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Impact of Rural revitalization on rural tourism and economy in fishing communities

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ABSTRACT: Rural revitalization plays a vital role in strategies for promoting sustainable rural development in developed and developing countries. However, China's rural revitalization concept has shown how viable its policies and strategies can be realized, thereby playing a lead role and setting an example for the trends in global urbanization. In this study multi-source data, as well per capita expenditure of rural resident, building and housing data, national official websites, and field surveys were used to investigate the morphological and social evolution of fishing rural communities from the perspective of touristification and to analyze their drivers. The results showed that from 1990 to 2021, the selected sample cases in Ningbo communities are transforming with traditional rural social and economic characteristics. these communities have experienced continuous increases in the average weighted building height, building volumes, and floor area ratio; Also the proportion of non-agricultural employment increased by 99.67%, and rural tourism has become the leading industry in the research site, this paper also examines how these communities are being transformed in the new agenda of urbanization in China since 2012 with an increase in value of agricultural output value during touristification. However, these data collated will lend support to earlier research, that rural revitalization strategy is beneficial to non-urban communities in terms of their economic development and growth in China, Africa, and especially Nigeria my home country. my findings so far also provided managerial implications suggesting that the local government should implement tourism-related development projects to enhance rural tourism activities to develop the local economies which in turn will increase employment.

Keywords Rural revitalization strategy, Rural economy, Rural communities, Spatiotemporal evolution, Rural development, morphology, per capita

I. Introduction

In consideration of these concepts, the rapid development of the urban economy and touristification is part of the general objective of rural vitalization. this is a way of systemically establishing a kind of coupling patterns of different rural development elements. this includes population, labor, technology, and industry. However rural vitalization is a major strategy for the rural development of China. However, China's rate of urbanization has grown year by year. The urbanized population in China has also grown from 17.9% in 1978 to 50% by 2020 (United Nations, 2004). China has however also reached its large-scale urbanization state, with an urbanization rate of more than 60% in 2011. considering these and however since, a new urbanization phenomenon has emerged in China, which has been featured by an increasing household income as a result of recent industrialization dominated and production-oriented development strategies. In addition to building a new countryside policy, this phenomenon has encouraged the young generation of rural dwellers to start a move back to their origin of places. Ningbo sub-provincial city in Zhejiang province of China is making impressive efforts in rural revitalization and also Ningbo's efforts in rural revitalization are impressive. Ningbo is rich and liveable with various harmonious neighborhoods. Ningbo has played an important role in the communication and cooperation between China and other parts of Asia in advancing Belt and Road cooperation. however, Industrialization and globalization Ningbo has greatly transformed rural areas in many aspects and different ways. This has also resulted in various types of countryside dwellings rated high on the global scale. Some rural regions have jointly experienced a great deal of economic and social prosperity under driving a kind of forces like rural tourism promotion and counter-urbanization stimulation (Canoves, 2006; Lowe and Ward, 2007) while on the other hand some rural regions are trapped in a vicious cycle of decline (Liu and Li, 2017). The Rural decline however is somewhat seen and viewed as a global issue, which is inevitably accompanied by increasing global levels of urban development (Markey et al., 2008). With a view of rapid advances and with also continuous improvement in urbanization, It has however been determined that rural urbanization will always be a leading aspect of the worldwide economic, social, and cultural evolution of rural vitalization (Long et al., 2019). Rural tourism however intertwines and combines the economic, social, and environmental

components of rural areas. this is said to be closely linked to people, space, and products and with also a kind of unique effects on the environment and economic growth (Nepal, 2007; Wang et al., 2016; Xia et al., 2011). Tourism development in villages can be said to promote a kind of rapid economic growth, create more jobs, and as well improve the quality of residents' life. However, there are certain drawbacks which include ecological damage, depletion of local resources, and overloading of infrastructure (Gao & Zhang, 2019; Liu et al., 2020; Torres & Momsen, 2005). Therefore, it is however very important to note and understand this relationship between The various values of tourism output and likewise the promotion of sustainable development of these villages. Rural areas play a kind of repositories roles of both natural and historical heritage in many globally, in which it is of commercial importance and this is because rurality is such unique point of sale for holidays in the countryside" (Lane, 1994, pp. 103). However, at present, rural tourism in most recent research works have focused on the local government's exploration of both the role and rationality of the joint management department in the tourism sector. Also, Some notable rural tourism studies have focused on similar issues on the impact of over-tourism on the local ecological environment and likewise the inept dissatisfaction of residents (Diaz-Parra & Jover, 2020; Fletcher, 2019; Liu et al., 2019). Recently, rural tourism research has been paying close attention to the contribution tourism income has made to the alleviation of poverty and job creation (Carius & Job, 2019; Higgins-Desbiolles et al., 2019). On the other hand Sustainability development however is viewed to only be achieved through economic and environmental balance (Li et al., 2019; Ortega et al., 2020). Rural exploitation and protection should however be made balanced during touristification. In one of Carnero's research, studies have shown that the characteristics of rural tourism in the context of people-to-people contact and a rich traditional environment, are said to be very important (Carneiro et al., 2015). however, these characteristics create a kind of a peaceful tourist environment, contrary to the otherwise noisy and tensed landscape of urban areas. However, sustainable tourism research should be more focused not just only on the sustainability of the ecological environments, but likewise the social order and a kind of sound economic functionings (Aquinoet al., 2018; Jaafar &Maideen, 2012).

Recent research on rural tourism has however expanded from early national studies to regional, provincial, and also city-level research (Kaptan et al., 2020; Liu et al., 2018; Wang & Yotsumoto, 2019). Although the various methods of rural tourism research are said to be diverse, each has its limitations. However and at present the main research methodologies rely on qualitative descriptions, questionnaire surveys, building models, and index system assessments (Christou, 2018; Christou & Sharpley, 2019; Lin, 2019; Nematpour & Khodadadi, 2020). so far, there's no current universal index system that has been established for the construction of the evaluation index. At present, the major indices which have been selected by researchers have included population, economics, and social development (Liu & Feng, 2019; Ma et al., 2020). consequently, there is still a kind of drawbacks of certainsmall-scale regional research on tourism-oriented rural communities in townships. Also, there is a kind of lack of long-term research from the point of view of space-time differentiation and a lack of quantitative research which is based on a kind of multi-source data such as remote sensing data, on-site research, and socio-economic data. However, the complex and diverse environments of rural communities tend to determine the complexity and diversity of their evolution. However, this evolutionary Path tends to vary when considering the type of area and also the scale of such settlements (Belhassen et al., 2014; Eusebio et al., 2017; Ristic et al., 2019; Zhang et al., 2016). On the other hand, most research into rural communities tends to be based solely on the effects of agriculture, industrialization, and the peri-urban (Ciolac et al., 2019; He et al., 2018; Liang et al., 2017; Lu, et al., 2020a). In This study, the exploration of the evolution of selected tourism villages has been employed to develop a more sophisticated model to boost rural areas' tourism economy. However one of the aims of this study is to provide various new insights into the touristification of fishing rural communities and a view on how to promote viable sustainable rural development. An in-depth view of the results will consequently highlight the contradictions between the tourism stakeholders and the decision-makers and compare how local governments, businesses, and residents participate in tourism. To achieve the research goal, this study uses remote sensing data from six periods of time in Ningbo to investigate the morphological and social evolution against the vantage point of touristification. However, the development indices of rural communities were used to analyze the evolution and driving mechanisms of spatial patterns.

II. Literature review

The rural revitalization strategy is a kind of systematic and as such comprehensive initiative which strengthens the rural economy. In the initial stages of the rural revitalization strategy, the government tends to be in a dominant position. The government presents a whole series of policies and also offers some financial support. However, In the subsequent phase, businesses will then use this policy support to promote rural development. With these, there is a continuous promotion and development of the rural revitalization strategy. Also towards the later stages of the strategy, rural residents tentatively and actively engage in production activities to improve the employment structure (Buzinde et al., 2020; Nugroho & Numata, 2020; Xu & Fang,

2019). The regional pattern of rural revitalization tends to depend on the various types of rural communities. By citing an example, especially in agricultural villages, economic development can be promoted in a way by expanding the various sales channels of selected fishery or agricultural products and also the processing of auxiliary agricultural products. However, In contrast, individual industrial villages, the transformation of farmers into workers optimize the employment and economic structure. In tourist villages, residents become service workers (Dai et al., 2016; Guo & Sun, 2016; Stoddart et al., 2020; Zhang et al., 2019). considerably there is this agreement amongst researchers about the various benefits of tourism development, there has been no clear understanding of the evolution of tourism, these can be particularly under the guidance of the rural revitalization strategy (Pung et al., 2020). though urbanization continues to progress, many rural residents have continued to move to urban areas for better jobs and living conditions. However, though many rural areas are still underdeveloped, there is still a lopsided development between urban and rural areas (Schmidt & Uriely, 2019; Sun et al., 2020). Therefore Chinese government has formulated a kind of rural revitalization strategy which alleviates the long-term problems of job losses and the recession in the fishery and agricultural sector.

III. Essence of morphological and social evolution, and ruralcommunities from a tourism perspective.

The early concept of sustainable tourism, which was centered on ecology and economics, has thereby been replaced with the view that social culture is of equal importance (Weaver et al., 2020). However morphological and social evolution and also the outcome of the tourism destination is an important way in which to observe the impacts of tourism on the various communities (Lu, et al., 2020b). Social evolution is an integral part of the evolution of the human settlement environment. Also, it is important to note that social animals, human beings' existence and development will have a social impact and their behavior could be analyzed by their social evolution (Mou et al., 2020; Wang et al., 2020). Rural communities are regions where rural people live and work (Li et al., 2018). however, the scale of development in rural communities is a close link to natural and human evolutionary processes which kind of manifest in the structure of production, human-land relations, and social structure (Yang & Chen, 2018). Also, the pattern of construction of rural communities is the morphological representation of a spatial evolution, industrial remodeling, and social reorganization of a rural regional system (Yang et al., 2015). The central authority can however optimize the spatial distribution, the hierarchical relations, and the governance of counties, key towns, (communities) in rural areas thereby establishing a construction pattern (Kubickova & Campbell, 2020; Xue et al., 2017). However, the establishment of a pattern of rural human settlement construction, it can be designed in a way it clarifies the positioning of different settlements in other to promote their development under local conditions.

In their studies of agricultural rural communities. Researchers also have used various traditional methods, such as field visits and questionnaires, as well as orthodox methods, such as remote sensing-based interpretation of vegetation cover, in the investigation of the relationship between settlement development and geographic indicators in villages. However Previous research has found that the construction of village service circles with villages as The main core helps to accelerate the development of urban and rural integration (Lozada et al., 2018; Watmough et al., 2016, pp. 188–203; Xia et al., 2019). In previous research, there were compared numerous areas at different stages of industrialization that kind of revealed an evolution in the functioning of rural housing due to industrialization (Jiang et al., 2016; Lai & Zhang, 2016; Ma et al., 2018; Shin & Chae, 2018). However, settlements have since changed from a single residential function to a composite function that integrates residence, industrial manufacturing, and also leisure tourism. peri-urban rural communities researchers have analyzed peri-urban agriculture and economic activities in which it was concluded that peri-urban areas have always been instrumental in alleviating pressure on urban regions, which requires settlements to have the complete infrastructure and a good ecological environment (Guo et al., 2018; Li et al., 2020; Pribadi & Pauleit, 2016; Zhou, 2017). However, it is said that each type of rural human settlement tends to follow its evolutionary pathway. Government representatives, tour operators, and rural residents, each participant performing his or her duties, jointly produced the results of the evolution (Duarte & Nyanjom, 2017).

IV. The relationship between morphological and social evolution and rural transformation development in developing countries:

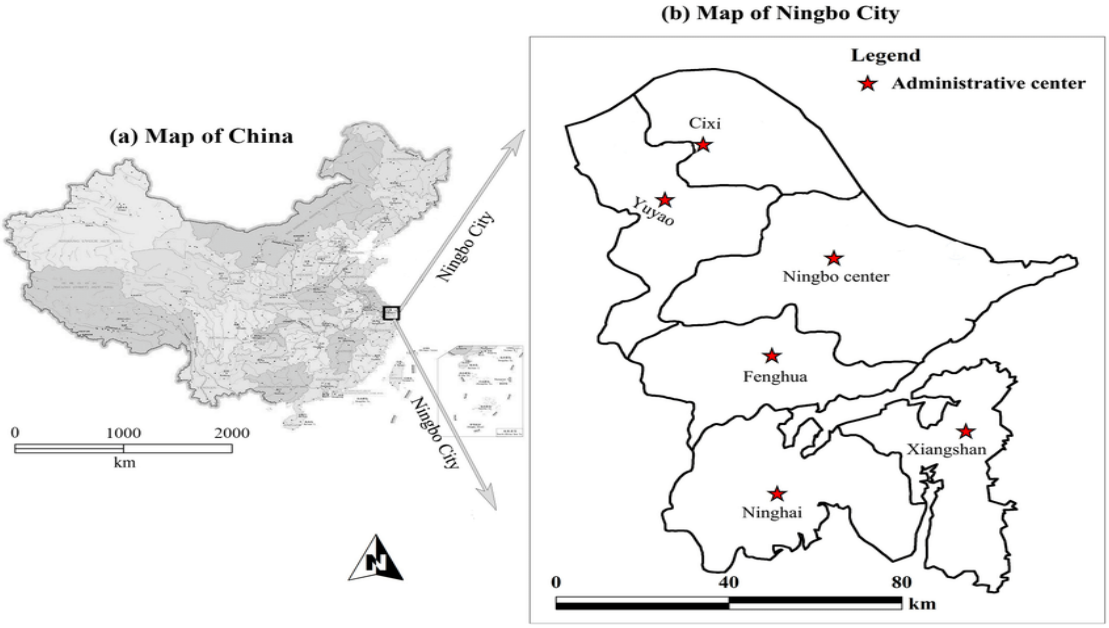
China case study

However, the evolution of rural urbanization in China is the world's second-largest economy, and also is representative of the world's largest developing country in the world (Liu, 2018; Quer, 2021). as of the end of 2016, China's urbanization rate grew to 57.35%, which is higher than the global rate of 54.50% (China Statistics Press (CSP), 2016). Also, China's rapid urbanization since its reforms and opening up to the world in 1978 has caused widespread concern both in China and abroad (Huang et al., 2019; Wang et al., 2018; Xu & Hou, 2019). The World Travel and Tourism Council (WTTC) however noted that China's share of travel and tourism in

GDP was recorded second in the world in 2019, each reaching US$ 1585 billion (WTTC, 2020a). In China The number of people engaged in tourism accounted for 10.3% of the total employment and also the number of tourism-related jobs reached more than 79 million (WTTC, 2020b). Also, The number of villages in China has now become rural tourism destinations and has now increased as a result of economic growth, urbanization, and higher standards of living (Brand˜ao et al., 2019; Li & Wang, 2020; Zhang et al.,2020). However, researchers should pay close attention to the development of China's tourism industry and provide other developing and developed countries with ideas and experience for the development by studying china's development over the past 30 years. The regional patterns of the various rural communities are the result of morphological and social evolution. Amongst these, morphological evolution is the more direct and visible change. Over the years and through the 30 years of development, the administrative villages have however undergone both tremendous changes in appearance and elegance as tall buildings rose from the ground. Evolution results have been presented using these three indexes: average weighted building height, building volume, and floor area ratio, in other to show the most significant changes in morphological evolution. Social evolution is a change that however should not be ignored in the development of rural communities because they are both the result and drivers of morphological evolution. Also based on the historical developments in Ningbo, this study has used the housing structure, employment structure, and industrial structure as indicators of social evolution.

V. Materials and methodology

i. Study area



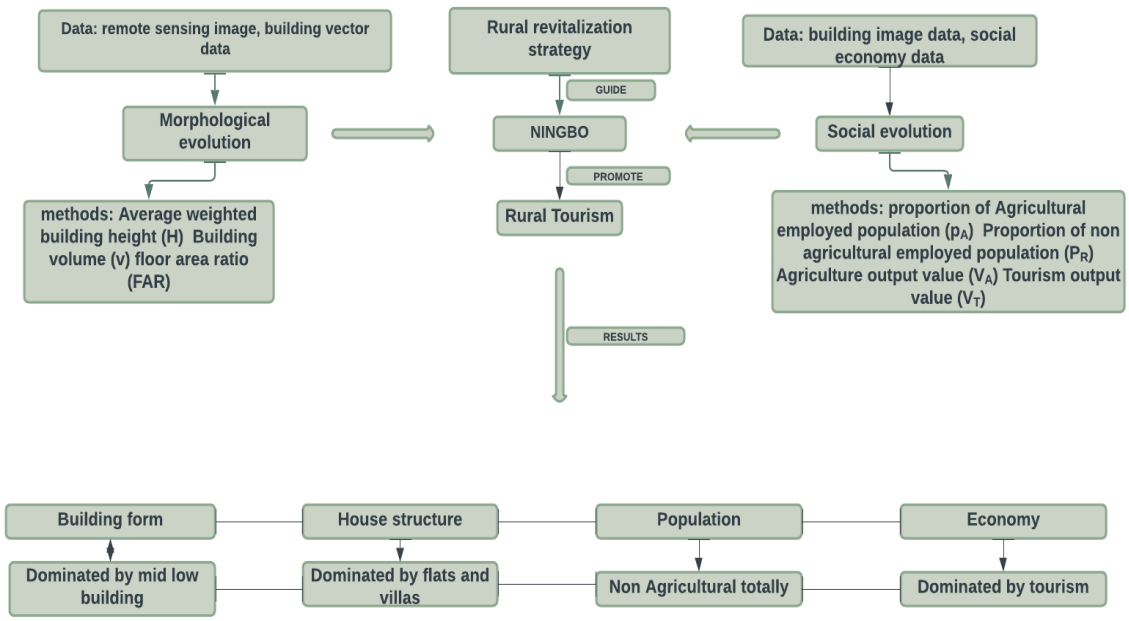
Chinese Name:(níng bō) the Population of Ningbo is 8,542,000, with an area of 9,816 square kilometers (3,790 square miles) it is located in the east of Zhejiang, east China. its administrative Division has 6 districts (Haishu, Jiangbei, Beilun, Zhenhai, Yinzhou, Fenghua). Ningbo has 2 counties mainly Xiangshan, Ninghai; 2 county-level cities (Yuyao, Cixi). GDP (2019)is CNY119.85 billion (USD 17.37 billion). Ningbo city is a Historic Port City on a Waypoint to Mt. Putuo to the east of Zhejiang, Ningbo however sits at the mid-point of the Chinese coastline, which is towards the south of the Yangtze Delta. It is adjacent to Shaoxing towards the west and Taizhou towards the south. The annual cargo throughput of Ningbo Zhoushan Port ranks the first in the world, and also the container volume ranks in the top three. However for tourists, what is worth visiting is the cultural heritage deposited in the city. One of the best parts is paying a visit to Tianyi Pavilion, the oldest library in Asia, and The Old Bund of Ningbo which is one of the former foreign concessions and has greatly made an indelible mark on Ningbo. Many and most oldEuropeanstyle buildings have however been transformed into bars and restaurants. In Ningbo city, there are Charming lakes in the North of the city which are ideal places for outdoor relaxation and cycling. Visitors during high and low peak seasons take visits to Mt.Putuo, one of the four famous Buddhist mountains in China. It distance takes 1 hour and 40 minutes to get there by car. However History as it IS one of China's oldest cities, the city has greatly witnessed the rise and fall of numerous dynasties. The city also represents the birthplace of the Hemudu Culture, which itself has a history of over seven thousand years. These early civilizations lived and thrived in the area, and have contributed tremendously to making the

city what it is today. Ningbo city is also an economically developed, modern city with a verse profound cultural foundation. It has always been an important port city for both domestic and foreign trade since the Song Dynasty 960-1279. However, after the Opium War in 1840-1842, Ningbo city became one of the topfive ports in China, thereby successfully utilizing its favorable location for water transport. However in recent times, despite its well-developed economy and infrastructure, it remains surrounded by charming natural scenery, Handicrafts, and natural countryside settlements. Although the city is striving towards modernization, perhaps the passion of the local people for producing traditional handicrafts remains undiminished. The natives and residents still design hand-plaited bamboo vases and screens and particularly popular animal figurings. The ancient Gu Mu Xiangqian, bamboo root carving, and bamboo sculpture all reveal the local characters of their various craft.

ii. Data sources

The current study used china and Ningbo statistical data spanning around 31years (from 1980 to 2021) to verify the effectiveness of a revitalization strategy for sustainable rural tourism in China's non-urban areas. Asper the building sector the collated data does not change significantly from one year to the next; hence, the representative years have been chosen to illustrate the various designated area's evolution over time. However, 1990 through 2019 were analyzed in other to examine the evolution of Ningbo in its early stage with limited growth and change over the years. Thereafter Ningbo's development has expanded at a steady pace, we have however set 5 years as the central period (2004, 2008, 2016 2019, and 2021). The housing and building vector data of relevant years (1998, 2004 2016, 2019, and 2021) were also obtained through the combination of remote sensing images and study of earlier research and journals on Rural revitalization. Meanwhile, data was also collated according to the Ningbo housing survey of 2019, the attributes of the building height and story.

iii. Research Roadmap



Calculation and description of rural communities evolution indexes.

Index types	Rural communities evolution indexes	Equations	Variable description

Building	**Average weighted building height**	$H = \frac{\sum_{i=1}^{n} A_i H_i}{\sum_{i=1}^{n} A_I}$	***Where Ai is the base area of building i, Hi is the height of building i, n is the number of buildings in the region.***
	Building volume (V)	$V = \sum_{i=1}^{n} A_i H_i$	***Where Ai is the base area of building i, Hi is the height of building i, n is the number of buildings in the region***
	Floor area ratio (FAR)	$FAR = \frac{\sum_{i=1}^{n} A_i F_i}{P_a}$	***Where Ai is the base area of building i, Fi is the number of floors of the building, Pa is the land area of the plot, n is the number of buildings in the region***
Population	**Proportion of agricultural employed population（PA）**	$P_A = \frac{E_A}{P}$	***Where EA is the agriculturally employed population, P is the total population***
	Proportion of non-agricultural employed population（PT）	$P_r = \frac{E_r}{P}$	***Where ET is the non-agriculturally employed population, P is the total population***
Economy	**Agricultural output value（VA）**	$V_{A=}\frac{I_A}{A_A}$	***Where IA is the comprehensive agricultural income, AA is the agricultural land area***
	Tourism output value（VT）	$V_{T=}\frac{I_T}{A_T}$	***Where IT is the comprehensive tourism income, AT is the tourism land area***

Indexes	Villages	1990	1998	2004	2008	2012	2016	2019
Average weighted building height (H)	Maoxin	3.00	3.00	3.15	5.48	8.19	11.67	14.27
	Waicao	3.00	3.91	4.12	4.86	5.20	5.85	7.82
	Yongwang	3.00	3.26	12.67	12.30	12.67	12.86	14.34
	Jiufeng	3.00	6.46	8.99	10.61	10.12	10.85	11.56
	Wandi	3.00	3.00	3.89	3.89	6.48	5.35	6.22
	Haitou	3.00	4.24	6.04	10.30	11.17	13.81	14.67
	Gaoni	3.00	3.00	6.37	4.99	7.12	7.57	8.89
	Average	3.00	3.84	6.46	7.49	8.70	9.71	11.11
Building volume (V)	Maoxin	8.41E+04	1.33E+05	2.36E+05	4.73E+05	1.43E+06	2.42E+06	2.92E+06
	Waicao	2.03E+04	4.43E+04	1.54E+05	3.21E+05	3.43E+05	2.68E+05	3.64E+05
	Yongwang	1.06E+05	1.30E+05	2.70E+06	3.17E+06	4.92E+06	3.72E+06	5.47E+06
	Jiufeng	2.19E+05	1.22E+06	3.82E+06	4.79E+06	5.12E+06	5.76E+06	8.76E+06
	Wandi	1.39E+05	1.90E+05	5.47E+05	5.47E+05	9.09E+05	1.20E+06	1.20E+06
	Haitou	1.32E+05	3.47E+05	7.56E+05	2.41E+06	2.88E+06	4.55E+06	5.89E+06
	Gaoni	2.49E+04	8.51E+04	8.21E+05	1.05E+06	1.20E+06	1.77E+06	1.77E+06
	Sum	7.25E+05	2.15E+06	9.03E+06	1.28E+0	1.68E+07	2.10E+07	2.64E+07
Floor area ratio (FAR)	Maoxin	0.01	0.01	0.05	0.05	0.10	0.44	0.74
	Waicao	0.02	0.02	0.04	0.08	0.08	0.03	0.09
	Yongwang	0.01	0.01	0.18	0.19	0.37	0.43	0.63
	Jiufeng	0.03	0.05	0.18	0.20	0.23	0.51	0.81
	Wandi	0.03	0.03	0.04	0.05	0.07	0.09	0.11
	Haitou	0.08	0.09	0.10	0.17	0.30	0.48	0.48
	Gaoni	0.01	0.02	0.30	0.30	0.31	0.22	0.42
	Average	0.03	0.03	0.13	0.15	0.21	0.31	0.55

Table: 1 Calculation and description of rural communities evolution indexes

iv. Morphology transition in the volume of buildings

In the calculations the building volumes of the seven villages have however been increasing continuously from 1990 to 2019, reaching a total volume of 2.64E+07m3 in 2019. so far it has been seen in Table:1 that the increase in the volume of buildings greatly differed from one village to another. By 2019, Waicao building volume was 3.64E+05m3, with slow growth over the 30years period. However, Jiufeng's building volume had reached 8.76E+06 m3 in 2019; showing an increase from 2.19E+05 m3 to 1.22E+06m3 between 1990 and 1998 and thereafter expanded rapidly. Wandi had an increase in its building volume approximately every 10 years; the building volume was less than 2.00E+05m3 between 1990 and 1998, thereby stabilizing at5.47E+05m3 between 2004 and 2008 and thereafter exceeded 9.00E+05m3 after 2012. Building volumes of other villages also increased significantly at various times after 2000. juifeng, which had the fastest growth rate in building volume, is located in the Mountain area of Daqi Sub-district of Beilun District, the most densely populated area in terms of tourist attractions. However, at present, waicao, which has the smallest building volume, is the farthest away from the town center and has the fewest tourist attractions.

v. Morphology transition in the ratio of floor area

In the study, it was divided the study area into patches based on village borders, major traffic arteries, and land use data. The floor area ratio of each patch was calculated and divided into five equal range levels: extremely low (≤0.20), low (0.20–0.80), medium (0.80–1.40), high (1.40–2.00), and extremely high (≥2.00). Between 1990 and 2016, however, the average floor area ratio of Ningbo increased from 0.03 to 0.31. The floor area ratios of the seven villages increased slowly and remained reduced overall. The floor area ratio of juifeng increased most from 0.03 to 0.51 during the study period and peaked in 2019. wandi floor area ratio showed the smallest increase, from 0.03 to 0.09. The floor area ratios of maoxin and haitou increased slowly in the early years, then accelerated from 2012 to 2016, with increases of 0.34 and 0.18, respectively. The floor area ratios of yongwang and Gaoni increased significantly from 1998 to 2004 by 0.17 and 0.28, respectively, and then rose slowly. The waicao floor area ratio increased slowly in the early years but then decreased from 0.08 to 0.03 between 2012 and 2016 with the demolition of unusable buildings. According to their spatial distribution, the

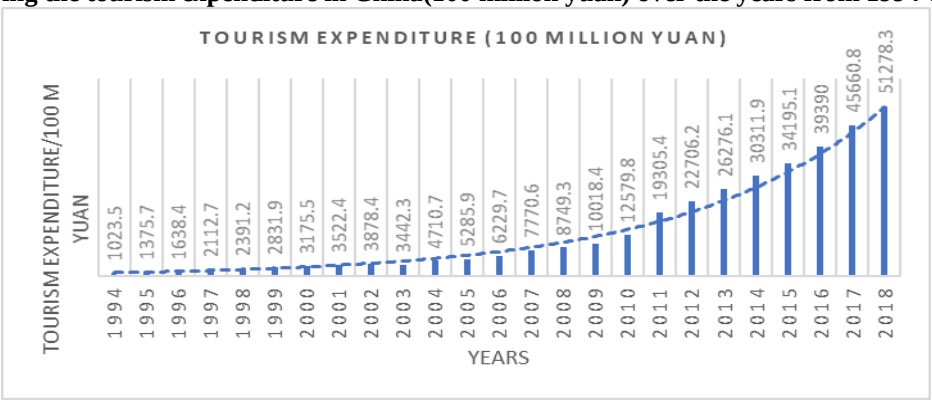
building floor area ratios in Ningbo were either low or extremely low before 1990, with higher levels appearing after 2004. Typically, the floor area ratio was high in central areas and low in northern and southern areas. though the average floor area ratio of the village was low (below 0.51), a small number of patches had extremely high floor area ratios. By 2019, patches with high and extremely high floor area ratios were concentrated mainly in yongwang and Gaoni. Low and medium floor area patches were mainly distributed in the central area of Ningbo. Patches with extremely low floor area ratios were concentrated in the villages in the north and south of Ningbo.

Table: 2

Year	Domestic tourist(millionpersons-times	Rural Residents	Tourism expenditure (100 million yuan)	Rural Residents	Per capita expenditure (yuan)	Rural residents
1994	524	205	1023.5	175.3	195.3	54.9
1995	629	246	1375.7	235.6	218.7	61.5
1996	640	256	1638.4	270.0	256.2	70.5
1997	644	259	2112.7	560.9	328.1	145.7
1998	695	250	2391.2	876.1	345.0	197.0
1999	719	284	2831.9	1083.7	394.0	249.5
2000	744	329	3175.5	940.3	426.6	226.6
2001	784	375	3522.4	870.7	449.5	212.7
2002	878	385	3878.4	1930.3	441.8	209.1
2003	870	351	3442.3	1038.2	395.7	200.0
2004	1102	459	4710.7	1351.7	427.5	210.2
2005	1212	496	5285.9	1629.7	436.1	227.6
2006	1394	576	6229.7	1815.0	446.9	221.9
2007	1610	612	7770.6	2220.2	482.6	222.5
2008	1712	703	8749.3	2777.6	511.0	275.3
2009	1902	903	10183.7	2949.9	535.4	295.3
2010	2103	1065	12579.8	3176.0	598.2	306.0
2011	2641	1687	19305.4	4496.8	731.0	471.4
2012	2957	1933	22706.2	5028.2	767.9	491.0
2013	3262	2186	26276.1	5583.5	805.5	518.9
2014	3611	2483	30311.9	6092.1	839.7	540.2
2015	4000	2802	34195.1	6584.2	857.0	554.2
2016	4440	3195	39390.0	7147.8	888.2	576.4
2017	5001	3677	45660.8	7987.7	913.0	603.3
2018	5539	4119	51278.3	8688.3	925.8	611.9

Source : China statistical yearbook 2019

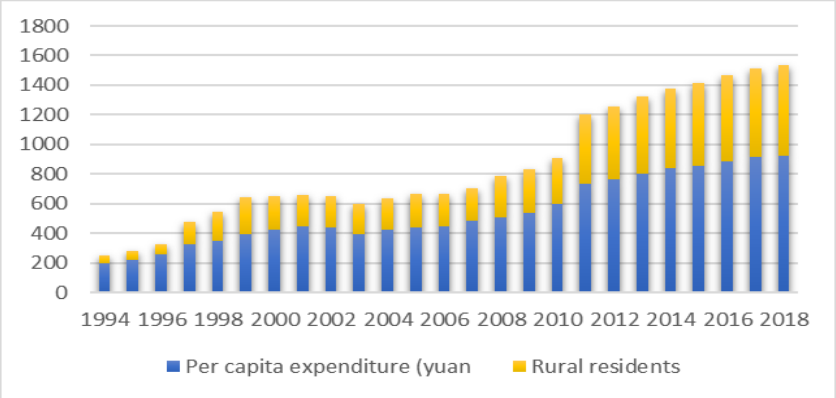
Graph showing the tourism expenditure in China(100 million yuan) over the years from 1994-2018



Tourism over the years increased at a high rate in ningbo, in 2017 ningbo realized a total revenue of 55.61billion yuan(ningbo statistical year book) with an increasing18.6% over the previous year. there were 110million domestic tourist up by 18.6%. the domestic tourism income was 164.91 billion, which was up by 19.0% 1869

million visitors treated and an increased rate of 7.7%. income from inbound tourism was $990million up by 79% by the end of the year 14 city level nongjiale characteristic village spots were also newly added with the total coming to 190

Graph showing the per capita expenditure with the rural residents population data over the years in Ningbo rural communities (1994-2018)



Resident income and expenditure Ningbos' disposable income per urban resident in 2017 was 48233 yuan, up by 8.0% over the previous year. Divided by urban and rural areas, the per capita disposable income of urban residents was 55656 yuan up by 7.9% (Ningbo statistical yearbook). in which the real increase was 6.0% after the deduction of the price index. The per capita disposable income of rural residents was 30.871 yuan up by 8.0% and the increase was 6.1% after the deduction of the price index. The per capita income difference between urban and rural residents was 1.80 in 2017, while the per capita living expenditure of Ningbo residents was 29,316 yuan up by 5.1%. when divided by the urban and rural areas the per capita living expenditure of urban residents was 33.197 yuan up by 5.1%, while that of rural residents was 20,239 yuan up by 4.8%. for 2018 the per capita disposable income of rural residents was 33633 yuan up by 8.9% an increase from the previous year, while the per capita living expenditure of Ningbo rural residents was 21248 yuan up by 5.0% against the previous year. Also in 2019 the per capita disposable income of rural residents was 36632 yuan up by 8.9% an increase from the previous year, while the per capita living expenditure of Ningbo rural residents was 22797 yuan up by 7.3% against the previous year. For 2020 the per capita disposable income of rural residents was 39132 yuan up by 8.9% an increase from the previous year, while the per capita living expenditure of Ningbo rural residents was 23481 yuan up by 3.0% against the previous year.

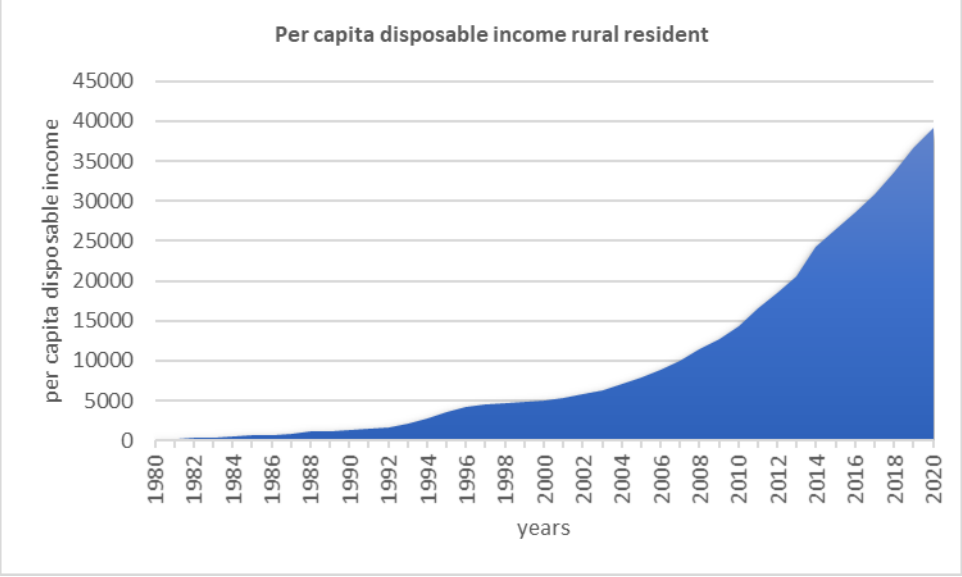
Per capita annual income and living expenditures and housing conditions of rural residents (Ningbo 1990-2021) Table: 3

Years	Per capita disposable income rural residents	Per capita living expenditure of rural residents	Per capita private housing area of rural residents
1990	1254	1166	27 70
1991	1441	1221	29.90
1992	1624	1368	31 00
1993	2060	1699	30 20
1994	2685	2215	33.60
1995	3484	2432	31 30
1996	4267	3283	30 76
1997	4568	3483	39.95
1998	4697	3589	37 58
1999	4798	3691	39 78
2000	5069	3929	41.57
2001	5362	4383	43 14
2002	5764	4508	46 74
2003	6221	4194	46.86
2004	7018	6102	49 90
2005	7810	6623	50 44

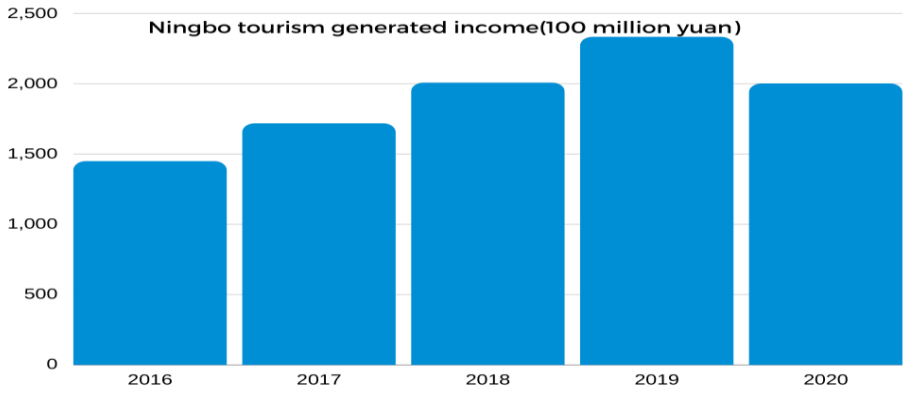
2006	**8847**	**7378**	**51.88**
2007	**10051**	**8062**	**53 24**
2008	**11450**	**9174**	**56 86**
2009	**12641**	**9789**	**55.88**
2010	**14261**	**9794**	**56 00**
2011	**16518**	**11253**	**57 22**
2012	**18475**	**12699**	**58 29**
2013	**20534**	**13915**	**58 87**
2014	**24283**	**16228**	**47.76**
2015	**26469**	**17800**	**49.28**
2016	**28572**	**19313**	**49 83**
2017	**30871**	**20239**	**50 20**
2018	**33633**	**21248**	**56.40**
2019	**36632**	**22797**	**57 80**
2020	**39132**	**23481**	**58 24**

However, Ningbo city Data show that in 2019, the GDP of the city increased by 79.2 billion yuan compared with the revised 1.1193 trillion yuan in the previous year, an increase of 6.8% year-on-year in comparable terms. So as for the total value of GDP and GDP growth, Ningbo has the best performance in 2019 over the past decade. In the meantime, the city has also taken the lead in terms of economic development balance, with the residents' income increasing and life getting better. In 2019, the per capita disposable income difference between urban and rural residents in the city fell to 1.77 from 1.79 the previous year, decreasing for 16 consecutive years. Taking the housing prices, about which the ordinary people are most concerned, for example, the latest report released by the Shanghai Yiju Real Estate Research Institute shows that in 2019 Ningbo's house price-to-income ratio (the ratio of housing prices to the annual income of urban residents) ranks No.9 in the major cities with a GDP of more than one trillion yuan, which is a moderate ranking. It is learned that in 2020 Ningbo will continue to implement the action plan and supporting policies for the development of the five major fields of emerging industries, the leap-forward development of the service industry, and the revitalization of the rural industries, towards the next trillion-level GDP goal, and strive to achieve more fruitful practical results with the implementation of the socialism with Chinese characteristics in Ningbo.

Per capita disposable income 1980-2020(Ningbo statistical year book 2021)



Graph tourism income Ningbo(2016-2020)



Types Rural communities evolution indexes (graphical representation)

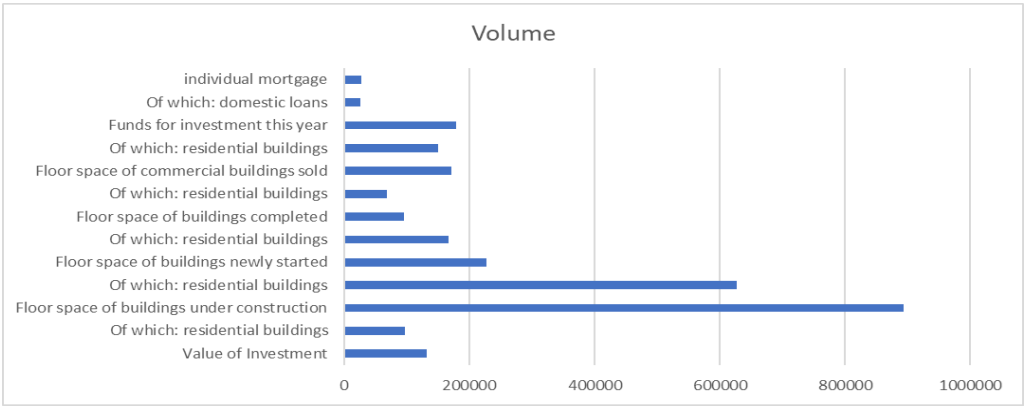


Table: 4

Indicators	2015	2016	2017	2018	2019	2020
Rural population/1000 persons	480.6	479.26	481.83	481.50		
Total rural employed persons/1000persons	298.87	296.48	293.82	293.28		
Personnel engaged in fishery and agriculture	19.12	18.34	18.28	17.58		
Gross domestic product/ rural residents	530.10	493.93	520.38	523.96		
Income of tourism (100million yuan)		1446.4	1716.0	2005.7	2330.9	1999.5

Source : China statistical yearbook 2019

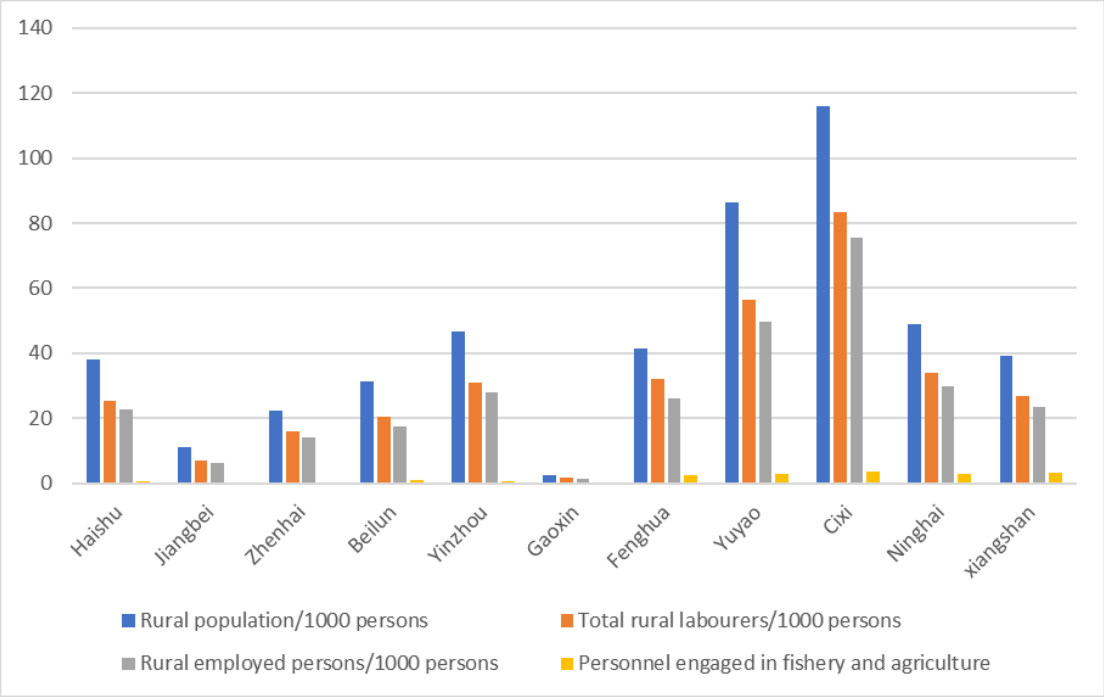
Table: 5

Indicators	Haishu	Jiangbei	Zhenhai	Beilun	Yinzhou	Gaoxin	Fenghua	Yuyao	Cixi	Ninghai	xiangshan
Rural population /1000 persons	37.99	11.13	22.38	31.21	46.8	2.45	41.38	86.21	116.13	48.95	39.31
Total rural labourers /1000	25.48	6.93	15.98	20.36	30.92	1.63	31.88	56.24	83.32	33.96	26.96

persons											
Rural employed persons /1000 persons	**22.78**	**6.31**	**14.13**	**17.42**	**27.98**	**1.50**	**26.11**	**49.70**	**75.57**	**29.95**	**23.33**
Personnel engaged in fishery and agricultur e	**0.69**	**0.18**	**0.28**	**1.10**	**0.69**	**0.05**	**2.38**	**2.73**	**3.50**	**2.93**	**3.12**

Source : Ningbo statistical yearbook 2019

Graph: rural population and employment Data in Ningbo Districts



Ningbo is a somewhat classic group city, and also is a central city of the south Yangtze River Delta. Ningbo is one of the economically developed coastal areas Since the late 1970s, its urbanization process has been greatly accelerated, this has however resulted in a great substantial increase in both urban areas and urbanization intensity. The land-sat M SS, T M/ ET M satellite images, which were respectively acquired in five periods of 1980, 1990, 2012, 2017, and 2020, were used to extract urban land of remote sensing and GIS software. We have analyzed the data on spatio-temporal characteristics including the rate of urban growth speed, growth intensity and fractal dimension.consequently, the outer spatial form of urban information and analyze urban growth data with the help expansion in Ningbo city was also analyzed, in whichthe results are as follows (1) From 1980 to 2012, the growth speed and the growth intensities of urbanized area in Ningbo city were accelerating greatly one to the three districts, though there were some differences in the growth speeds and intensities (2) The fractal dimensions of urbanized land structure were fluctuant and relating to the growth process of urbanized land When the shape of urbanized land tends to be regular, the fractal dimension will decrease (3) The mode position of index of the growth intensities related to shape centre of the urbanized land tends moving toward the outside But the change o f the mode value differs from one other in the three districts (4) The direction of spatial expansion of urbanized land was related to transplanting of port and the development o f port economy (5) With the transformation of Ningbo port from river port, estuary port to coastal port, the evolvement of outer spatial form of Ningbo city was from the type of single central city with river port, enclave group city of estuary port concept one city and one town, enclave group city of coastal port concept one city and two towns and discontinuity zonal city of coastal port concept one city and many towns.

lastly, the T-shaped outer spatial form of modern Ningbo city composed of towns along the coast and towns along the Yongjiang River will come into being.

Variable description

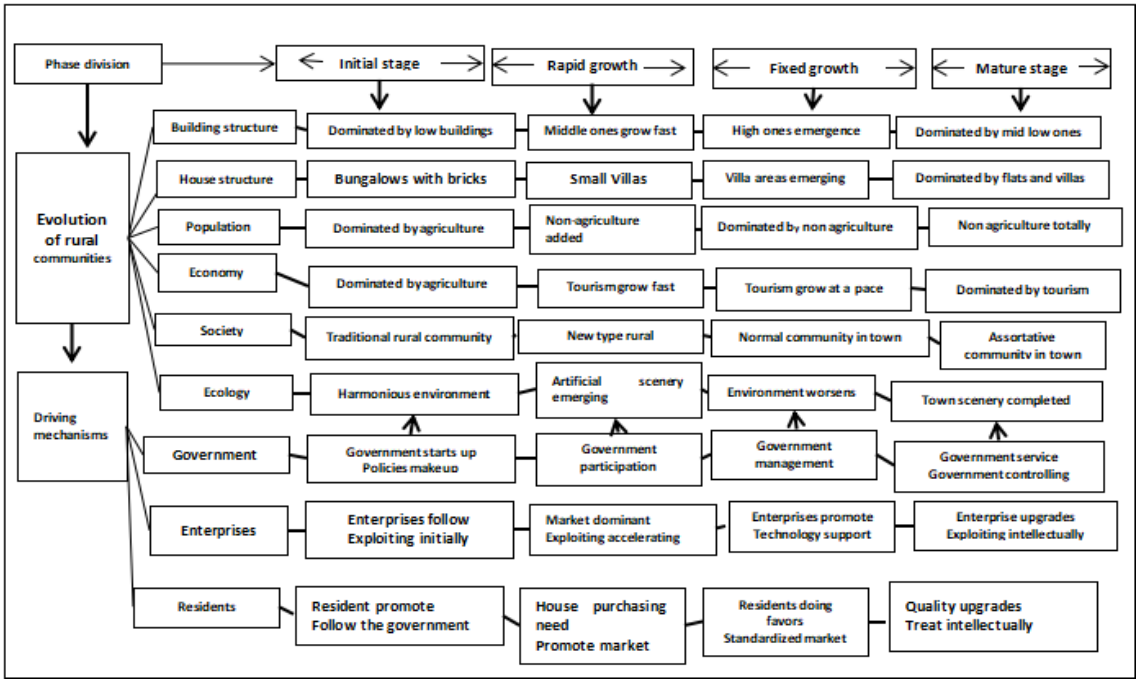


Fig. Driving mechanism of Evolution

However, the development of rural human settlement mechanisms of Ningbo, which is surrounded by the sea on three sides, has abundant marine resources, vast forest areas, scenic surroundings, and a kind of variety of natural tourism resources. In addition to social and economic development, this is thereby improving the living standards of residents, also changing residents' lifestyles and cultural concepts for residents, however, the tourism industry in Ningbo has greatly developed. In consideration of the Increasing demand for tourism and related industries has also however led to the integration of all villages into different town administrative units. Government, also businesses, and residents have been participants and the main actors in promoting the Spatio-temporal evolution of rural communities, in considering this we can see in the table above each has its role in each stage of the evolution of Ningbo.

(1) Initial stage: At this stage, Ningbo was however dominated by one-story bungalows and the output value of agriculture, was the main economic generator, however, the government was particularly playing important roles in making Laws, policies, and plans which were related to the development of tourism were formulated under the guidance of the government. Also at this stage of infrastructure construction, the government promoted policies on natural resources and gave priority to protection, with use as a secondary al objective.

(2) Rapid growth: At this stage, these data show the rapid morphological evolution of Ningbo. Infrastructure was however well developed after the initial stage and the tourism market mechanism emerged. Looking at the development of the tourism industry became increasingly important for the Spatio-temporal evolution of Ningbo. However Tourism-related enterprises have led to further developments in human settlements, and policies have been formulated to support the development of tourism.

(3) Fixed growth: At this stage, the number of tourists has inevitably and gradually increased and the government and residents have begun to offer comprehensive formal tourism services. Residential buildings and tourist accommodation quickly expanded. Between 2004 and 2012. At this stage, the economic value of tourism in Ningbo has steadily increased, and the appearance of the villages has changed significantly. This stage has given priority to economic development, with cultural development an additional objective. In addition, markets began to be
regulated.

(4) Mature stage (2010–2017): At this stage, The evolution of Ningbo was almost complete. Tourism however became the leading industry in which the proportion of non-agricultural employment in Ningbo was up 99.67%. All residents lived in more than five-story residential buildings or in picturesque villa areas. However residents were an important part of the human settlements of the village and town, and their activities had a key impact on

the Spatio-temporal evolution of Ningbo. Also as rural communities matured, the role of the government however diminished, business and market regulation over time became more stable, and compromises between the interests of residents and tourists were the key drivers behind Ningbo's evolution. At this stage, the government has formulated service-oriented policies to regulate the development of tourism, which are needed to meet the key interests of residents while protecting natural resources. Immediately after analyzing the results, the present study however compares these findings to the product life cycle theory (PLC). The Product Life Circle theory model was first introduced by Vernon and Wells (Vernon & Wells, 1996) in which describes the four stages of the product life cycle (introduction, growth, maturity, and decline) that are associated with marketing and management decisions of a product. We however found out that tourism development over time can be broken down and divided into four distinct phases: which are; introduction, rapid growth, fixed growth, and maturity. These findings have aligned with the Product Life Circle theory and without the declining stage of the case showing that sustainable development can be promoted in rural communities by revitalizing these various tourism destinations.

Scenery of Zhangshui Town

Baiyan Mountain Countryside

Sangzhou, Ninghai Narada Dongqian Lake Resort

Picture above shows the rural revitalization of Ningbo rural areas which was included under the Three-Year Action Plan for the Implementation of the Strategy of Rural Vitalization (2018-2020) the vision was aimed to develop the pilot zone for integrated development of urban and rural areas, promote the modernization of fishery agriculture, tourism and support the making of a city of fame. However, the Action Plan has played an important role in the development of agriculture, rural areas and farmers and the implementation of the strategy of rural vitalization. Ningbo has Aims at vitalizing industries, talents, culture, ecology and institutions, Ningbo also has carried out the nine actions which included promoting the integrated development of rural and urban areas, the construction of urban agriculture, the beautification countryside, the upgrade of people's living in rural areas, the nurturing of culture and the integrated reform of these rural villages etc. Also in this study of rural revitalization there are other key projects ongoing in Ningbo including the Ecological Protection and Development Project in Siming Mountain, the "152211" Modern Agriculture Project, the Bed and Breakfast Economy Project and Waste Classification Projects.

Data sources and descriptions

DATA TYPES	TIME	DATA	DATA SOURCES
Interpretation of china and ningbo statistical Data and field survey	1990, 19982017, 2019 2021	China statistical year book 2019 Ningbo statistical year book 2021 Ningbo statistical year book book	http://vod.china.gov.cn:88/ http://vod.ningbo.gov.cn:88/ http://vod.ningbo.gov.cn:88/
Building vector data	1988, 19982017, 2019 2021	Based on the 2017 housing and building vector data, through the combination of national statistical data and field survey, the housing building vector data of relevant years are obtained Building vector dataresolution:30m	Ningbo statistical year book interpretation and field survey https://map.baidu. com
Building image data	2022	Photosof representative buildings built in corresponding years	https://map.baidu. com
Field survey Social economy data	1988, 19982017, 2019 2021	Population, agricultural income,tourism income, etc.	Data of china and Ningbo Statistical Yearbook and Bureau of Statistics
Administrative division data		Country, province, city, county(region), village (town, street) data	Ningbo Municipal Planning Bureau Ningbo planning and rural affairs bureau

VI. Findings

The administrative divisions of Ningbo has six districts, two counties, and two county-level cities. Which are Haishu district, Jiangbei district, Zhenhai district, Beilun district, Yinzhou district, Fenghua district, Ninghai county, Xiangshan county, Yuyao city, and Cixi city. During our field survey and data collection, In Ningbo's continuous rural revitalization planning efforts and concepts It was discovered that Ningbo Bureau of Agriculture and Rural Affairs that Zhejiang Provincial Department of Agriculture and Rural Affairs, The Zhejiang Provincial Department of Finance and TheZhejiang Provincial Office of the Improvement of Urban

and Rural Landscape through their various websites have jointly begun the further improvement of the first pilot villages for future village construction in the province recently, in which a total of 11 villages in Ningbo were included. Seven out of the eleven pilot villages was thereby used as key study areas.The seven villages identified in this study are as follows: the Maoxin Village of Gulin Town of Haishu District, the Waicao Village of Yongjiang Sub-district of Jiangbei District, the Yongwang Village of Zhuangshi Sub-district of Zhenhai District, the Jiufeng Mountain area of Daqi Sub-district of Beilun District, the Wandi Village of Xiaying Sub-district of Yinzhou District, the Wan'anzhuang Village of Zhouxiang Town of Cixi County, the Haitou Village of Liyang Town of Ninghai County, and the Gaoni Village of Huangbi'ao Township of Xiangshan County.Reportedly, the pilot villages have so far completed and further done the preparation of their respective construction plans. According to the plans, the pilot villages will actively promote the project construction in line with the requirements of China's party construction, with humanization, digitization and ecology as their various core concept. In line with the requirements of the prosperity of leading industries, beautiful and livable places and flourishing theme cultures, this pilot villages will be develop based on the rural characteristics of Ningbo. The implementation of these multiscenario applications as smart medical treatment, community culture and smart education, smart tourism, smart assistance, smart elderly care and smart children care will promote the pilot construction and demonstration of modern fishery, agricultural and rural modernization in the villages.

VII. Conclusion

It is necessary to promote the revitalization of rural industries, closely focus on the development of modern fishery, agriculture, and the integrated development of the first, second, and third industries in rural areas, perhaps also build a rural industrial system, realize industrial prosperity, put industrial development on the basis of promoting peasants' income, endeavour to eliminate rural poverty, and promote rural life. It is also important to revitalize rural industries and build an industrial system that focuses on promoting fishery, agricultural modernization and an integrated development of the primary, secondary, and tertiary industries in rural areas.Sourcingnew tourist locations and growing businesses will help rural residents to increase income, along side improving to all lengths to eliminate poverty and achieve prosperity in rural areas. On March 8, 2018,the president of china Xi Jinping addressed these issues, when attending the deliberations of the Shandong delegation to the first session of the 13th National People's Congress under the background of the rapid development of China's tourism industry and the rural revitalization strategy.

This study, however, has used remote sensing images from six periods as well as several buildings (an average weighted building height, building volume, and floor area ratios) to represent morphological evolution in developing countries, Using the Ningbo towns as a sample. The use of data on housing structures, employment structures, and also industrial structures in representing the town's social evolution. In the world of academic research, this research has various innovative contributions. First, the study complements and validates the findings reported by Liu (Liu, 2018) and Wang and Yotsumoto (Wang & Yotsumoto, 2019).In their research an extensive area frame sampling technique was used in presenting macro-ideologies. However, their findings do not apply to smaller and rural areas within the resource limits. the research object is the micro-scale of village and town level, which can be however be analyzed more accurately. And Secondly, this study has also combined the perspective of human settlements, touristification and applied it to rural areas that previous studies have not investigated. Also, the findings have provided new insights from all interdisciplinary perspectives into the tourism field of rural communities. And Thirdly, there are more types of data available than in other studies (Fletcher, 2019; Stoddart et al., 2020; Nugroho & Numata, 2020). The data collated in (Table 1) used in this study are not only rich in variety but were also multi-sourced, which includes various government official websites, remote sensing interpretation, and field surveys. However, the accuracy is very high and refined in every building, with a period of over 30 years. Fourthly, this paper has provided an in-depth assessment of the case area. Whereas Unlike Watmough (Watmough et al., 2016, pp. 188–203) only has examined the evolution process just in one dimension, In our study our analysis focused on the spatial form of buildings to the social evolution with the external performance of employment structure, economic structure and housing structure, which however shows the changes over time of the case area in a comprehensive and multi-level way in six time periods. And lastly, this study selects Ningbo, China's 5A National Tourism Resort, as a case study. However, China is a big tourism country and also the largest developing country in the world, the development and evolution process of the Ningbo case area has provided experience and a reference model for other countries, especially Africa and other regions that plan to use tourism to promote the sustainable development of villages. The results gathered and reported in this study demonstrate that China is a suitable study sample (Quer, 2021; Long et al., 2019). However, this paper has reached the following conclusion: that the average weighted building height, building volume, and floor area ratio of Ningbo increased from 1990 to 2019. In 1990, all of the houses in Ningbo were one-story bungalows, but by 2014 the average weighted building height had reached 9.71 m. Since 1993, when Ningbo began to focus on the development of tourism, affluent villagers have built small second-story buildings, ending the uniformity of one-story houses. However

after 2008, residents' demand for a better living environment stimulated the development of the villa market, and some companies developed five and six-story residential buildings, further diversifying the housing structures of the villages. By 2016, few one-story bungalows remained and these were converted to flower shops and aqua-farms. Some factories have been used to store machinery. Fishery and Agriculture have consistently been one of the most important industries. The value of agricultural output has steadily increased from 1988 to 2016, with an early share of agricultural employment as high as 94.14%. However, the value of the tourism industry's output has grown rapidly in Ningbo since. By 2007, the output value of the tourism industry had reached a record high, far exceeding that of agriculture in the same period. Meanwhile, the proportion of non-agricultural employment also increased. By 2019, the proportion of people engaged in non-agricultural employment grew as high as 99.67%, in sharp contrast to the proportion of the remaining fishery and agricultural employment population. Thus the output value of the tourism industry was almost ten times the agricultural output value in the same period. However, the employment structure and economic structure of the case area have undergone groundbreaking changes in the past 30 years. Though In the initial stages of the development of these case areas, the government plays a leading role in guiding enterprises and residents in finding ways to promote tourism development. With the development of rural communities' tourism, the tourism market mechanism tend to originate. However, the compromise between the interests of businesses, residents, and tourists was the main driving force for the development of the research area. Over time the leading role of the government gradually weakens, thus the role of policy regulation is strengthened. local governments, businesses, and residents have always been the main participants in promoting the Spatio-temporal evolution of rural communities.

VIII. Limitations and future research

However, in this study certain aspects may not necessarily be applicable to the evolution of all rural communities world wide.This isbecause complex human settlements determine the evolutionary paths in which results in the different types of rural communities. Whereas In the future, a comparative study of agricultural, industrial, urban and other rural communities can also be carried out, the rules on the evolution of types of rural communities can however be summarized, and a universal research outcome can be sought after. Also in this study several unsolved theoretical and empirical problems were encountered, with the smallest administrative unit available for employment and industrial statistical data at town level. Not enough economic data were available for the villages in Ningbo, which has prevented a more accurate analysis of the changes in each village. Thus In future research,socio-economic data at the village level should however be obtained to improve accuracy and allow a comparison of advantages and disadvantages in the developmental paths of these villages. Also the rural variables selected in this research method may however have covered the evolution of the study area, but if more variables are selected, the results will be more accurate. As an example, the adding of nighttime lights data to form evolution will not only produce the results of building evolution, thus also the results of population flow evolution. Adding population structure to social evolution, age composition and educational level are also important ways of reflecting the evolution of rural communities. However the experimental accuracy was seen to be limited by the capacity of the remote sensing images, and also the precision of measuring the building heights and flooring which was obtained from the Ningbo Land Resources and Housing Bureau and field surveys, and the rounding of this certain values during calculations. However, research data are accurate to two decimal places, which, though its limited, it is therefore seen to be more accurate than the data in previous studies. However on the next step it will be the quantitative analysis of theses certain driving factors, which will be based on a qualitative analysis of the driving mechanisms, and also the identification of the factors which have had the greatest impact on Ningbo's temporal and spatial evolution. However future studies should also focus on local government contributions to local tourism-related economic development, this is because the government oversees rural tourism, thereby ensuring that it follows the desired direction. And also by exploring the link between local government autonomy, rural tourism can shed light on the driving factors for rural tourism development.

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