

SOCIAL NETWORK ANALYSIS OF KAMPUNG KUANTAN FIREFLIES PARK, SELANGOR AND THE IMPLICATIONS UPON ITS GOVERNANCE

HO Mohd-Shahwahid^{1, *}, MN Mohd-Iqbal², AM Amiramas-Ayu², I Rahinah³ & MS Mohd-Ihsan⁴

¹Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

²Institute of Tropical Forestry and Forest Products, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

³Faculty of Design and Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia.

⁴Merdeka Centre for Opinion Research, 43560 Bandar Baru Bangi, Selangor, Malaysia

*mohdshahwahid@gmail.com

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MOHD-SHAHWAHID HO, MOHD-IQBAL MN, AMIRAMAS-AYU AM, RAHINAH I & MOHD-IHSAN MS. 2016. Social network analysis of Kampung Kuantan Fireflies Park, Selangor and the implications upon its governance. Community-based management practices stakeholder inclusivity is claimed to be the panacea in overcoming problems and dilemmas in governing ecotourism. Kampung Kuantan Fireflies Park (KKFP) in Kuala Selangor faced several complaints from tourists which were hypothesised to be associated with governance of the park. Social network analysis was utilised to identify the key stakeholders within the governance network of managing ecotourism and in understanding the interests and roles of these stakeholders. The network metrics used were number of edges, density, geodesic distance, and degree and betweenness centralities. The network metric and map obtained suggested that the local community boatmen had the highest degree and betweenness centralities in the KKFP social network. Inclusivity, particularly in the fireflies observation boat ride and tour services, had occurred but involvement in the management decision-making held by the district office could be improved. Possible explanations are provided for the dichotomy of findings between the informal power held by the local community boatmen and the formal authority held by the district office in the context of the Malaysian culture and custom.

Keywords: Inclusivity, social network map, network metrics, local community participation, degree and betweenness centralities

INTRODUCTION

Malaysia is blessed with a variety of ecosystems that include the natural rainforests. However, Malaysia is at risk of losing this priceless natural asset if economic growth is charted without conservation initiatives to protect it. Malaysia's Economic Transformation Programme was introduced in 2010 to propel the nation towards a high income, inclusive and sustainable nation (Prime Minister Department 2015). The Economic Transformation Programme focuses on 12 national key economic areas, one of which is tourism. Ecotourism has the potential to be developed as an important contributor to the nation's gross domestic product. About 10% of total tourist arrivals into Malaysia are ecotourism-related (Prime Minister Department 2015) Ecotourism activities must be nature-based, have minimal impact, inculcate environmental

and cultural awareness and respect, provide financial benefits and empowerment to local people and raise sensitivities to the political, environmental and social climate of the host countries (EDGE 2015).

The merit of including local communities in ecotourism development has been reported by many researchers (Bodin & Crona 2009, Mohd-Ihsan et al. 2010, Mohd-Shahwahid 2012, Moscardo & Murphy 2014). Local community is capable of handling different types of stakeholders in tourism sites. Tourism is best managed using bottom-up strategy in order to avoid manipulation by the local elites. Recent researchers have found that social network analysis is effective in overcoming problems and dilemmas in governing tourism (Folke et al. 2005, Ohtsuki et al. 2006). Social network analysis is a

process of investigating a social structure such as the running of a tourism site through an analysis of its network. A network comprises nodes that represent individual stakeholders involved in the running of the tourism site. Ties or edges are specific relationships or interactions that connect these nodes. Social network analysis can be used by existing formal institutions in encouraging stakeholders to deal with environmental law and enforcement (Scholt & Wang 2006). The objectives of this study were to identify the tourism ecosystem, in particular the relevant stakeholders, that were playing important roles at Kampung Kuantan Fireflies Park (KKFP) and to understand their interests in the network. An analysis was carried out to determine how the interests of these stakeholders had affected the governance of the park.

MATERIALS AND METHODS

Research method, study site and survey

There are some key characteristics which differentiate social network analysis from other types of methods usually used in social science studies. Social network analysis focuses on the relationship between stakeholders which are termed as nodes and on the implications of the patterns of their relations through the use of the concepts of centrality (Freeman 1977, 1979) and power (Bonacich 1987). Social network analysis makes use of network analysis and contingency mathematics which belong to graph theory.

In resource management there are two types of analyses on social network (Bodin & Crona 2009). The first analysis is on the pattern of relations between stakeholders. This paper focuses on the information flow ties, whereby the network ties describe the way stakeholders inside the network communicate with each other regarding activities that occur within the tourism site. The term for this different patterns of edges according to social network analysis notation is referred to as structural characteristics of the network. The second analysis is to develop a range of network metric analysis. There are two levels for network metric analysis, namely, node and network levels. Node level refers to the way individual stakeholder is characterised inside the network while network level analyses the overall

network ties observed from outside the network (Borgatti & Li 2009).

Based on these two types of analyses, five social network analysis network metrics were computed. The first was the total number of edges established between the nodes in the network. The second network metric was density that reported the available number of edges as a proportion of total possible number the whole network could achieve. The highest level of density was 1 which implied that a network was fully connected whereby every node had edges or was connected to all other nodes in the network. Hence, a higher density suggested that the network was very cohesive. The third network metric was geodesic distance that revealed how many people had to be informed after which, the information regarding tourism activity at the site would be passed around the network. Geodesic distance gauged the level and speed of information sharing in the network. The shorter the distance the faster the information was relayed. The fourth network metric was degree centrality. Degree centrality focused on the number of edges connected between each node. When a node was connected to a large number of other nodes, the node had high degree centrality and the more nodes it was connected to, the more central and visible it became inside the network (Freeman 1979). The node with a higher degree centrality could enact changes and make decisions to improve the network. The fifth network metric was the betweenness centrality which measured how often a node lay on the shortest path between all combinations of pairs of other nodes (Kim et al. 2011). This measurement focused on how other nodes were dependent on this node to reach out/contact other nodes inside the network. This node would have intermediary role inside the network, with other nodes relying on it. This made the node central in the network. These network metrics were used to investigate how tourism governance at the tourism site was affected. The formula for each of the network metrics and its explanation are given in Table 1.

KKFP, a popular ecotourism destination located 67 km south of Kuala Lumpur, was selected for this investigation. This site is managed by the district office. Funds are provided to the district office by the state government and Tenaga Nasional Berhad,

Table 1 Formulae for network metrics used in the analysis

Centrality	Definition	Formula
Total number of edges (TN)	Sum of edges in the network	$TN = \sum_i T_i$ where T_i = number of edges of node i , $i = 1 \dots I$ I and I = total number of nodes in the network
Density (D)	Proportion of network that is connected; measured by the sum of edges in the network as a proportion of the total possible edges in the network	$D = TN/TP$ where TP = total number of possible edges inside the network and $TP = (I - 1) \times I$
Geodesic distance (GD)	Proportion of the number of nodes that have to be connected for information on the active in the network to be circulated	$GD = \sum_i n_i / TN$ where n_i = number of connected nodes to be achieved by each node i in the network and i range from $1 \dots I$
Centralisation	A network with too high or too low centralisation measure will experience unbalanced distribution of power or control	-
Degree $C_D^{SN}(i)$	Number of other nodes a particular node i is directly connected to	$C_D^{SN}(i) = \frac{T_i}{I - 1}$ for normalised node (node i) where I = number of nodes in the network SN and T_i = number of edges of node i
Betweenness $C_B^{SN}(i)$	Frequency with which a node falls in between pairs of other nodes on their geodesic distance (i.e. path of shortest distance between any two nodes)	$C_B^{SN}(i) = \frac{2 \times \sum_{i \neq j \neq k} P_{jk}(i)}{(n-1)(n-2)}$ for node i where $P_{jk}(i)$ = number of shortest paths between nodes j and k where node i falls in between and P_{jk} = total number of shortest paths between nodes j and k

the main energy provider in Malaysia. As its corporate social responsibility project, the latter had constructed a visitor complex complete with ticketing booth, handicraft and exhibition center, food stalls, public toilets and parking area. Co-management was practiced at KKFP and legal formal administrative set-ups had been put in place by the district office and the State Economic Planning Unit (Jamil & Suzana 2004). This management style seemed to fit the description of community involvement in managing and providing ecotourism services. Local community living in the vicinity of KKFP was given the opportunity to provide boat rides and guide services for tourists to observe the fireflies at sites located 20 km from the estuary of the Selangor River.

However, KKFP was facing problems in maintaining environmental quality, site attractions and tourist facilities and services (Lim et al. 2010, Mohd-Shahwahid et al.

2013). Problems included not meeting tourist expectations, unacceptable behaviours of service providers and other tourists, lack of knowledge and communication skills of service providers and inadequate responses to tourists' needs and requests. Given these circumstances, a specific investigation was needed to determine the effectiveness of the governance of KKFP and the level of inclusivity of local community in decision-making and management of the park. For this network study, stakeholders involved were identified and their relationships described. The network boundary was defined. The stakeholders and relationships formed the nodes and edges in the network respectively. Any node, although lacking in formal mandate to govern but was involved or affected by the tourism activities, policy or law being implemented, was included in the social network analysis of the study site. Nodes were later classified into several categories depending on their functions, e.g. tourist activity

providers, material suppliers, government administrators, visitors and non-governmental organisations (NGOs).

Snowball technique was used to identify respondents (Biernacki & Waldorf 1981). With this method, a respondent nominated another one or more respondents that he or she thought might have an important contribution or are involved with KKFP. The process continued until there was no new stakeholder or node to be described. This indicated that the desired population had been targeted and the network boundary was reached. This method allowed respondents inside the network to set the boundaries. It was the most suitable network method as the study needed to capture both formal and informal nodes inside the network, thus, reflecting the actual population better than using informed experts (Sandström 2010). The comprehensive interviewing process of nominating respondents helped complete the mapping of social relations of the study site and produced the network structure. Nevertheless, it should be noted that this approach had a weak point in that it might exclude stakeholders that were isolated from the rest. It was impossible to have, with certainty, all stakeholders that had interests in KKFP.

Data was collected through field survey using standardised questionnaire. Before starting the data collection process, the draft questionnaire was pre-tested at the study site. Based on results of the pre-test, some minor corrections were

made to the questionnaire. This study relied heavily on survey, field observation and insights gained from detailed discussion with respondents having various interests in the park. A team of four enumerators visited the study area to get information from respondents. The enumerators were trained to acquaint them with the objectives of the study and purpose of the survey before and during the fieldwork data collection. During the survey, each respondent could nominate up to a maximum of 10 others who had interests in KKFP to be interviewed. This ensured that the study captured a wide array of interests and roles in the network. A total of 80 respondents were surveyed. Data and information from the survey were entered into a datasheet following the social network analysis data entry system. UCINET and NetDraw softwares were used to analyse the network data.

RESULTS AND DISCUSSION

A total of 10 roles were identified (Table 2) and the largest number of respondents were local community boatmen (37.2%) and tourists (24.4%) (Figure 1). These two stakeholders were perceived to have strong interests in KKFP and were influential on the services provided by the park.

The total number of edges established in the network at KKFP was 855 (Table 3). The density computed was 0.14 implying that, on average, one node only knew 14% of the total

Table 2 Highest degree and betweenness centralities for each category of stakeholders at Kampung Kuantan Fireflies Park

Stakeholder	Degree centrality		Betweenness centrality	
	Metric	Rank	Metric	Rank
Local community boatmen	48	1	1853.64	1
Kuala Selangor District Office	45	2	720.11	2
Tenaga Nasional Berhad*	37	3	275.50	4
Merchandise seller	25	4	341.35	3
Non-governmental organisation	17	5	241.89	5
Private tourist sector	8	6	67.72	8
Other local community	6	7	110.62	6
Researcher	6	7	83.03	7
Tour agency guide	3	9	35.70	9
Tourist	2	10	14.86	10

*Main energy provider in Malaysia

Table 3 Summary of network metrics for the social network analysis at Kampung Kuantan Fireflies Park

Network index	Value
Number of respondents	80
Total number of edges	855
Mean network density	0.14
Mean geodesic distance	2.27
Mean degree of centrality	10.92
Mean betweenness centrality	97.42

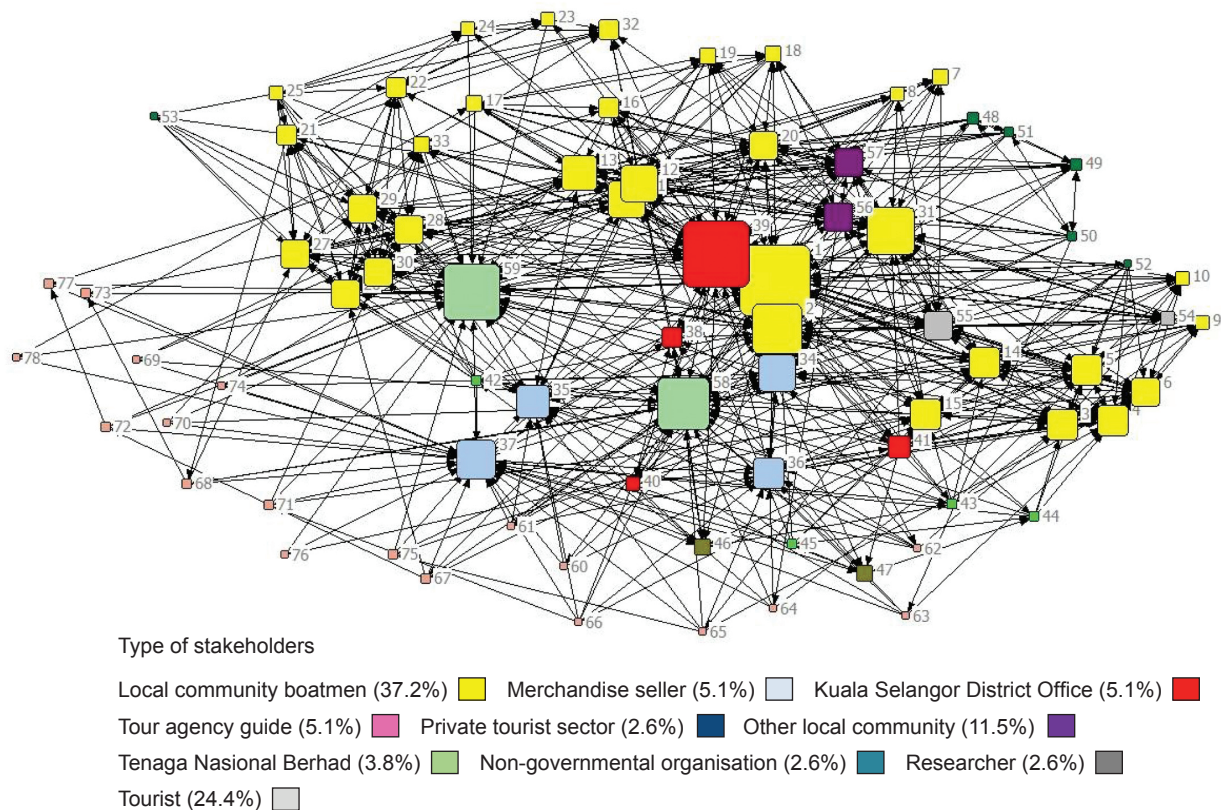


Figure 1 Graphic representation of the betweenness centrality between individual stakeholders in the network at Kampung Kuantan Fireflies Park; node numbers represent individual respondents belonging to a particular stakeholder, the larger the box the greater is the betweenness centrality

population at the site. With a maximum possible density of 1, this suggested that KKFP was not highly cohesive. A network with high number of social edges has greater participation in joint management (Bodin & Crona 2009). Since this was not the case at the park, the co-management in KKFP appeared to be ineffective.

The geodesic distance showed that KKFP needed 2.27 nodes for information regarding tourism activity to be well circulated. This

relatively high geodesic distance suggested that information moved rather slowly at KKFP. Good information network is achieved when the geodesic number is approaching 1 (Bodin & Crona 2009). For co-management of a park to excel and have a good chance of surviving, the level of information sharing needs to be higher and faster.

The network degree centrality and betweenness centrality obtained were 10.92 and

97.42 respectively. Nodes or stakeholders with high degree and betweenness centralities meant that they received greater information of events and feedbacks of what had happened at the park. With greater information, the stakeholders had greater influence in making decisions regarding regulations and policy at the park (Bodin & Crona 2009). Table 2 provides the ranking of the highest degree and betweenness centralities obtained by each category of stakeholder at KKFP while Figure 1 mapped out the interconnectivity occurring between the stakeholders. Stakeholder categories are represented by different colours. Stakeholders with high betweenness centrality scores and hence greater connectivities were represented by larger node sizes.

Local community boatmen had the highest degree and betweenness centralities at the park (Table 2). This confirmed the essential role played by these boatmen who ferried tourists to the firefly site. Being local villagers, the boatmen had local indigenous knowledge on the ecology of the firefly and the relationship between firefly populations and the *berembang* (*Sonneratia caseolaris*) trees along the river. With this basic understanding and knowledge, the boatmen operated with little disturbance to the habitat. Hence, their services were sought after by the district office, NGOs, researchers, visitors and tour guides. The relationship between the boatmen and the district office was interesting. The district office depended on them as agents to provide informative and satisfactory tourism services. However, like all other business operators at the park, the boatmen had to apply for operation licenses and comply with rules and regulations set by the district office if they were to sustain their tourist ferrying services. This made the district office the defector authority of power base. The boatmen did not make decisions on management of the park which were vested in the district office. The second highest mean degree and betweenness centralities were from the district office node. Although the boatmen had huge influences at KKFP, they had no formal authority and administrative power to enact changes. Therefore, many grievances and suggestions provided by tourists together with ideas originating from the boatmen were not relayed effectively to the district office and hence not acted upon (Lim et al. 2010, Mohd-Shahwahid et al. 2013).

Community stakeholders at KKFP felt isolated because of the lack of formal power in decision-making with regard to tourism services at the site. The boatmen were contracted to provide services in a manner pre-determined by the district office. They did not have formal administrative authority especially on matters relating to decision-making within the park due to positioning of power in the KKFP organisation; the power did not lie on social network influence but instead on formal institutional administrative authority. Being influential did not translate into being formally powerful. The boatmen had a lot of informal power to suggest changes in the running of the park but had ignored it to avoid problems. Such circumstance of power relation was common in the Malaysian society where respect of formal authority remained very thick. The general power structure in Malaysia revolves around intra-bureaucratic struggles to control major sources of patronage (Crouch 1996). In order to retain its operational licenses and favourable working conditions, the boatmen had to be in good terms with local authorities in particular the district office and vice versa.

In the Malaysian context, this could also be explained culturally. Power confrontation is not the usual accepted norm in conflict management. This can be observed in various levels of the general Malaysian society, where power struggle, either in terms of politics, economics and socio-cultural matters, are usually resolved in non-confrontational ways. The basis of social relations that has shaped the structures and social actions in the country lie on bargaining and negotiations (Shamsul-Amri & Anis-Yusal 2014). Progress depends on mutual cooperation and compromise which would give more benefit to the most number of stakeholders. Thus, as in the social network analysis at KKFP, retaining positioning of power would be more beneficial without challenging the official authority. Continuous bargaining and negotiations in various forms should be the common practice to ensure survivability and sustainability of the whole network system and stakeholders' economic interests.

IMPLICATIONS AND CONCLUSIONS

The main objective of this study was to identify the stakeholders, their roles in the social network,

characterise the relationships between them and establish the effects on governance issues at KKFP. Network metrics based on density and geodesic distance scores and relationships of individual node at KKFP showed that the local boatmen had the highest degree and betweenness centralities and hence greater informal power in the social network. KKFP provide ecotourism services with the participation of the local boatmen in ferrying tourists along the river to observe fireflies. In this respect, inclusivity had occurred but the administering of the park in general had remained with the district office with limited inputs from the community. The boatmen had a lot of power but did not exercise it fully. The social culture among the rural Malaysian community is one of respect towards formal authority and avoidance of conflict. The boatmen and other local community stakeholders were pragmatic in dealing with the situation. They did not challenge the authoritative position and this ensured the continuity of their business contracts at the park.

Despite the findings of the social network analysis, a top-down management approach seemed to be in place. Mechanisms have to be created to take advantage of the findings of this analysis with respect to whom the degree and betweenness centralities occurred. There was a greater need for local community participation in decision-making. Lack of direct participation in the management of the park affected the interest of various community stakeholders at the tourism site as some of them felt isolated and their views were insufficiently incorporated in the management of the park. When stakeholders do not feel that they are needed, changes in policy and regulations are difficult to be implemented because of lack of collaboration. The community may perceive that they do not have sufficient motivation to care about the site and some may perceive themselves as merely involved in earning an income with no say on the management of the site.

In conclusion, administration of KKFP needed the involvement of different types of stakeholders in the pursuit of greater co-management at the park. The park would gain from capitalising on the existing relationship between each node in the network.

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