

Significant Indicators in the Assessment of Environmental Tourism Carrying Capacity (ETCC): A Case Study at Royal Belum State Park, Perak Darulridzuan, Malaysia

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Abstract: Carrying capacity concept is viewed as a weak concept in tourism management and planning although the original theory was seen as a remarkable solution in controlling the impacts of tourism towards the environment. However, due to its complexity and vagueness in indicating attributes and criteria to govern the framework, this theory received big criticism among scholars. Hence, this study was carried out to evaluate the importance of indicators over another to produce a hierarchical structure of environmental tourism carrying capacity (ETCC) framework for Royal Belum State Park (RBSP). ETCC is a site-specific way for implementation, where the indicators should be developed to solve the issues occurring on the site rather than being generalized for all sites. The methodology applied in this study is through triangulation approach which involves a process of identifying relevant indicators via content analysis, indicators screening via questionnaire survey, determining appropriate stakeholders via stakeholder analysis and evaluating the significant indicators via structured interview. The data collected were then analysed by using analytic hierarchy process (AHP) method rooted in the multi-criteria decision making (MCDM) process. The study has discovered that biophysical environment dimension (0.369) is the most important against tourism facility management (0.361), social-cultural (0.167) and political-economics dimension (0.103). Likewise, the top four indicators representing the four dimensions are wildlife threatened species (0.186), tourist satisfaction level (0.259), policy and regulations by park manager (0.300) and community profits (0.528). Based on these findings, it can be concluded that prioritizing the indicators could enhance the efficiency of ETCC, particularly in the implementation stage, by engaging appropriate stakeholders to participate in the data collection. This study also proved at theory that ETCC is a tailor made framework that works according to the issues and problems encountered at a specific site.

Key words: Environmental tourism carrying capacity (ETCC) • Significant indicators • Royal Belum State Park (RBSP) • Analytic hierarchy process (AHP) • Stakeholder analysis

INTRODUCTION

The rapid growth of world population raises a brisk attention on environmental awareness that trigger the emergence of sustainability term in all kind of development. World Population Data Bank estimates the world population will reach up to 7,241.9 million in

2015, however on 31 October 2011, world has welcomed the 7th billion people on earth whom born from various countries [1].

A massive conflict of tourist destinations in diversifying their product to keep their clientele expanding may put pressure on environmental and cultural resources as well. Since tourism manipulates

environment as resource of their products, more pressure and impacts rest on this facet are indisputable. Environment and tourism are intricately connected which nurture a proclamation by many scholars who see environment as resource of tourism [2-4].

Many policies are pursued to control the growth of tourism. The emphasis is still on short-term management, investment priority on costly infrastructure but less managing on the grounds. Most of tourism management and planning failed to highlight the importance of each indicators, which lead to seeing all indicators are equally important. Thus, this study is attempted to study the connotation of environmental tourism carrying capacity (ETCC) by evaluating the significant indicators which governed the framework. With plenty number of indicators governing the ETCC framework, it was seen as the flawed concept and almost impossible to be implemented into real world. Conveying the concern of evaluating the significant indicators of ETCC for Royal Belum State Park (RBSP) as the aim for this research to be achieved, a basic assumption was established as the first move. The hypothesis is that the efficiency and the practicality of a specific site could be enhanced further by ranking of the indicators in ETCC framework where it has seen as the major factor contributes to the failure of the theory.

Literature Review: Ecotourism as alternative tourism: Ecotourism is seen as a potential concept to balance nature conservation as the ecological components, with involvement of local communities, representing of socioeconomic and cultural components [5]. The ecotourism is one of the initiatives to lessen the impacts on environment in which it offers low impact activities and nature based tourism. The key principles of ecotourism as laid out during the World Ecotourism Summit in 2002 are; i) active contribution to cultural and natural heritage, ii) inclusion of local and native communities in the planning of ecotourism and a contribution to their well-being, iii) visitors are familiarized with the cultural and natural heritage of the places they visit, iv) better independent travellers and organized tours of small-sized groups [6]. Likewise, the ecotourism can be regarded as nature-based tourism which requires a responsible travel to natural areas, in order to enjoy and appreciate the nature, while at the same time promote conservation and provide beneficially active socioeconomic involvement of local people.

Human can be considered as the major causal factor to the worsening environment condition. Some activities have significant impacts toward environment although it may broadly promote as a low impact occurrence and embraced a respectful exploration of nature. Ecotourism sites are under extreme pressure from the increasing number of visitors, the demand for outdoor activities and the development of tourism facilities for the sake of human satisfaction who visit the area. The environment started to deteriorate gradually and degrade the magnitude of visitor quality experience, for instances, effects from excessive walking and mountain biking can cause wear and tear to paths and trails, soil erosion and disturbance to wildlifeduring their breeding periods [7]. Besides, tourism also has significant impacts on socioeconomic as well. Studies have shown that communities in the growth stage of tourism development cycle have traffic congestion problems, crowdedness in public areas and other social problems [8]. These circumstances can be measured by the number of population in the world as world population is the key predictor [8,9] of current and future human impact on planet. In some way, tourism industry contributes to the population change [9], mainly through migration. Tourism destination has huge economic prospect which attracts rural migrants to achieve a better relative quality of life. Considering all aspects connecting to the development of tourism and its adverse impacts to the environment, a mechanism should be established to determine the threshold of each carrying capacity before it exceeded and reached to its burst phase.

Environmental Tourism Carrying Capacity (ETCC): When beholding natural environment as a host for tourism, there are loads of components that intersect with a fragile system. On account of the high sensitivity that this natural environment possesses, a marginal change to its setting contributes to waning of the whole system. Thus, an application of carrying capacity theory into this issue could discard criticisms by scholars either on conceptual or practicality which eventually draw a declaration of flawed concept. People's expectations of carrying capacity are that it will provide a magic number for the total number of tourists. However, the concept raises significant questions for decision-makers that establish policy, scientists that profess to define capacity and public that experiences the effects of tourism [7 and 10]. It transforms the theory of how many people can an area sustains into how much social and biophysical condition desired or appropriate at a tourist destination.

The evolvement of different concepts of carrying capacity for tourism starts from the transferral of the idea of determining a maximum number of users towards achievement of desirable condition and the identification of limits of acceptable change and the measurement of phenomenon towards its perception [4]. Many scholars first realized the tourism carrying [11] as the suitable approach in managing tourism development, however as time passes by, the crux has been changed to diverse concepts such as environmental carrying [12], ecotourism carrying capacity, ecological carrying capacity [13], recreation carrying capacity, carrying capacity of the environment and tourism environmental carrying capacity. However, the focal point of the concepts in all theories invented by the researchers is mainly both facets of tourism and environment.

Tourism carrying capacity (TCC) centres at the maximum number of people that may visit a tourist destination at the same time without causing destruction of physical, economic and socio-cultural environment and an unacceptable decrease in the quality of visitor satisfaction. Environmental carrying capacity (ECC) refers to the capacity that the regional environment can endure pollution and strength that the environment can support exploitable activities that can be merged as ETCC. Hence, it can literally described as the maximum number of tourism activities that regional environment can endure without diminishing of its physical, economic and socio-cultural environment in concert with restraining an acceptable decrease of visitor satisfaction quality.

The Components of ETCC: ETCC is viewed as a multifaceted concept which involves multidimensional components to ensure a better tourism management and planning. In order to make an ETCC structural framework as comprehensive as defining all dimensions related to tourism planning, a rigorous study from previous research is taken into account. Keeping in mind that there is no definite study on ETCC framework discovered, there are studies on indicators' selection to measure carrying capacity that are most likely related, in correlation. There are three studies by different authors that have significant connection among each other in describing the ETCC indicators. Through amalgamating the three sources [12] and [11], an ETCC survey model is established latterly. The three studies developed a model to measure carrying capacity pertaining to the goal identified in the studies. A content analysis of three-layered model has been accomplished by eliminating the similar patterns of any

indicators represented as its rationale in bringing up those models. Furthermore, the integration process generates a pragmatic structure in fabricating the ETCC survey model to avoid discrepancies that may arise.

The content analysis suggested that there are four dimensions embodying the role of ETCC survey model, which are: i) biophysical environment, ii) social-cultural, iii) political-economics and iv) tourism facility management. The biophysical environment dimension comprises elements of the natural and built environment. The biological capacity is concerned with impacts on the ecosystems and resources [11], while the physical capacity refers to the built environment [4]. By combining both aspects into one dimension, the biophysical environment encompasses of several attributes that are: i) water and hydrology, ii) air, iii) topography, iv) climate, v) fauna/ wildlife, vi) vegetation and vii) pollution.

Social carrying capacity is used as generic term to inculcate both the levels of tolerance of the host population as well as the quality of the experience of visitors to the area [11]. However, cultural aspect has close relationships to social as the concern is towards local community as the host as well. The social – cultural dimension is centres at; i) demography, ii) employment and iii) social behaviour. Whilst, the political – economics refers to the impacts of tourism on the local economic structure, activities including competition to other sectors [4]. The attributes fall under this dimension are: i) tourism earnings, ii) tourism investment and iii) public expenditure. By considering tourism infrastructures as separate dimension from other dimension is because they have a central focus on the facility management for better monitoring. The attributes for the dimension are identified as: i) tourist flow, ii) tourist facilities, iii) transportation and mobility and iv) tourist behaviour.

Royal Belum State Park (RBSP): RBSP is located within the area of Belum Temenggor Forest Complex (BTFC), near town of Gerik, Perak, Malaysia bordering Halaba National Park, Thailand on the north, Kelantan forest on the east and UluMuda Forest Reserve, Kedah on the west [14]. The landscape of BTFC comprises of pristine mountainous forest, majorly submerged under the man-made Temenggor Lake that expands about 15,200 hectares, a consequence of the 1970's damming of several rivers for the purposes of irrigation, water catchment and hydro-electric power generation [15].

Malaysia is one of the 17 mega diverse countries that house many endemic species and deemed with other 17 countries, Malaysia encompasses more than 70 % of the

earth's species [14]. According to the Malaysian Ministry of Natural Resources and Environment (NRE), Malaysia is a home to approximately 15,000 species of vascular plants, 229 species of mammals, 742 of birds, 242 species of amphibians, 567 species of reptiles, over 290 species of freshwater fish and over 500 species of marine life. Amongst habitat to diversity of the ecosystems is located at Royal Belum State Park and Temenggor Forest Reserve. It is supported by recognition to BTFC as one of the Important Bird Area (IBA) in the world by BirdLife International [16], one of Malaysia's Important Birds Areas [17], a priority tiger conservation sites by the National Conservation Action Plan 2020 [15] and the identification of Environmentally Sensitive Area under Malaysia's National Physical Plan 2005 [14].

RBSP is not only home for enormous types of endangered species of flora and fauna, it is also a shelter to 5560 indigenous people or known as *Orang Asli* (as recorded as Department of Orang Asli Affairs [JHEOA], 2008 cited in [15]. There are three major groups, namely Negrito, Proto-Malay and Senoi which are further divided into 18 sub-ethnic groups. The group of indigenous people live in BTFC comprise a majority of the Jahai (sub-ethnic of Negrito) and Temiar (sub-ethnic of Senoi).

MATERIALS AND METHODS

Data Collection: In assessing the significant indicators of ETCC from the bulky set of indicators and criteria that govern that framework, a robust filtration has been made. Initially, the bulky set of indicators was collected via content analysis and a set of questionnaire survey was designed with a purpose of indicator screening. The survey was distributed to 27 respondents whom are academicians, environmentalists, local authorities and representatives from private institutions. All respondents were asked straightforward close-ended questions and a few open-ended types to obtain their satisfaction ratio of the propose site.

The second stage complies with the objective which is to prioritize those indicators in attaining the most significant indicators of ETCC. At this stage, respondents have been identified with a form of relevant knowledge and interest connected to the issue concerned. Thus, a group of stakeholders was identified which consists of 7 individuals to participate in the structured interview since this study is very much concerned about the data accuracy and trustworthy response in demonstrating a valuable research outcome. It is to be noted that the

structured interview is done using dispersed group approach in separate scenarios. In order to ensure consistency, each respondent is given meticulous description on the background and objectives of the survey, while guiding respondents through the process the researcher is careful not to be bias to any aspects of the procedure of answering the questions. The process has been thoroughly explained to each of them to ensure common understanding of the key terms and criteria to be weighed. This process is crucial to secure consistent interpretations of the terminology[18].

Data Analysis: For this study, an analytic hierarchy process (AHP) method was applied to analyse the data. AHP is developed for a complex decision making process involved with multiple attributes through pairwise comparison, consists of three basic principles which are decomposition, comparative judgements and hierarchical composition or synthesis of priorities.

Basic decision hierarchy introduced by [19] comprises of goal, criteria, sub-criteria and alternatives. However, with regard to this study where the aim is to evaluate the indicators that have significant roles to the fabricating the ETCC framework, the alternatives are considered as zero alternatives. It represents as the problem has no alternatives in which decision makers have to cognitively ascertain the decision alternative by ranking the relevant attributes or criteria that lead towards a constructive alternative. The challenging part in the process of determining the significant indicators embarks on the consistent judgements by all decision makers upon a set of criteria and sub-criteria in the decision hierarchy. The decision hierarchy is depicted in Figure 1.

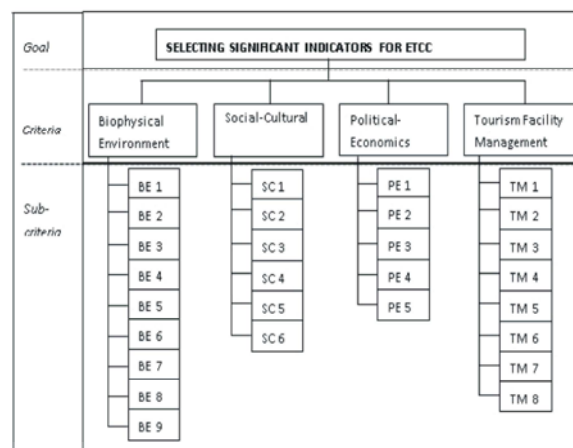


Fig. 1: Decision hierarchy adopted by AHP

There are four dimensions or criteria in determining the significant indicators of ETCC framework which are: 1) biophysical environment, 2) social – cultural, 3) political – economics and 4) tourism facility management. In each dimension, there is sub-criteria charted below as subsequent elements that are depending upon.

The rationale of having only nine sub-criteria is because [19] inclined the issue of having the larger quantity the better. Numerous examples show that too much information is as bad as little information because by knowing more does not guarantee a better understanding. What is the most crucial point to be emphasized is the revolutionary significance of a person who knows less, somehow understood more [19].

This hierarchical structure is used during the stage of structured interview with the identified stakeholders. The 7 individual sets of survey were accumulated collectively to represent as a group decision and constructed a single judgment by forming a geometric mean. All the individuals were somehow relinquished their preferences and chained their judgements in such a way the group represents a new individual. Their identities are 'lost with the every stage of aggregation and a synthesis of the [20] to generate the group's priorities. A simple formula to calculate the geometric mean is expressed below;

$$\sqrt[n]{X_1 X_2 \dots X_n}$$

where n is the decision-makers. Geometric mean is the best way to achieve equal synthesised judgements which satisfies the unanimity, the homogeneity and the reciprocal [19]. The group decisions that denote as individuals are afterwards transferred into DEFINITE software. DEFINITE software is a short version of 'decisions on a finite set of alternatives' that has been developed to improve the quality of decision making process [21].

RESULTS AND DISCUSSION

Multicriteria Analysis: Weight settings: Multicriteria analysis involved pairwise comparison to obtain relative importance of each indicator. The comparison matrix is using a scale of numbers between 1 to 9, as to indicate how many times more important on element over another with respect to the criterion with respect to which they are compared [19]. There are four matrices demonstrated as there are four dimensions or criteria to be taken into account with respect to the research aim as well as the matrix of the main criteria.

To achieve a consistent judgment, consistency index (CI) is calculated for each comparison matrix, which the value of inconsistency has to be smaller than 10 percent or 0.10. The smaller the variance to the CI value, the consistent the judgment is.

The priorities derived from comparison matrix are deciphered into diagram to show the degree of relative importance of one sub-criterion over another. The indicators are arranged in ranking order from lowest to the highest ranking. For biophysical environment dimension, the most important criterion weighted by stakeholders is wildlife threatened species (BE6), whereas the least important criterion is climate (BE7). For social-cultural dimension, the first place goes to policy and regulations by park manager (SC4), second place is behavioural awareness (SC3), third belongs to residents' satisfaction level (SC6), while the last two are employment rate (SC2) and population density (SC1) respectively.

The ranking of sub-criteria for political-economics dimension where the top three most preferred by stakeholders are: community profits (PE4), gross domestic product (GDP), growth rate (PE1) and tourism investments (PE3). On the other hand, the indicator ranked the bottom by respondents is political stability (PE5). For tourism facility management, tourist satisfaction level (TM4) is positioned at the highest in the ranking, followed by tourism product availability (TM3), cognition to crowding (TM8) and tourism facilities (TM2) while the bottom two belong to tourist flow (TM1) and access road capacity (TM5). The main criteria matrix resulted with the most significant dimension which is weighed up at 0.369, followed by second dimension at 0.361, third and fourth at 0.167 and 0.103 respectively.

Ideal Synthesis: Data synthesis as outlined in AHP method is a multiplication of each ranking by priority of its criterion and sub-criterion and sums of weights for each alternative to get the final priority. An ideal mode of synthesis is used in this study to determine how well each alternative performs relative to the ideal benchmark [22]. Table 1 illustrates the overall results which encompasses of local weight for four dimensions, local and global weight for each sub-criteria as well as the idealised weights (in percentage) for each of them. The global weight is the actual weight with respect to the parent criteria, where the sums of all sub-criteria is equal to the weight derived for their parent criteria. For instance, biophysical environment weight is 0.369, where that value is derived from the sum of the sub-criteria weights (BE1 to BE9).

Table 1: Final result on global weights, local weights and idealised weights

Dimension	Local weights	Sub-criteria	Global weights	Local weights	Idealised weights (%)
Biophysical environment	0.369	BE 1: Water quality	0.047	0.127	68.3
		BE 2: Water management system	0.053	0.145	77.6
		BE 3: Air quality	0.027	0.072	38.7
		BE 4: Air pollution	0.016	0.044	23.6
		BE 5: Vegetation loss	0.059	0.161	86.5
		BE 6: Wildlife threatened species	0.068	0.186	100
		BE 7: Climate	0.010	0.028	15.1
		BE 8: Waste management	0.043	0.116	62.3
		BE 9: Soil condition	0.045	0.121	65.1
Social – cultural	0.167	SC 1: Population density	0.006	0.038	12.6
		SC 2: Employment rate	0.013	0.080	26.6
		SC 3: Behavioural awareness	0.049	0.292	97.3
		SC 4: Policy & regulations by park management	0.050	0.300	100
		SC 5: Criminality & safety	0.025	0.151	50.3
		SC 6: Residents' satisfaction level	0.023	0.140	46.6
Political – economics	0.103	PE 1: GDP growth rate	0.015	0.143	27.1
		PE 2: Tourism receipts	0.012	0.113	21.4
		PE 3: Tourism investments	0.012	0.117	22.1
		PE 4: Community profits	0.054	0.528	100
		PE 5: Political stability	0.010	0.099	18.7
Tourism facility management	0.361	TM 1: Tourist flow	0.024	0.067	25.8
		TM 2: Tourism facilities	0.039	0.107	41.3
		TM 3: Tourism products availability	0.063	0.174	67.1
		TM 4: Tourist satisfaction level	0.094	0.259	100
		TM 5: Access road capacity	0.024	0.067	25.8
		TM 6: Travel distance	0.037	0.102	39.3
		TM 7: Travel time	0.034	0.094	36.2
		TM 8: Cognition to crowding	0.047	0.129	49.8

Instead, the local weight is defined as a sum of all sub-criteria that is equivalent to 1. The ranking of each sub-criterion that is more significant over another is noticeably by reviewing the weights. Subsequently, the idealised weight is derived from dividing each weight by the largest weight to compose the proportionate value to the ideal weight. For example, for tourism facility management, the sub-criteria of TM3 (tourism products availability) is 67.1 percent as good as the ideal one, TM4 (tourist satisfaction level) and so on. The ideal benchmark amongst other in the same dimension is given as 100 percent, which brought it to the top in the hierarchical structure as the most significant in the dimension.

Analysis and Discussion: The findings suggested most scholars who claimed the idea of achieving sustainable tourism is through management of natural resources and the environment are unequivocally right. With a relative importance of 3.69, biophysical environment which

consists of ecological elements of indicators beats tourism facility management with nearly closed at 0.08, the least significant dimensions for ETCC framework are socio-cultural and political-economics which derived relative weights of 0.167 and 0.103, respectively. From this hierarchical structure, it somehow justifies to the hypothesis of this study which by ranking the indicators and criteria could enhance the efficiency of the theory particularly in the implementation stage. Thus, the park management has better coordination in directing development into the park because all criteria are not considered as equally importance.

As we discrete the indicators in those dimensions, indicators that are most significant to biophysical environment is wildlife threatened species, to tourism facility management is tourist satisfaction level, to social-cultural is policy and regulations by park management and to political-economics is community profits. Pertaining to the issue addressed at RBSP where the major concern

among stakeholders is wildlife species that are rarely found in most areas in the park, draws immense attention from environmentalist to protect the habitat to secure their lifelong. It was found a baby elephant crossing the highway and hit by a car, counterpart with studies that stated the biggest threats to RBSP are illegal poachers and illegal logging [14]. The other notable concern to the park is community profits as indigenous people have utmost priority to the local authorities in bringing them together along with the development. Their participations are not being neglected since they are part of the Royal Belum itself. Most of them are still practicing of harvesting natural resources, fishing, collecting herbs and tubers for sale and for ritual purposes. It is hope with many NGOs will also continue to contribute towards the development of this group in term of providing education and improving life, which is similar to the government schemes. [15].

Based on tourism and facility management dimension, tourist satisfaction level is ranked as the most significant over access road capacity as the least. By looking at current rules and regulations imposed by the park management on limiting the visitor arrivals through issuance of permits to only 500 visitors per month, so as the capacity of current base camps to cater big crowd at one time. The tourism facilities at the park are in the process of upgrading, making the current facilities seems insufficient to the management. Another unforeseen finding is the access road capacity is ranked at the bottom proving it to be the least important indicator in tourism facility management dimension. In tourism planning criteria, access road is one of the major components to be considered as it directs the tourists to the desired destination with pleasant journey. This finding however contradicts with the current access road to RBSP which are meandering, distance from the closest airport and can be reached only by water transport.

Based on these findings, it can thus be suggested that ETCC theory is not merely a flawed concept as such numerous scholars argued with. For example, scholar like [4] argued that the concept of carrying capacity cannot provide an accurate and comprehensive measure to operationalize in the real world. Furthermore a bunch of indicators underlying the theoretical foundation always become as drawbacks for scholars to accept this theory. It is possible to note that theory of ETCC can be achievable through identifying and evaluating the indicators which are proportionate to issues concerned at the particular site. Additionally, indicators required for this park's development might differ from other park that

has dissimilar attraction, in line with some scholars that say effectiveness of ETCC implementation relies on flexible factors that are 'tailored made' to the area under consideration. On the other hand, the result of wide gap between the two dimensions on top against the other two at the bottom is unexpected as the degree of importance of them should be proximately close. A possible explanation for this might be these components are the substitute factors contribute to the tourism planning, which are regarded to be less importance as compared to the top dimensions. It also complements with the vision of the park which is to manage the biodiversity ecosystems towards conservation with high proficiency but very little attention has been paid to the other contributing factors.

CONCLUSION

The main criteria that every concept attempted to emphasize are environment and tourism, but the approach differs from each other. By taking factors, which were amongst the reasons why the concept is failed, this study attempted to prove that through an assessment of the significant indicators developed for a specific site could make this concept a huge success. What is lacking in previous research has been taken into account, which is prioritizing the indicators to be produced in hierarchical structure and determine the stakeholders participation.

The results of this study indicate that the hypothesis produced earlier is verified by ranking the indicators in ETCC framework contributes to the effectiveness of quantifying the theory into implementation. With a focal objective of minimizing the impacts of tourism activities at the park while at the same time protecting our natural environment for future generation with the involvement of local community. The top four indicators for each dimension, wildlife threatened species, tourist satisfaction level, policy and regulations by park manager and community profits signify the vision and mission that RBSP management has drawn. Based on these findings, it can be concluded that the identification of significant indicators for ETCC framework should be tailored made for the area under consideration to demonstrate an efficient management planning. It is somehow proved the theory from [4] that the successfulness of carrying capacity concept is embarked on the site-specific way of implementation. Besides, a production of hierarchical structure of ETCC indicators can facilitate the park management in structuring future plans for the park and which indicator has the highest priority amongst other.

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