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Mapping Spatial Relationships among Travel Nodes for Tourism Development

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A B S T R A C T

This research aims to explore the emergence of new core areas of tourism due to the increasing tourist attractiveness of attractions; meanwhile, peripheral areas are being marginalized by the spatial competition that has occurred since the improved transport. By exploring the spatial hierarchy of travel nodes in this study area, this research demonstrates the spatial competitiveness of travel nodes since the improved transport. To clarify the relationships of spatial competition among the travel nodes at a regional level, convenient random sampling was used to collect data based on 300 questionnaires distributed among 5 townships. GIS spatial analysis was adopted to examine the core-periphery and hierarchical relationships among the travel nodes before and after the improved transport. Although the improved transport promoted tourism development; it also intensified spatial competition among the travel nodes in terms of the emergence of a core-peripheral area. The increased number of travel nodes emphasized the visibility of the core area after the improved transport.

Introduction

Has the improved transport promoted local tourism development? Most tourism and transportation studies have suggested that the improved transport has promoted tourism development by increasing accessibility for tourists (Dickman, 1994; Khadaroo & Seetanah, 2008; Prideaux, 2000; Su & Wall, 2009). Schiefelbusch, Jain, Schäfer, and Müller (2007) also proposed that the improved transport might link the primary, secondary and tertiary nodes, creating a travel chain in terms of tourist spatial structure. Using Perpignan in France and Barcelona in Spain as examples, Masson and Petiot (2009) further indicated that although transportation was

available in both locations, many tourist activities took place mainly in Barcelona. Compared with Barcelona, Perpignan was less attractive because fewer tourist attractions were available than in Barcelona; thus, tourists tended to choose to visit Barcelona. Therefore, Masson and Petiot proposed that although the improved transport has driven the development of tourism, it has also intensified the spatial competition between tourist attractions, thus resulting in the emergence of core-peripheral areas in terms of tourist spatial pattern.

Destination competitiveness has emerged as a significant theme (Crouch & Ritchie, 1999; Dwyer et al., 2000; Enright & Newton, 2004; Cracolici & Nijkamp, 2006, 2008; Lohmann & Pearce, 2010). Hsueh (2012) used the concepts of tourist zone (Gunn, 1993) and travel node (Dredge, 1999) to explore the influences of the improved transport on local tourism development in the Puli area of Taiwan and concluded that the improved transport has promoted the local economy, extended tourist stay duration, and transformed the functions of travel nodes beyond their community function to the dimension of tourism development. Accompanied by the emergence of many new travel nodes, a Vines effect named by Hsueh (2012) could be demonstrated.

Through tourism development, marginalization has emerged in peripheral tourism areas, rendering the local residents relatively invisible. In particular, our understanding of how tourism has played an important role in dynamic changes in social structures, social network, and sense of place has been expanded (Eastman, 1995; Marshall, 2001; McKercher & Fu, 2006; Pearce, 2002; Prideaux, 2002; Sindiga, 1996). Sindiga (1996) observed that the marginalized society present in a Swahili-speaking area in Kenya was negatively affected by tourism. This Swahili-speaking area originally contained a traditional Islamic society; however, due to the development of tourism, traditional norms have gradually declined. Even though several international hotels served tourists, the employers usually did not hire local Swahili-speaking residents. Without the community involvement of Swahili populations, the tourism in this area is considered to form a 'tourism enclave'. McKercher and Fu (2006) observed that due to their modest needs and life goals, residents living in peripheral areas of Tap Mun Island are focused on retaining their connection to place and their attachment to ancestral homes and traditional lifestyles. In other words, tourism provides an opportunity to foster a sense of place for those who choose to remain here.

While exploring marginalization through tourism development in this area, some researchers have focused on how the internal core-periphery relationship is reflected in the tourism sector of the subordinate island (Chaperon & Bramwell, 2013; Harrison, 1995; Weaver, 1998). As Chaperon and Bramwell (2013) demonstrated, the notion of dependency provides useful insights into the spatial relationship between peripheral areas and core areas through the process of tourism development. Although the peripheral areas have become a tourism enclave, in which the local residents are controlled by an agency of the core area, the periphery has become dependent on the core.

Several studies have focused on the spatial relationship between peripheral areas and core areas by examining the development of tourism (Hsueh, 2012; Masson & Petiot, 2009; Prideaux, 2000; Schiefelbusch et al.,

2007). The research presented here attempts to explore the marginal phenomenon of tourism based on the improved transport by using indexes of the number of travelers and the type of route taken by travelers; it presents a theme that while the core areas are emerging due to geography proximity of tourist attractions, the peripheral areas are undergoing marginalization due to spatial competition that occurs during the development of tourism. Based on the perspective of competition among travel nodes, this research aimed to analyze the influence of the improved transport on the development of local tourism along the route of National Highway 6 to Sun Moon Lake or to Cing Jing Farm.

After the improved transport occurred in 2010, National Highway 6 replaced Taiwan 14 Line and became the main route to enter this area of Taiwan, which includes the major attractions of Sun Moon Lake and Cing Jing Farm. In this study, we aimed to clarify the spatial pattern of travel nodes; those with low accessibility became marginalized, whereas those with high accessibility were transformed to a core area after the transportation revolution. Dredge (1999) assumed that destination types could be grouped according to tourist attractiveness into the following three types: primary node, secondary node, and tertiary node. Primary nodes refer to destinations with the most attraction that inspire travelers to visit; secondary nodes have secondary attraction to travelers, and tertiary nodes are contingent attractions that traveler visit by the way. Using this concept of three travel node types, this study explores the transformation of hierarchical travel nodes resulting from the improved transport.

Methods

Data collection

Using the random convenient sampling method, we conducted a survey on 300 individual tourists in the major tourist attractions of Cao-Tun Township, Guo-Shing Township, Pu-Li Township, Yu-Chih Township, and Ren-Ai Township, which lie along National Highway 6, from December 2011 to December 2012. Questionnaires were distributed at tourist attractions that were visited frequently by independent travelers, such as the Formosan Aboriginal Culture Village, Chung-Tai Chan Monastery, Tau-Mi Community, Pu-Li winery, and that were convenient places at which to conduct the questionnaire survey. To trace the locations of tourist attractions visited by the travelers, this research used GPS technology in the same way as Hsueh (2013a,b) to locate all 32 tourist attractions visited by the 300 sampled travelers; then all the identified positions were specified using X, Y coordinates on a GIS map based on a TWD 97 projection system.

In this study, the questionnaire was designed in two parts; the first included tourists' personal attributes and motives, such as where they were from and how long they intended to stay. The second part included the arrangement of travel nodes and the ranks of the travel nodes. To explore the tourists' primary, secondary and tertiary travel nodes before and after the improved transport, the individual travelers' travel nodes in their entire itinerary were calculated separately to analyze obvious changes in rank of the travel nodes and to determine whether new travel nodes were added after the improved transport.

Data analysis

To clarify the spatial completion relationships among the travel nodes at the regional level along National Highway 6 of Taiwan, this research used convenient random sampling to collect data by distributing 350 questionnaires in central Taiwan. Fifty of the sampled travelers gave their travel itineraries without providing data or presenting them in insufficient detail. Therefore, these travelers were removed from the questionnaire sample (*N* was reduced from 350 to 300). We conducted simple statistics descriptive analysis and used GIS spatial analysis methods (including spatial selection analysis, multiple ring buffer analysis, and point density analysis) to examine the core-periphery relationship and clarify the hierarchical relationship among travel nodes before and after the improved transport.

These results illustrated the dynamic spatial-interaction among the travel nodes using point density surfaces with a 9-km circular neighborhood or searching the radius to calculate the density value of each cell (1 km^2). In the density surface, cell values are calculated using specific points that fall within the search radius. This study conducted point density analysis using ArcGIS 10 and calculated the density surfaces for the studied tourist attractions to distinguish different core-periphery zones of tourism development before and after the improved transport. Based on a multiple ring buffer analysis of the accumulative number for each travel node overlaid with the raster of locations of the travel nodes on spatial selection analysis, the hierarchical relationship accounting for the core and peripheral zones of tourism development that emerged after the improved transport was demonstrated.

Result and Discussion

Table 1 indicates that the percentage of the travelers staying for one day in this study area increased from 31% to 37% after the improved transport, whereas those staying for two days decreased from 69% to 61%. This outcome may reveal that the improved transport influenced the stay duration of the travelers. Decreased percentages of the number of travelers seeking accommodation were observed in Cao-Tun Township (from 1% to 0%), Guo-Shing Township (from 8% to 0%), and Ren-Ai Township (from 34% to 16%). Although the percentage of the number of travelers seeking accommodation in this study area decreased from 57% to 51%, the percentages increased in Yu-Chih Township (from 7% to 16%) and Pu-Li Township (from 7% to 19%). In particular, travel accommodations are found close to Pu-Li Township, which also became a clustering area of primary travel nodes after the improved transport (Table 2).

Table 2 shows that the sum of primary travel nodes in Pu-Li Township for all travelers increased from 23 to 147 after the improved transport, and the cumulative sum of travel nodes also increased from 167 to 561; however, Guo-Shing Township became peripheral, and the total number of primary travel nodes decreased from 23 to 1 whereas the cumulative sum of travel nodes decreased from 73 to 5. In contrast to Guo-Shing Township, Pu-Li Township became a new core area of tourism; increased number of travel nodes emerged due to the presence of new tourist attractions. Ren-Ai Township appears to be less attractive than Pu-Li Township because the sum of primary travel nodes decreased from 112 to 48, and the cumulative sum of travel nodes decreased from 196 to 78. This finding corresponds to

the proposed conception of Schiefelbusch et al. (2007) that improved transports promote the core-periphery phenomenon due to spatial competition for tourism development; in other words, when travel nodes have the same accessibility at the regional level, nodes with more tourist attractiveness will experience greater tourist competitiveness.

Figure 1, which shows the sum of travel nodes in different ranks for each township, clearly illustrates the variations of travel nodes by the cumulative sums for Cao-Tun Township, Guo-Shing Township, and Pu-Li Township before and after the improved transport. Pu-Li Township obviously experienced an increase in the sum of travel nodes whereas Guo-Shing Township (a marginalized area) experienced a decrease in the sum of travel nodes. Table 3, which shows the accumulated sum of travel nodes for all travelers, reveals that Tau Mi Community (152) with the highest cumulative sum, instead of Sun Moon Lake (127), became the most frequently visited travel node after the improved transport and was distinguished from other travel nodes within Pu-Li Township. Figure 2 shows that a new core area was developed in Pi-Li Township, which had highest cumulative sum of travel nodes with geographically close locations after the improved transport.

Figure 3 shows the spatial distribution of all travel nodes; through point density analysis, it reveals that frequently visited areas among the travel nodes are clustered in Pu-Li Township. As shown in Figure 3, the density values show two significantly divergent views.

First, the highest density value (approximately 0.066 to 0.077) clusters are found in Pu-Li Township and represent travel nodes favored by the travelers. Second, areas of darker color show more clustered travel nodes and represent the emergence of a core area after the improved transport. When processing the multiple ring buffer analysis, a similar situation to that described above emerged as indicates in Figure 4. The emerging core area (Pu-Li Township) of the travel nodes mainly included neighborhoods within a 3-km radius, whereas relative to the other travel nodes in the buffer ring, the peripheral area was defined as including Cao-Tun Township and Guo-Shing Township.

Buhalis (1999) indicated that many peripheral areas engaged in the process of tourism development are rural in character and that this phenomenon may be associated with poor agriculture, depopulation and limited local investment capital. In our case, Pu-Li Township fortunately attracted local investment capital and was able to establish many destination facilities with higher tourist attractiveness; this situation was different from Cao-Tun and Guo-Shing Townships, which experience poor agriculture and depopulation. Within the limited time budget of a one-day stay, travelers preferred to visit Pu-Li Township because it had more tourist attractions; for the same reason, many newly emerging travel nodes are in Pu-Li Township. Many villages in Guo-Shing Township have suffered depopulation and economic stagnation, undergone economic transformation to serve as fringe tourism areas, and become part of the pleasure-providing periphery by offering strawberry picking and small-scale domestic tourism opportunities for urban residents to escape crowded neighborhoods. Botterill et al. (2002) also noted that peripheral areas tend to have poorer infrastructure and services than the core and are inaccessible. Guo-Shing Township once had 15,000 residents and

Table.1 Staying duration and places of accommodations for the travelers

Samples (N=300)	***Before improved transport***		***After improved transport***	
Staying Duration				
One day	92	31%	112	37%
Two days	207	69%	182	61%
Over two days	1	0%	6	2%
Sites of Accommodations				
Cao-Tun Township	4	1%	0	0%
Guo-Shing Township	24	8%	0	0%
Pu-Li Township	21	**7%**	58	**19%**
Yu-Chih Township	19	7%	49	16%
Ren-Ai Township	103	34%	48	16%
Total	171	**57%**	155	**51%**

Source: Questionnaire survey（2010）

Table.2 Sums of travel nodes in different ranks for each township

Township	**Before Improved Transport**			
	Primary Nodes	Secondary Nodes	Tertiary Nodes	Sum
Cao-Tun	2	17	0	19
Guo-Shing	**23**	47	3	**73**
Pu-Li	**23**	130	14	**167**
Yu-Chih	140	79	0	219
Ren-Ai	**112**	84	0	**196**
Total	300	357	17	**577**

Township	**After Improved Transport**			
	Primary Nodes	Secondary Nodes	Tertiary Nodes	Sum
Cao-Tun	10	8	1	19
Guo-Shing	**1**	3	1	**5**
Pu-Li	**147**	342	72	**561**
Yu-Chih	94	72	4	170
Ren-Ai	48	29	1	**78**
Total	300	454	79	**833**

Source: Questionnaire survey, 2012

Table.3 Sums of travel nodes in different ranks for tourist attractions of each township

Travel Node	Before the Improved Transport (N=300)				After the Improved Transport (N=300)			
	Primary Nodes	Secondary Nodes	Tertiary Nodes	Sum	Primary Nodes	Secondary Nodes	Tertiary Nodes	Sum
1. [a] National Taiwan Craft Research and Development Institute	2	17	0	19	0	1	0	1
2. [a]Taiwan Times Village	0	0	0	0	10	7	1	18
3. [b]Glutinous Rice Bridge	0	13	1	14	0	3	1	4
4. [b]Fu-Guei Strawberry Farm	3	23	2	28	0	0	0	0
5. [b] Atayal Village	9	5	0	14	0	0	0	0
6. [b] Hui-Sun Forest Recreation Area	9	3	0	12	1	0	0	1
7. [b] Pei-Kang River Hot Spot	2	3	0	5	0	0	0	0
8. [c] Adahesong Taiwan King Garden	0	0	0	0	20	21	14	55
9. [c] Niu-Er Stone Sculpture Park	0	4	0	4	0	0	1	1
10. [c] Chung-Tai Chan Monastery	3	10	0	13	17	39	0	56
11. [c] Pu-Li Winery	4	56	4	64	2	85	9	96
12. [c] Tau-Mi Community	5	20	2	**27**	46	90	16	**152**
13. [c] 18^{o}C Chocolate Shop	6	14	0	20	42	57	18	117
14. [c] Olliere Castle	0	0	0	0	3	0	0	3
15. [c] Carp Lake [c]	0	3	1	4	0	10	2	12
16. [c] TaiYi Ecological Leisure Farm	0	10	3	13	0	1	1	2
17. [c] MakeBy Iron	0	0	0	0	1	2	0	3
18. [c] National Chi Nan	2	5	1	8	3	3	0	6

University								
19. [c] Pu-Li Paper	0	0	0	0	4	16	3	23
20. [c] Guang-Sing Paper Mill	0	4	0	4	1	7	2	10
21. [c] Muh-Sheng Museum of Entomology	0	1	0	1	0	0	0	0
22. [c] Di-Mu Temple	3	1	0	4	7	2	1	10
23. [c] Taiwan Geographical Center Monument	0	2	2	4	0	6	1	7
24. [c] Hung Gee Bees Farm	0	0	0	0	0	2	3	5
25. [d] Taiwan Adventist College	0	2	1	3	1	4	0	5
26. [d] AntiqueAssam Tea Farm	0	0	0	0	0	18	1	19
27. [d] Sun Moon Lake	127	49	0	**176**	85	42	0	**127**
28. [d] Formosan Aboriginal Culture Village	13	28	0	41	9	8	0	17
29. [e] Lu Shan Hotspot Area	13	21	0	34	2	6	0	8
30. [e] Aowanda Forest Recreation Area	8	12	0	20	1	4	0	5
31. [e] Cing Jing Farm	85	29	0	114	43	10	0	53
32. [e] He-Huan Mountain	6	22	0	28	2	9	0	11
Total	300	357	17	674	300	454	74	828

Source: Questionnaire survey (2010)

[a] Cao-Tun Township, [b] Guo-Shing Township, [c] Pu-Li Township, [d] Yu-Chih Township, [e] Ren-Ai Township

Figure.1 Sums of travel nodes in different ranks for each township.

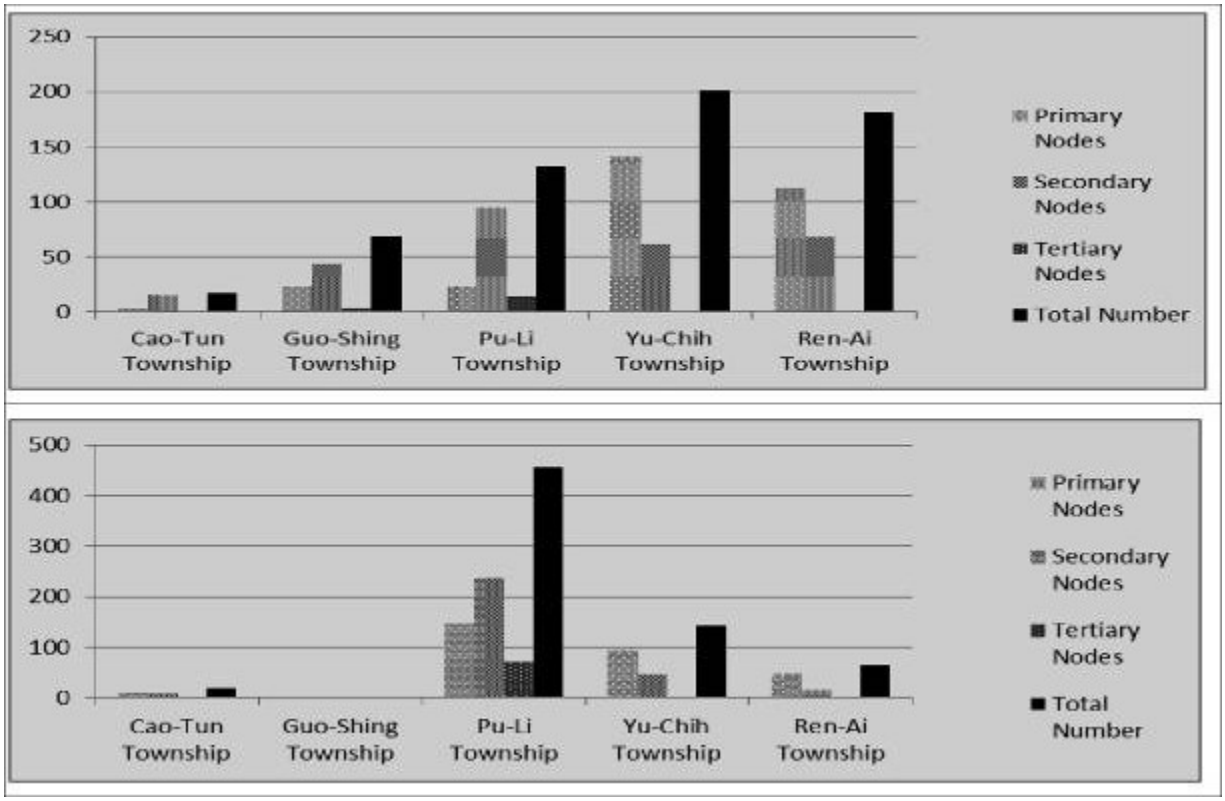


Figure.2 Accumulative sum of each travel node for all travelers before and after the improved transport

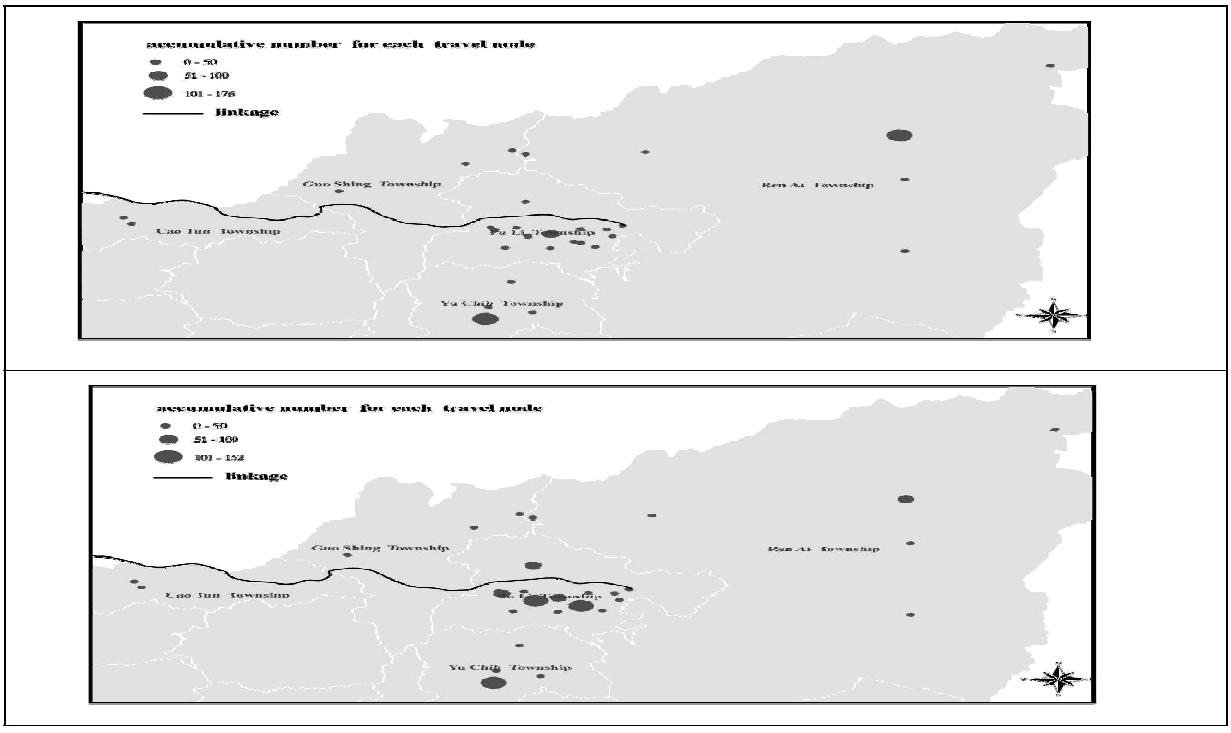


Figure.3 Point density surface for the spatial distribution of all travel nodes.

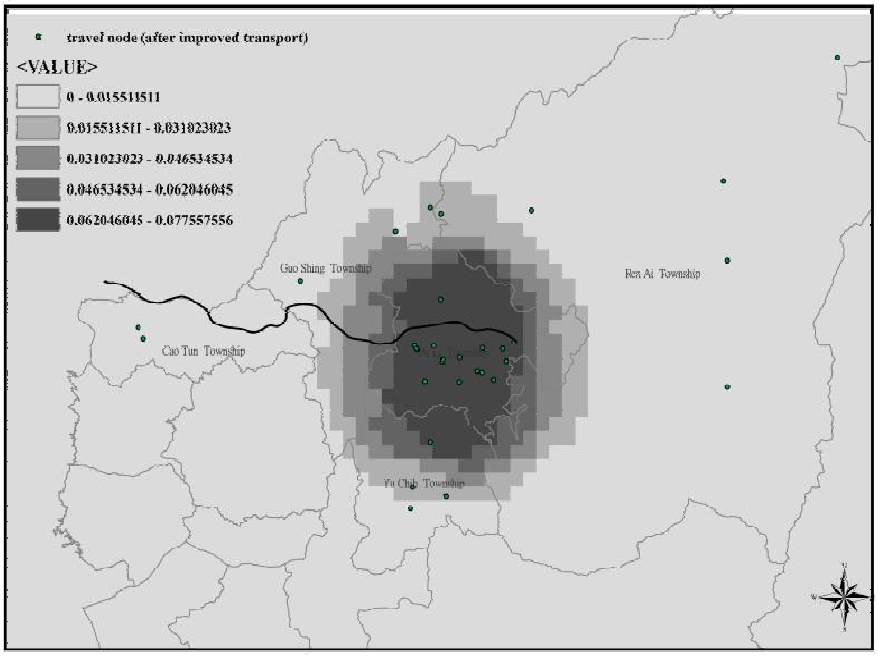


Figure.4 The new core area that emerged after the improved transport

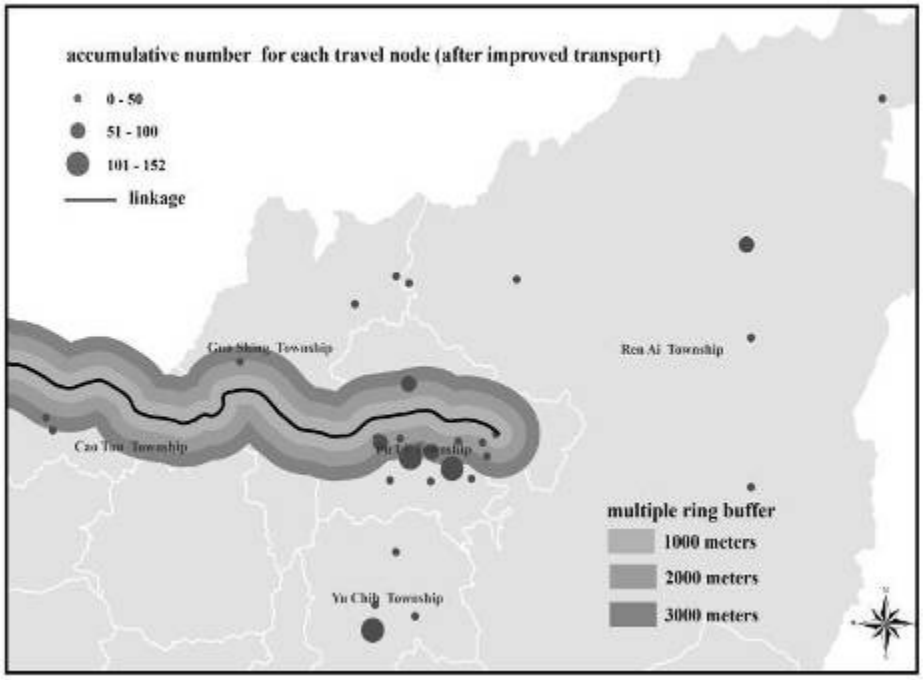
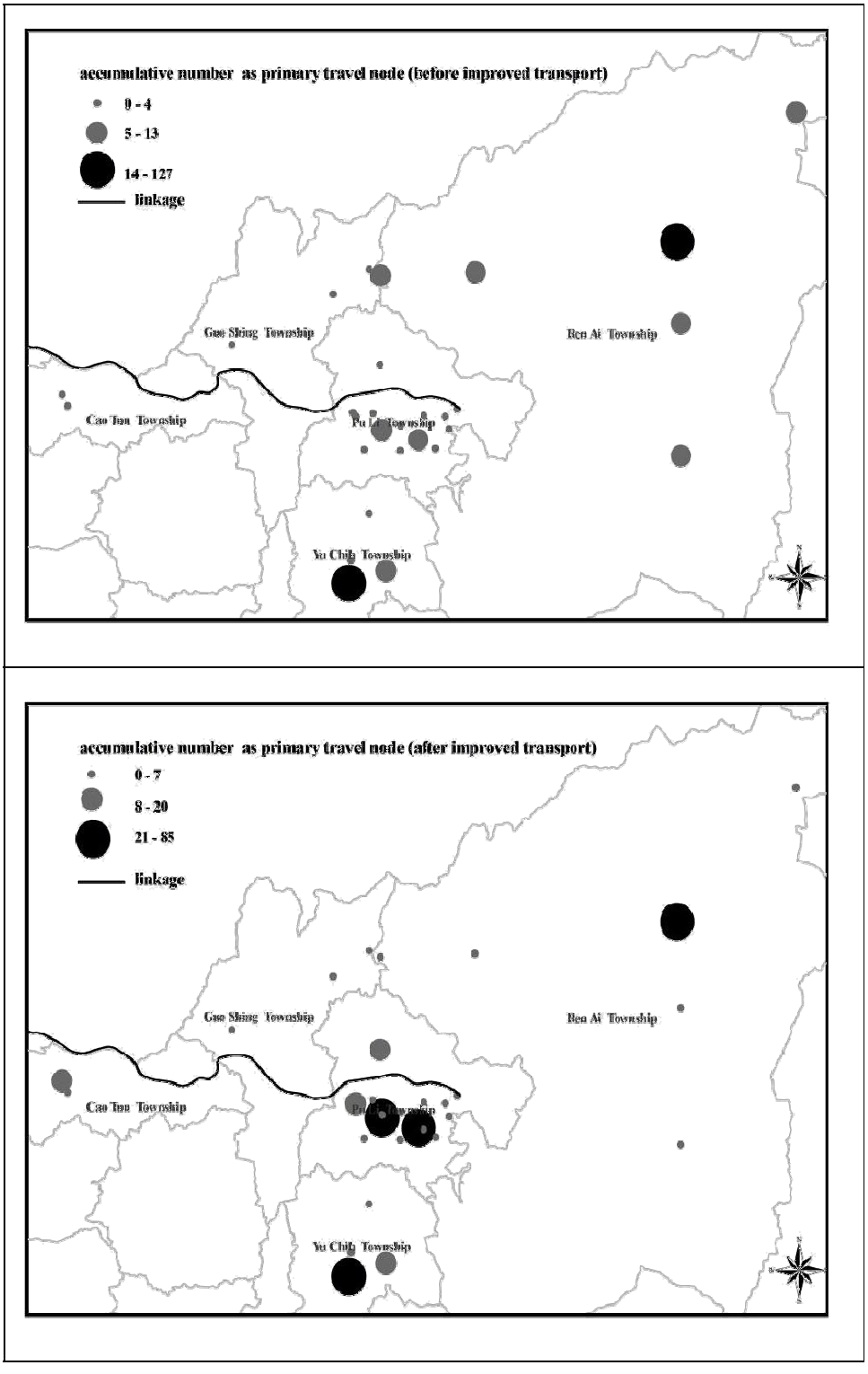


Figure.5 Accummulative sum of each travel node as primary nodes before and after the improved transport



served as the source of bananas and betel nuts for other rural communities. However, the township began to decline in the 1980s due to a decrease in farming, and currently there are few opportunities for young people who move to the city; perhaps as few as 2,000 elderly people live there permanently.

The uniqueness of tourist attractions is an issue of greater significance to peripheral areas than to the core because travelers must allocate additional time and finances to travel to these regions (Prideaux, 2002). Alberti and Giusti (2012) indicated that the formation and development of tourism clusters foster regional competitiveness. The clustering of tourist attractions promotes tourism competitiveness, as illustrated in Figure 5. After the improved transport, Pi-Li Township was promoted as a major tourist attraction with many primary travel nodes by providing an increased number of attractions, whereas Guo-Shing Township is obviously a marginalized area for tourism. Figure 5 shows the cumulative number of each travel node as primary travel nodes for all travelers before and after the improved transport. The cumulative number of travel nodes of Pu-Li Township is apparently higher than those of Yu-Chih Township and Ren-Ai Township, which were originally the clustering areas of primary travel nodes before the improved transport.

The result of the process illustrated above is that the competitiveness of tourism development can be assessed through several perspectives. First, the core area of travel nodes is promoted by the tourist attravtiveness and sustained by the process of clustering; this phenomenon distinguishes the core from the neighboring area, which becomes peripheral.

The spatial structure of tourism in this region for functional activity was transformed by interactions between the core and periphery after the improved transport. This research illustrates the important role of tourist atractiveness in tourism development. Any future discussion of tourism development must consider not only transportation but also tourist attractiveness.

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