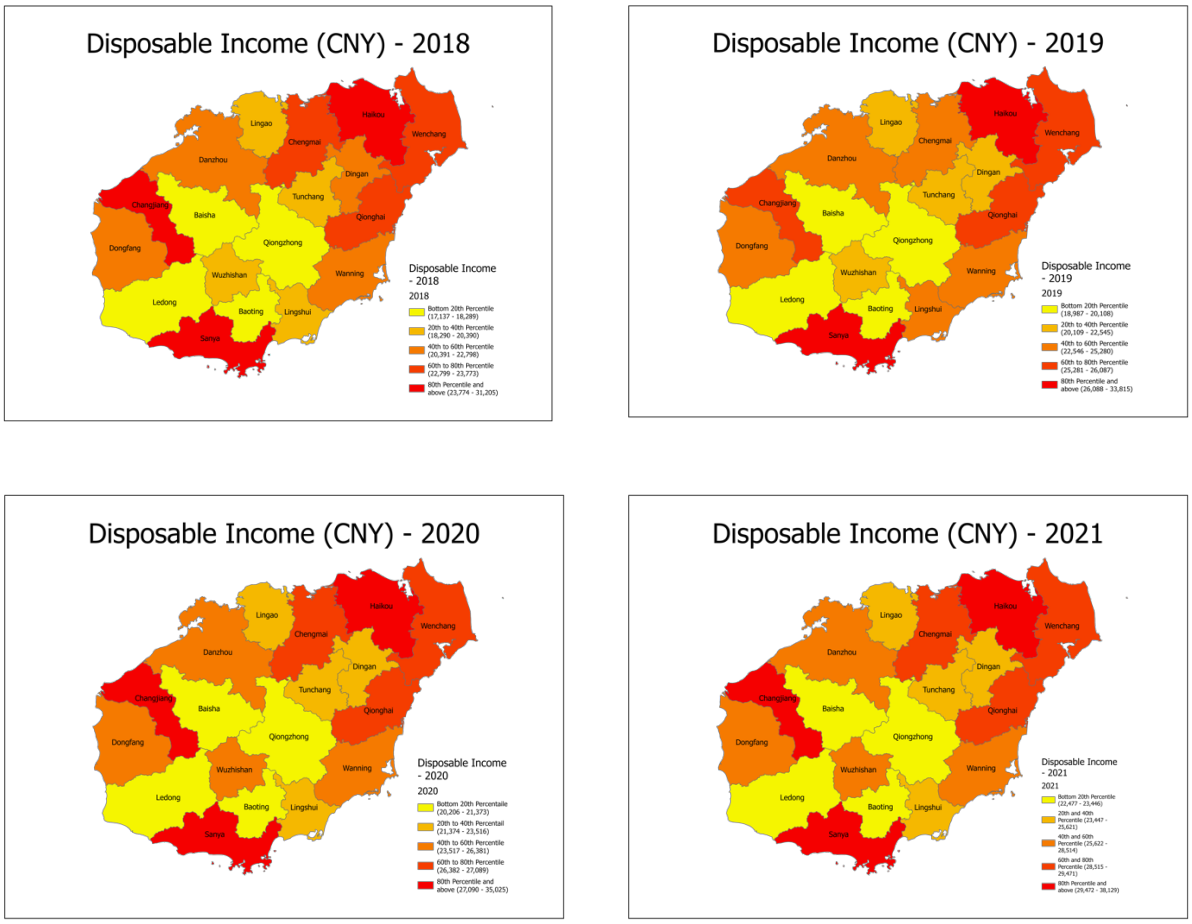
economic disruptions in regions. These regions may have a more solid economic foundation, higher-income households, or more diverse industries that provide stable employment opportunities and higher wages.

By comparing the disposable income from 2018 through 2021 (see Figure 4), it's obvious to see that in the case of coastal cities such as Haikou, Sanya, and Danzhou, as well as other coastal areas, disposable income is typically greater than in cities located further inland. This is attributable to tourism, real estate development, and higher wages in industries associated with the coastal environment. The presence of natural attractions and tourist destinations in coastal areas may stimulate economic activity and result in higher disposable incomes for residents.

Examining changes in disposable income over time can also shed light on a region's economic resilience. During a recession or economic downturn, disposable income may decrease as households face decreased income or increased financial pressures. However, if disposable income levels recover relatively quickly after a recession, this indicates that the local economy has a high capacity for resilience. This may be the result of factors such as effective government policies, diverse industry sectors, or a skilled workforce able to adapt to changing economic conditions.

Overall, analyzing disposable income patterns and differences provides valuable insight into the economic resiliency of different areas within a city or region. Higher disposable incomes contribute to the financial stability and adaptability of households, which in turn can sustain local businesses and contribute to economic growth during difficult times. Given the observed overall increase of disposable income across the province and relatively small variations of spatial patterns over time, the maps provide support for the hypothesis that various areas in Hainan have demonstrated levels of economic resilience during the pandemic.

Figure 4: Disposable Income of Hainan, 2018 – 2021. Note: Figure 4 is the disposable income of Hainan by region. This figure shows the distribution of each quantile in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)



3.4 Gross Domestic Product

The Gross Domestic Product (GDP) is a commonly used indicator of a country's or region's economic performance. It represents the total value of goods and services produced within a particular time frame and geographical area. As a result, GDP is a useful indicator of economic resilience, reflecting an economy's capacity to withstand external shocks and recover from recessions.

The analysis of Hainan's GDP trends from 2017 to 2021 reveals intriguing insights into its economic resilience (see Figure 5). During this time, the province's GDP increased

consistently, with a significant spike in 2021. This suggests a positive trajectory in economic growth and a degree of resilience in the face of various challenges. Notably, several coastal city-regions, such as Haikou, Danzhou, and Sanya, have consistently ranked among the highest in terms of GDP per capita over time. Tourism, real estate development, and robust economic activities related to the coastal environment likely benefited these regions.

The capacity of an economy to generate income and generate employment opportunities is indicated by a high and stable GDP. It indicates the region's or country's capacity to sustain its population's well-being and provide basic goods and services. A higher GDP indicates that the local economy can withstand external disturbances, such as economic crises and recessions, and recover more quickly (Sharifi & Allam, 2023).

Changes in GDP over time can provide insight into a region's economic resilience. A decline in GDP during a crisis or recession may be indicative of an economy's inability to withstand external shocks, as the economy may struggle to adapt. However, a rapid rebound in GDP after a recession indicates a more resilient economy that can adapt to and recover from adverse conditions.

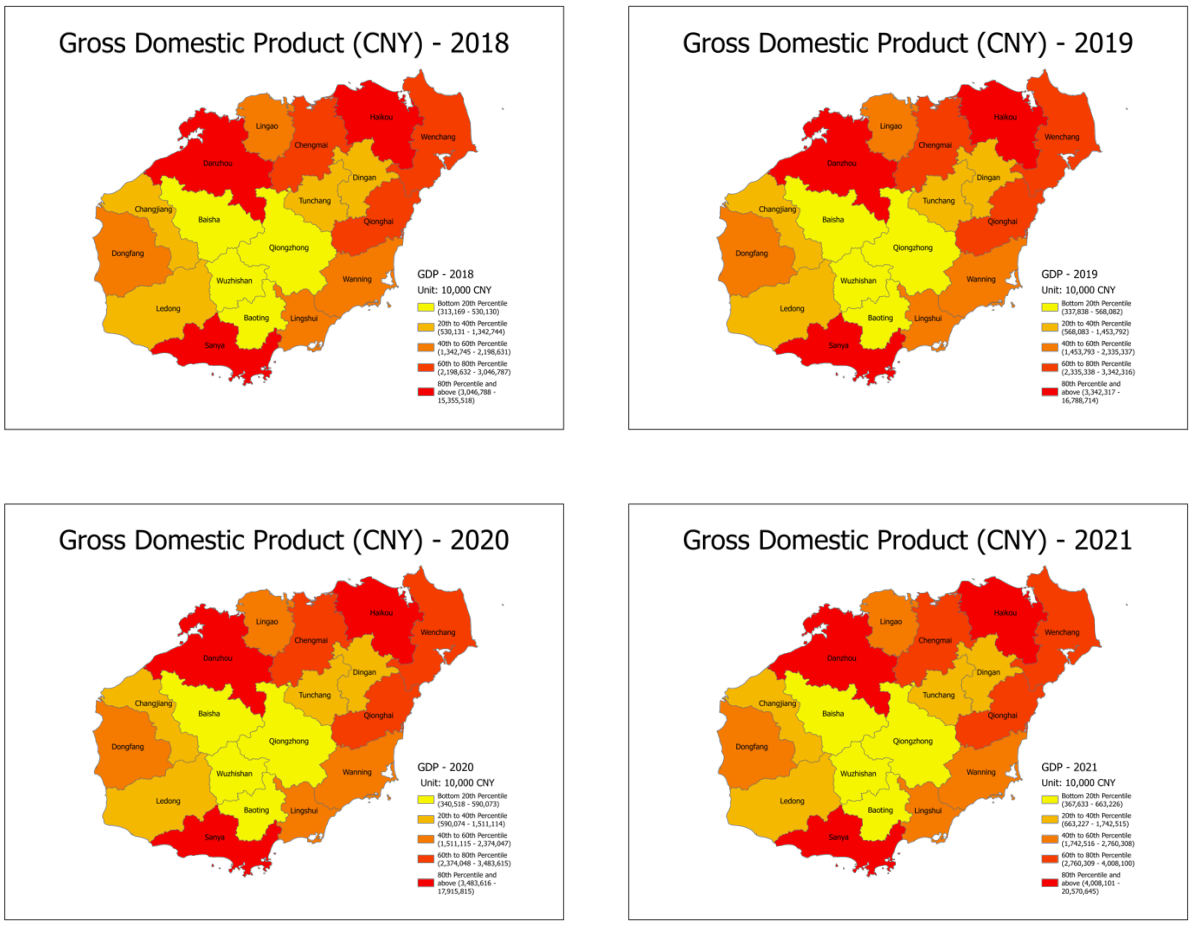
However, it is essential to note that GDP alone does not capture the total complexity of economic resilience. To gain a more complete understanding of a region's economic resilience, other factors, such as income distribution, economic diversity, employment stability, and social welfare, should be considered. In addition to GDP, these additional factors provide a broader perspective on the overall health and adaptability of the economy.

A key feature of GDP is the ability to usually reflect the state of the economy, although limited to recorded factors. The analysis of GDP as an economic indicator and its ability to determine the resilience of Hainan is not totally precise and rigorous. It should be noted that the

GDP value does not account for the self-sustainability of certain rural populations and excludes unrecorded factors.

Based the analysis shown in Figure 5, it is evident that the Gross Domestic Product (GDP) of Hainan has continued to exhibit growth despite the adverse impact of the pandemic. It is remarkable because Hainan's economy was formerly dependent on the agricultural and tourism sectors. Despite the implementation of lockdown and travel restrictions in China during the COVID-19 pandemic, Hainan province has demonstrated a positive trajectory in terms of its Gross Domestic Product (GDP) over multiple years. This resilience in economic performance serves as an indicator of the province's ability to withstand and recover from challenges.

Figure 5: Gross Domestic Product of Hainan, 2018 - 2021. Note: Note: Figure 5 is the GDP of Hainan by region. This figure shows the distribution of each quantile in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)



3.5 Number of overnight tourist arrivals

In the context of the tourism industry, the number of tourists visiting a city or region can serve as a valuable indicator of economic resilience. Examining the trends in tourist arrivals between 2017 and 2021 provides insight into the resilience of Hainan's tourism industry. Figure 6 illustrates a general upward trend in the number of tourists, with a slight decline from 2018 to 2019 and 2020 to 2021.

Many tourists visiting a city or region can be indicative of a thriving and healthy tourism industry. When tourists visit a location, they contribute to the local economy by purchasing goods and services like lodging, food, transportation, and entertainment. This expenditure

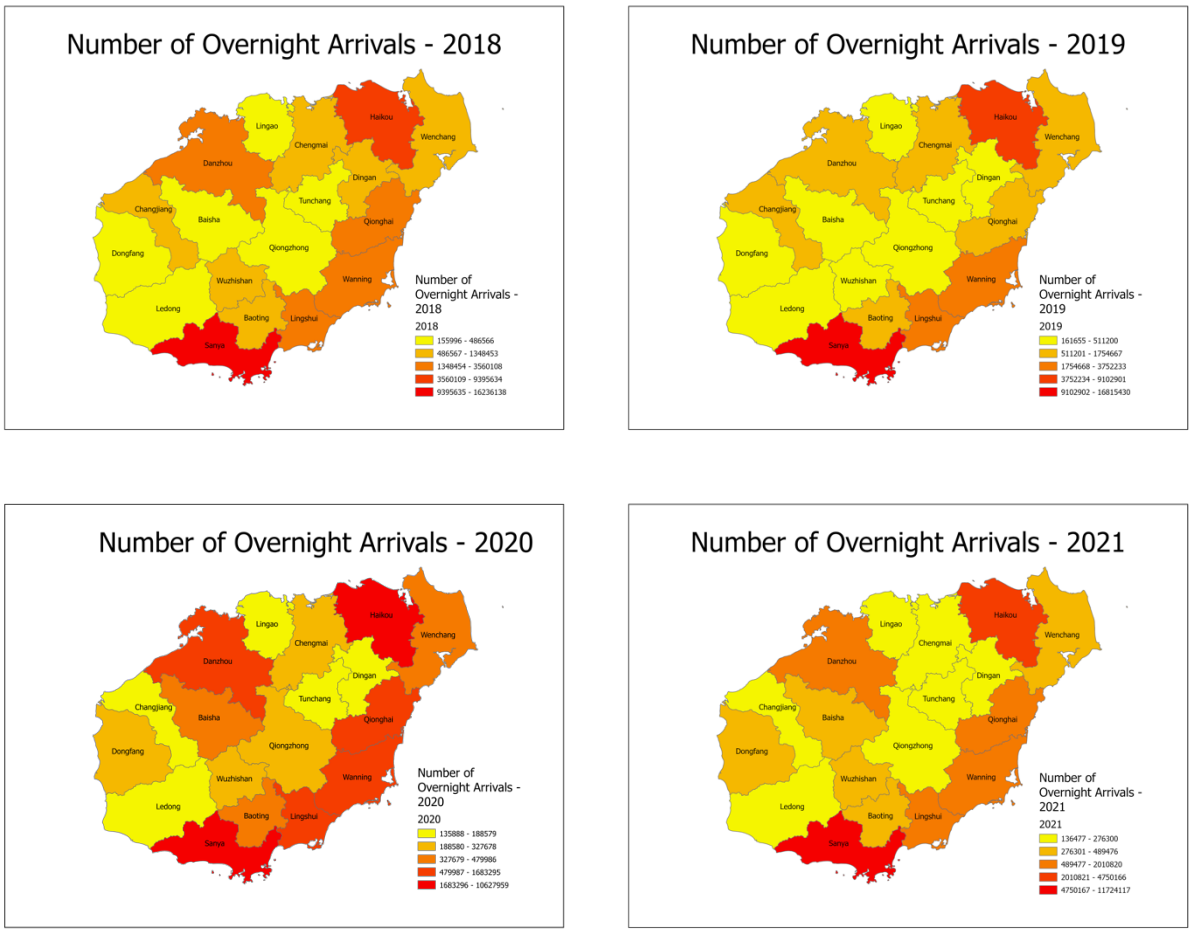
generates revenue for local businesses, stimulates the creation of jobs, and contributes to the region's overall economic growth.

Moreover, many tourists can indicate that a city or region has a favorable image and reputation as a desirable travel destination. This positive reputation can attract future investments and tourists, resulting in long-term economic growth. An awesome tourism industry can also increase the visibility and appeal of a city or region on the international stage, thereby attracting businesses and diversifying the local economy (Yu & Zheng, 2019).

It is essential to keep in mind, though, that relying heavily on tourism as the sole economic driver can make a city or region vulnerable to external factors. Pandemics, economic downturns in the tourism industry, and natural disasters can have a significant impact on the tourism industry and the local economy. This vulnerability demonstrates the need for economic diversification and the growth of other sectors to ensure resilience in the face of unforeseen events.

In conclusion, analyzing the number of tourists that visit a city or region provides helpful insights into the economic health of the tourism industry. A large number of tourists is indicative of a thriving tourism industry that contributes to the local economy and attracts investments. Figure 6 illustrates an obvious rise in tourism activity a year after the start of the pandemic. This suggests a gradual recovery within the tourism industry. Furthermore, the data indicates that the tourism sector in Hainan has demonstrated resilience, as it didn't experience significant setbacks during the pandemic. However, cities and regions must diversify their economic base to mitigate the risks associated with an overreliance on tourism and build a more resilient economy able to withstand external shocks.

Figure 6: The Number of Overnight Arrivals, 2018 - 2021. Note: Figure 6 is the Number of Overnight Arrivals of Hainan by region. This figure shows the number of visitors arrived each night in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)



CHAPTER 4: TOWARDS URBAN SOCIAL RESILIENCE

Social resilience is the capacity of a community to withstand and recover from social disruptions, challenges, and changes while preserving its core functions, cohesion, and well-being. It involves the capacity of individuals, groups, and institutions within a community to adapt, cope, and recover from adversity, such as natural disasters, economic recessions, social conflicts, or public health crises. Social resilience is characterized by social cohesion, community engagement, trust, and the presence of supportive social networks.

Measuring social resilience is a complex task that requires the evaluation of a multitude of dimensions and indicators. Several methods and frameworks have been developed to evaluate social resilience, with each focusing on a unique aspect. Common indicators include social connectedness, community engagement, social capital, trust, social networks, and social support, as well as the presence of resilient institutions and governance. By capturing these indicators, quantitative data such as surveys and questionnaires can be used to measure the social resilience of a community. Using quantitative indicators, this study relies on numbers receiving a minimum living allowance, the number of residents, and the number of health care institutions (Barns & Berry, 2008).

Understanding and measuring social resilience can increase community participation and engagement. It promotes collaboration and enables community members to actively participate in their own resilience-building processes. Involving the community in resilience measurement and decision-making fosters a sense of ownership and collective responsibility, which strengthens social cohesion and boosts overall resilience.

4.1 Numbers receiving minimum living allowance: Rural vs. Urban

The minimum living allowance, also known as social assistance or welfare, is a form of financial aid given to individuals or families who cannot meet their basic needs. Typically, it targets vulnerable populations experiencing poverty, unemployment, or other socioeconomic disadvantages. It is provided to people who are unable to support themselves and have a low income or no income at all. By analyzing the number of people receiving minimum living allowance in a particular area, I can determine the level of social vulnerability among individuals in that area. Higher numbers of people receiving minimum living allowance indicate a higher level of social vulnerability. Nevertheless, the government's ability to provide and distribute a minimal living allowance as a kind of social welfare against the challenging circumstances of a global epidemic might be seen as indicative of a city- or region-level social resilience.

The number of individuals receiving minimum living allowance can indicate a community's economic vulnerability in the context of social resilience. Greater numbers of recipients in both rural and urban areas may be indicative of an increase in poverty, inequality, or economic instability. It indicates that a sizeable portion of the population is experiencing financial difficulties and cannot meet its basic needs.

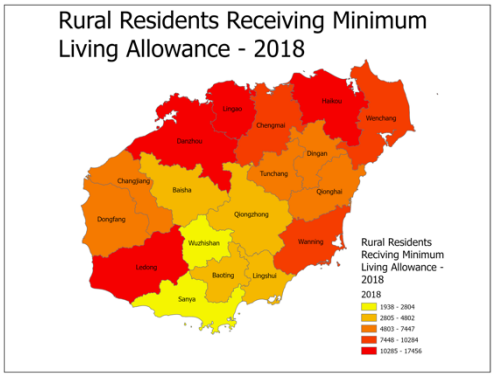
The number of individuals receiving minimum living allowance can have multiple effects on social resilience. On one hand, social assistance can serve as a safety net, assisting individuals and families in navigating difficult circumstances and sustaining a certain level of well-being. It can mitigate the immediate effects of poverty, improve access to essentials such as food and shelter, and give those in need a sense of stability (Craig, 2011).

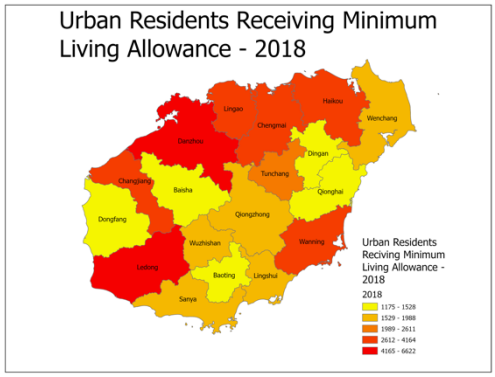
However, heavy reliance on social assistance can also reveal underlying structural problems in a community or society. Large numbers of recipients may indicate systemic

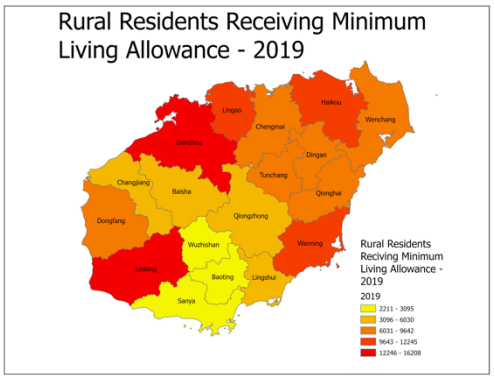
problems, such as limited employment opportunities, inadequate social services, or unequal resource distribution (UNRISD, 2015).

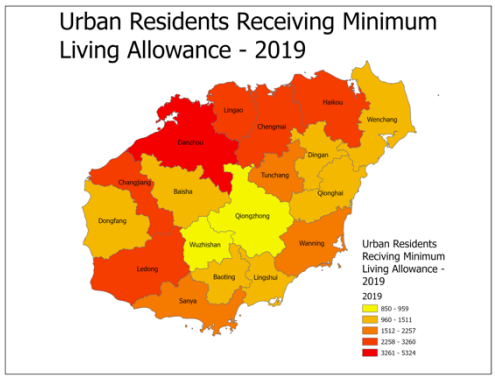
Figure 7 illustrates the distribution of minimum living allowance recipients in Hainan province, categorized by urban and rural individuals, and further separated by city and county levels. The data spans the years 2018 to 2021. These maps suggest that there has been an upward trend in the number of individuals receiving minimum allowances in both rural and urban areas until 2020, indicating a likely increased poverty rate in Hainan. This may suggest Hainan has a lower level of individual-level social resilience and may also suggest a strong city-level social response to the pandemic through the buffer of a city- or community-based welfare system. Based on the information presented in Figure 7, there was an observed increase in the total number of recipients from 2018 to 2020, followed by a subsequent decline in 2021. Additionally, the number of recipients residing in urban areas of each city/county (as urban residents) exhibited an upward trend during the same period from 2018 to 2020. It is hypothesized that social resilience has exhibited signs of improvement following the year 2020. As previously mentioned, the observed patterns based on the maps suggest that individuals (and likely family households and communities) face challenges in social resilience, although the overall social response from the local government (probably due to economic resilience) of Hainan remains in a positive state.

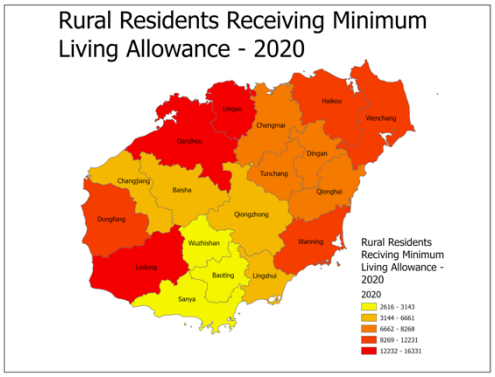
Figure 7: Rural & Urban Residents receiving minimum living allowance, 2018 - 2021. Note: Figure 7 shows the urban and rural residents receiving minimum living allowance of Hainan by region. This figure shows the number of people receiving minimum living allowance in each class in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)

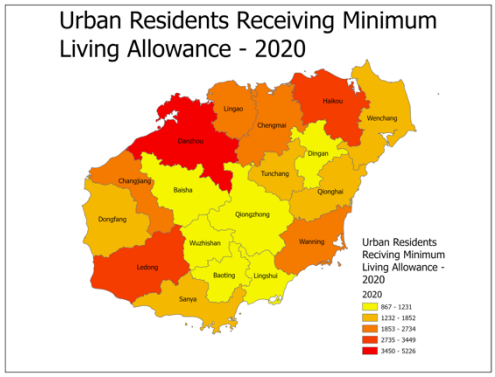












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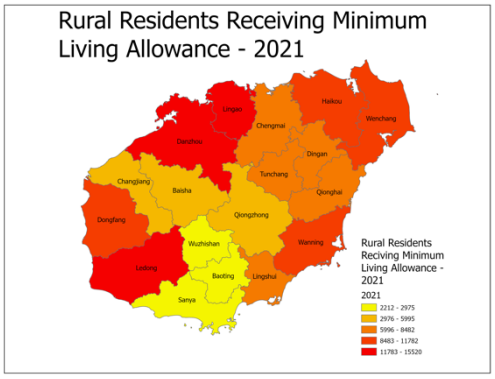
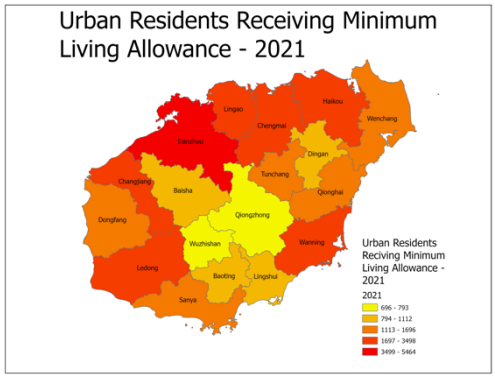




4.2 Number of residents: Rural vs. Urban

The distinction between Hainan's urban and rural residents can have a major impact on social resilience. Typically, urban areas have higher population densities, a more developed infrastructure, and greater access to services and opportunities, whereas rural areas face challenges such as limited resources, inadequate infrastructure, and lower socioeconomic indicators. In numerous ways, these differences can affect the social resilience of urban and rural communities.

The availability of social and community resources plays a crucial role in shaping social resilience. Urban areas have a higher concentration of public facilities, social services, educational institutions, healthcare facilities, and recreational spaces compared to rural areas. These resources contribute to the social infrastructure of urban communities, fostering social connections, community cohesion, and access to support networks. However, in analyzing the data presented in Figure 8, that the number of rural and urban residents increased from 2018 to 2019 and decreased from 2019 to 2021, the reason of increasing in rural population from 2018 to 2019 being that according to Li et al (Li, Jia, Cao, Xiong, Yang, Zhou, Yi, & Li, 2020), in Hainan province, the area under cultivation of areca nut trees expanded from 66,554 acres to 378,895

acres between 2010 and 2016, and the associated output value climbed from 9.76 billion to 40.13 billion US dollars. Some rural populations are returning migrant because the raising Areca nut economy. The areca nut industry in Hainan Province held a significant place in the local economic development, as evidenced by its contribution of 7.1% to the gross domestic product (GDP) in 2016. And Areca nut, scientifically known as Areca catechu L., is a kind of tropical tree that falls within the Palmae family. The crop in question has significant industrial importance across the South and Southeast Asian region, including countries such as China, India, Indonesia, and Malaysia, among others. The fruit of the areca nut, also referred to as belnut, is widely consumed as a chewable product and holds significant value as a primary ingredient in traditional herbal medicine among those regions (Li, Jia, Cao, Xiong, Yang, Zhou, Yi, & Li, 2020). In 2020, the Chinese government reported that the areca nut has gained economic value and is now commonly referred to as the “golden fruit”. According to estimates, the per capita revenue derived from the cultivation of Areca nut is projected to constitute approximately 30.9% of the per capita disposable income of farmers during the latter part of the year in 2020. The Areca nut holds significant importance as a tropical cash crop in Hainan, exhibiting distinct local features and advantageous qualities. That tree is among the three types of trees that the province administration ardently promotes for advancement. At the conclusion of the previous year, the extent of Areca nut cultivation in Hainan Province encompassed 1.78 million acres, serving as a significant economic revenue stream for the province’s 2.3 million agricultural practitioners (Ministry of agriculture and rural affairs of the people’s republic of China, 2020). This suggests that rural areas may face challenges in accessing essential services and resources due to factors such as geographical isolation and limited infrastructure, potentially affecting their level of social resilience.

Moreover, economic opportunities and employment prospects often differ between urban and rural areas. Rural areas may be more reliant on traditional industries such as agriculture or fishing, whereas urban centers typically offer a broader range of employment opportunities in a variety of sectors. Diverse employment opportunities in urban areas can contribute to economic resilience by providing individuals with more options for income generation and economic security. In contrast, limited employment opportunities in rural areas can contribute to economic fragility and undermine social resiliency.

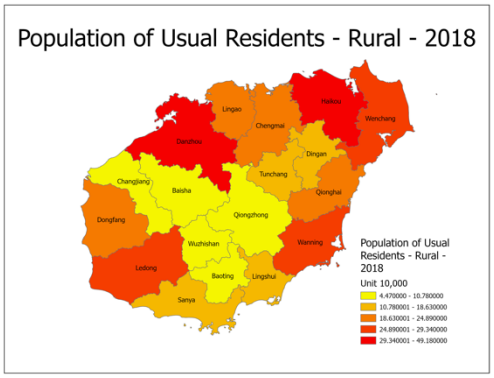
Social resilience is also influenced by differences in access to education and skill development. Greater access to vocational training and skill development programs is also prevalent in urban areas. These educational opportunities enhance the capacity of individuals to adapt to changing conditions, gain new skills, and enhance their job opportunities, thereby strengthening social resilience. In contrast, rural areas may have trouble gaining access to quality education and training opportunities, thereby limiting their economic mobility and social resilience potential.

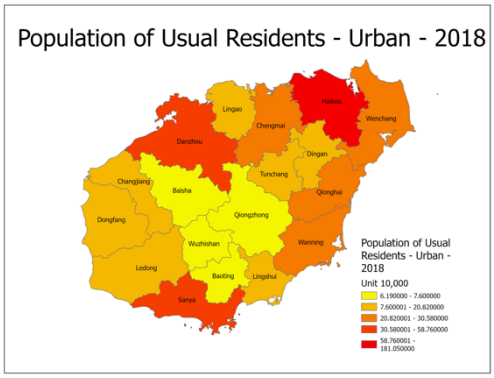
The data presented in Figure 8 illustrates the number of individuals who stay in the same rural and urban regions for more than six months (termed as “usual residents” according to Chinese yearbooks). From 2018 to 2019, an increasing number of individuals have chosen to reside in the less urbanized counties of Hainan, particularly in the towns/small cities characterized by mountainous terrain within these counties. These locations are perceived to offer favorable conditions for enhancing an individual’s respiratory health. The population of more urbanized city-regions has also experienced growth from 2018 to 2019, particularly in coastal cities such as Dongfang. Since the initial outbreak of the pandemic, there has been a decrease in the population of both rural and urban areas from 2019 to 2021. This fall is evident in

the overall reduction in the number of residents in both rural and urban regions. There is a potential explanation for the decrease in the number of residents. The rationale is related to the restrictions imposed by the pandemic on travel, which disrupted the plans of many individuals residing in northern regions who intended to spend the winter in Hainan. This reasoning can also be extended to the urban population, including elderly individuals or relatively wealthy households who possess properties in urban areas.

In summary, it can be observed that both rural and urban areas encounter challenges in social resilience within this sub-category. Prior to 2019, both rural and urban areas demonstrated excellent performance in terms of population absorption and social resilience along with economic growth. During the pandemic, both rural and urban areas in Hainan experienced challenges in expanding local population, which is an indicator of challenges in social resilience conditions.

Figure 8: Rural & Urban Population, 2018 - 2021. Note: Figure 8 illustrate the number of residents in Hainan by region. This figure shows the number of residents in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)





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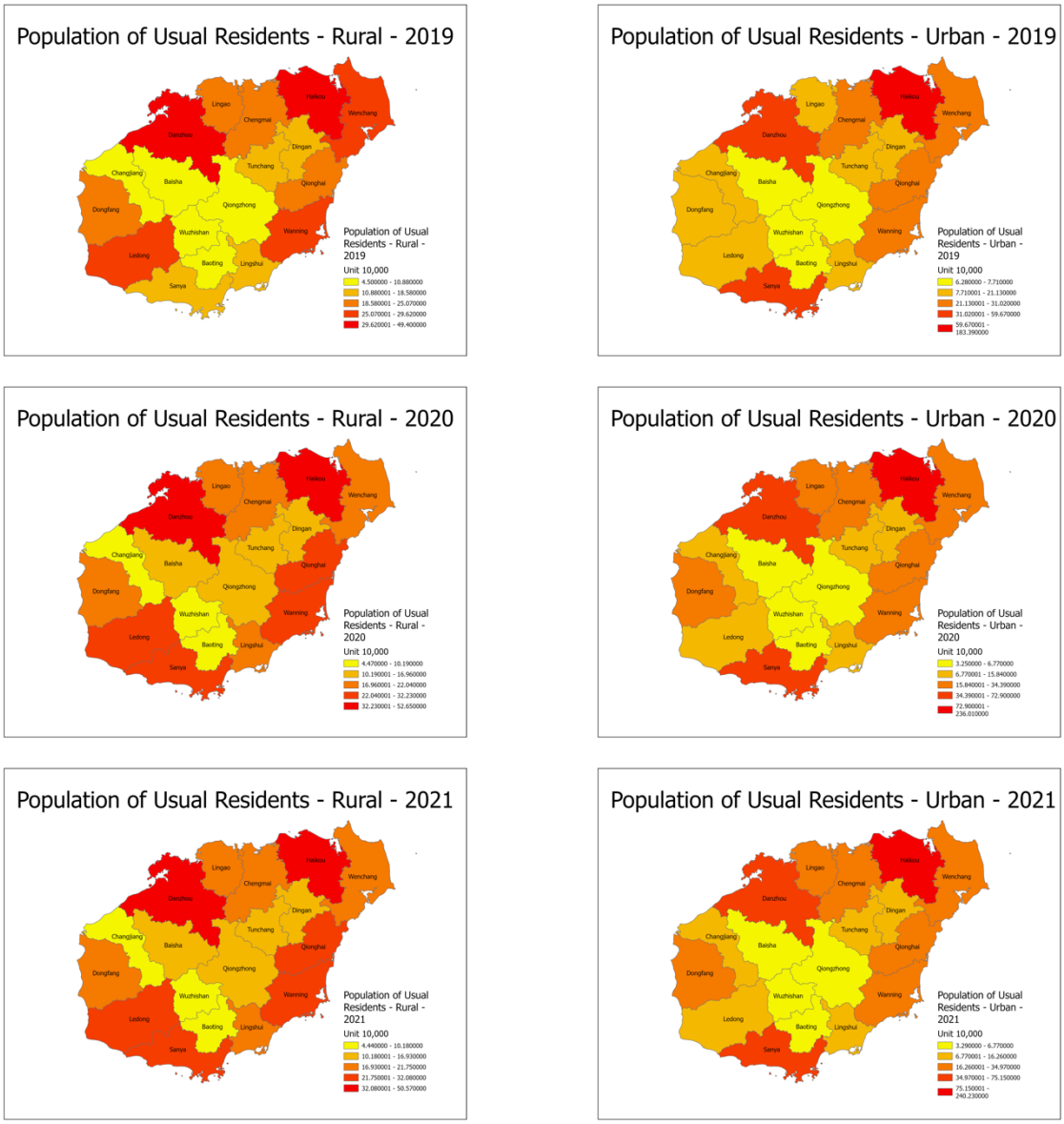


4.3 Number of health care institutions

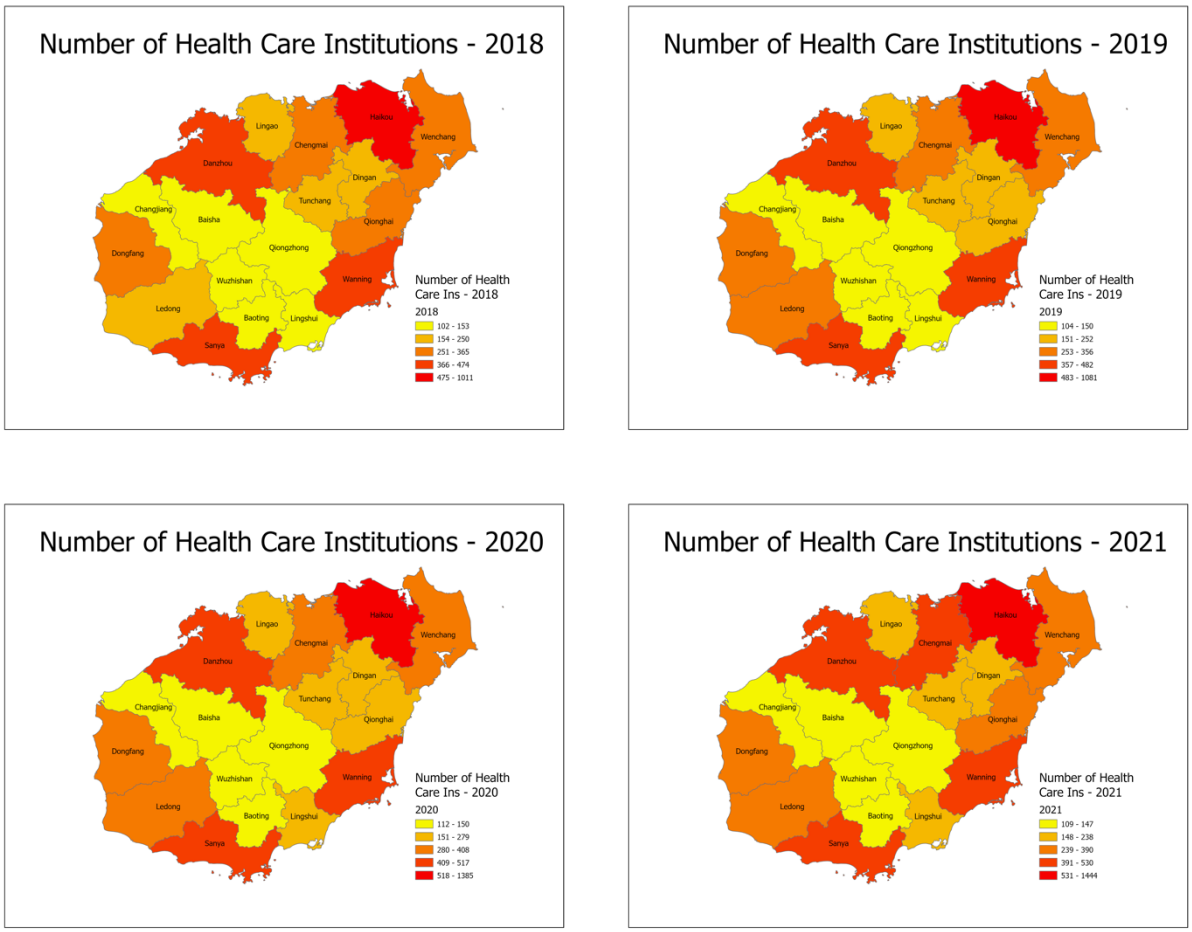
Healthcare institutions include hospitals, clinics, medical centers, and other facilities that provide the population with essential medical services. The availability and accessibility of healthcare institutions are crucial for promoting and maintaining the health and well-being of individuals, which contributes to social resilience.

Accessible healthcare institutions reduce barriers to healthcare, allowing individuals to seek medical attention in a timely manner, thereby improving health outcomes and overall resilience. In times of crisis or emergency, healthcare institutions are critical. Healthcare institutions play an important part in epidemics, natural disasters, and public health emergencies by providing medical care, emergency response, and containment strategies. Their presence and ability to effectively manage such situations can increase the community's resilience to health-related shocks and crises (World Health Organization, 2019).

From Figure 9, one can see that the number of healthcare facilities increased from 2018 to 2021, with Wanning standing out in comparison to other regions. Wanning is densely populated with health care institutions compared to the rest of Hainan.

It is essential to recognize that the distribution and accessibility of healthcare institutions are key determinants of their effect on social resilience. Disparities in the availability of healthcare institutions, especially in underserved or marginalized communities, can create barriers to access, resulting in health disparities and diminished social resilience. Promoting social resilience requires ensuring equitable distribution and accessibility of healthcare institutions across diverse regions and populations (World Health Organization, 2019). Given the analysis presented above, the quantity of healthcare institutions is indicative of Hainan's ability to respond quickly to emergencies such as the COVID-19 pandemic. Theoretically, a greater number of hospitals corresponds to better resilience. The hospital numbers in Hainan were observed to be increasing, indicating an increase of social resilience in this particular area.

Figure 9: Number of Health Care Institutions. 2018 - 2021. Note: Figure 9 is the number of health care institutions of Hainan by region. This figure shows the number of health care facilities of each region in Hainan from 2018 to 2021. (Statistical Yearbook of Hainan – 2022)



CHAPTER 5: CONCLUSIONS AND IMPLICATIONS

Based on the economic and social data provided in this study, there is no doubt that Hainan has a resilient economy. From an economic standpoint, Hainan's emphasis on becoming a free trade zone, attracting foreign investment, and developing industries such as tourism has contributed to the island's economic resilience. The analyses of economic indicators such as disposable income, GDP per capita, and tourist arrivals reveals positive trends and growth in Hainan's economy, indicating its ability to withstand shocks and recover from challenges. As a result, Hainan has made positive progress in economic resilience, but social resilience isn't as great as we predicted.

Hainan has taken steps to improve social resilience by investing in healthcare infrastructure and fostering utility among residents. The presence of healthcare institutions demonstrates a commitment to addressing basic utilities and constructing a resilient society.

Despite the progress made by Hainan in terms of economic and social resilience, it is essential to maintain awareness and address areas that need further enhancement. These areas include the maintenance of economic growth and diversification, reduction of income disparities, reduction of poverty, and continuous inclusion of migrant populations.

In conclusion, Hainan's efforts to strengthen economic and social resilience have positioned it as a promising urban resilience example. However, continuous monitoring, evaluation, and targeted interventions are required to address existing challenges and ensure that resilience is built on a foundation that is inclusive and sustainable. Hainan can continue to enhance its urban resilience and contribute to the long-term prosperity and well-being of its residents by pursuing a comprehensive approach that combines economic development with

social well-being. This study provides an important first step toward future studies on urban resilience in more Chinese cities.

In line with the study's hypothesis, the economic indicators of GDP, disposable income, and tourist arrivals in Hainan exhibit an increasing trend overall in urban and rural areas, suggesting a heightened level of economic resilience in the region despite the onset of the pandemic. Nevertheless, within the realm of the social sector, the data reveals a positive trend in the number of hospitals, whereas the remaining two indicators, especially the number of individuals receiving a minimal living allowance and the number of residents, exhibit a negative trend since the pandemic. These findings suggest that Hainan's social resilience faces challenges that need to be addressed.

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