

RURAL TOURISM 3.0: CONCEPTUALISING AN INNOVATIVE APPROACH IN MONITORING THE 'HEALTH' OF RURAL DESTINATIONS IN MALAYSIA

Vikneswaran Nair¹, Badaruddin Mohamed², Amran Hamzah³,
Lo May Chiun⁴ & Hong Jer Lang⁵

¹Centre for Research & Innovation in Tourism, Hospitality & Food Studies,
School of Hospitality, Tourism & Culinary Arts, Taylor's University

²Sustainable Tourism Research Cluster
School of Housing, Building & Planning, Universiti Sains Malaysia

³Department of Urban and Regional Planning,
Faculty of Built Environment, Universiti Teknologi Malaysia

⁴Business and Management Department,
Faculty of Economics and Business, Universiti Malaysia Sarawak

⁵School of Computing & Information Technology
Taylor's University,

E-mail: vicky.nair@taylors.edu.my

ABSTRACT

With the evolution from Web 1.0 to Web 3.0, web servers are able to dynamically generate rich web information to internet users. The capabilities of Web 3.0 can be used in the tourism sector to manage the industry more effectively. One of the major forms of tourism that is gaining its momentum in Malaysia and requires efficient management is rural tourism. Nonetheless, in the last decade, the concept of rural tourism has melded with mainstream tourism and resulting in it losing its distinctness. Consequently, the tourism industry's growth throughout the years has created an increasing amount of stress economically, socially and environmentally. Hence, the development of a sustainable and responsible rural tourism is needed in fulfilling the objectives of all stakeholders in the system. Thus, the main aim of this paper is to conceptualise a framework to monitor the 'health' of rural tourism destinations in Malaysia using Web 3.0 technologies. A rural tourism prototype called the "Rural Tourism 3.0" is developed to assess, advice and monitor the economic, socio-cultural and environmental responsible impact of rural tourism destinations using an integrated real-time decision support system.

Keywords: *responsible tourism, rural tourism, carrying capacity, Web 3.0, framework, rural tourism*

1. INTRODUCTION

As Malaysia evolves to become a fully developed nation by 2020, the Economic Transformation Programme (ETP) that the Government engineered, set a bullish target to achieve 36 million tourist arrivals and RM168 billion (US\$48 billion) in tourism receipt by the targeted period (PEMANDU, 2010).

As a nation rich with its biodiversity, the Malaysian ecotourism and rural tourism sector are growing to become an important sector for the tourism industry (Lo *et al.*, 2012). Both Peninsular Malaysia and East Malaysia (Borneo Island that consist of Sabah and Sarawak) have one of the best ecotourism destinations in the region (Lifestyle Asia, 2012). Most of these world class destinations are set in the rural landscape of Malaysia.

Hence, the development of sustainable rural tourism destinations is essential if Malaysia wish to continue to attract and be a regional leader in responsible tourism. Rural tourism includes a wide range of attractions and activities that usually take place in agricultural or non-urban settings (Lanea, 1994; Frochot, 2005). Rural tourism destinations essentially has distinct characteristics - wide-open spaces, low levels of tourism development, and opportunities for visitors to directly experience agricultural and/or natural environments (Irshad, 2010). Rural tourism is growing at a phenomenal rate in Malaysia as the nation continues to attract high tourist arrival and is expected to be a major contributor to the nation's tourism receipt (Siow *et al.*, 2011).

Nonetheless, in the last decade, the concepts of ecotourism and rural tourism have melded with mainstream tourism. Hence, it has lose its distinctness (UNEP, 2010). The tourism industry's interest in appearing to be "green" or "sustainable" has increased in exponential proportions over the past year (Jurowski, 2008). Although tourism is a profitable business (if managed well), yet the industry is taking its toll on the environment (not to mention the social impact on the local communities). For many people today, going on a 'green-holiday' is an increasingly central feature of the travel patterns that has spread across the globe. Consequently, the tourism industry's growth throughout the years has created an increasing amount of stress economically, socially and environmentally as the carrying capacity of these destinations are not checked or adhered (Goodland, 1992). The inter relationships among all the stakeholders in the management of rural tourism destination must be fully identified since each stakeholder's needs may be different from the others.

Increasing number of tourists exploring the fragile rural destinations has led to the increased environmental concern (Sharpley, 2000; Hall, 2004) by resource managers, tourism officials, and local communities as to how much visitation can a destination sustain before it is no longer desirable. Both natural and socio-cultural resources attract people because of their aesthetic, recreational or educational/scientific values (Dlamini, 2013). However, many of these features are particularly sensitive to human disturbance. Negative impacts resulting from inadequately planned and uncontrolled tourism development can easily damage the environment on which the success of these projects depends (Vehbia & Doratlia, 2010). Without careful attention to the balance between the volume and type of rural tourist activity and the sensitivities of carrying capacities of the resources being developed, tourism projects can be not only environmentally harmful but also economically and socio-culturally self-destructing (Mbaiwa, 2003). Hence, multidimensional data and information is required to be processed and be used for pro-active decision making in the efficient management of the rural destination.

With rich information in excess via web technologies, the management of these rural tourism destinations can be made more efficient. New web technologies can be introduced to assist in the responsible management of these rural sites. As one of the world's largest and most pervasive industries, the travel and tourism sector are as exposed as any other sectors to the forces of change that are being brought about by ongoing developments in the Information and Communication Technologies (ICT) sector. The advent of the web technologies is having profound impacts on the tourism industry.

Whilst catering to the demands and expectations of increasingly sophisticated consumers in today's shrinking global village, the tourism industry has to also take cognisance of its responsibility vis-à-vis the environmental and socio-cultural impact brought about by tourism. These trends have made the tourism industry one of the most information intensive sectors in a rapidly localising economy. Recent advances in the web technologies have provided convenient tools to the tourism industry to cope with new challenges in the knowledge-based globalise society. The web technology is profoundly changing the production, distribution and consumption of touristic products. ICT is probably the strongest driving force for change within the tourism industry (Daniele, 2003). Thus, with the evolution of web technologies from Web 1.0 to Web 3.0, web servers are able to dynamically generate web knowledge-based information to internet users and in the case of the tourism industry to all the stakeholders. Hence, the 'health' of the rural tourism destinations can be better managed with the availability of this dynamic knowledge.

Therefore, the main objective of this paper is to conceptualise a framework to monitor the 'health' of rural tourism destinations in Malaysia using Web 3.0 technologies in assessing, advising and monitoring the economic, socio-cultural and environmental responsible impact and carrying capacity of rural tourism destinations. This framework is essential if the tourism industry in Malaysia is to move towards sustainability and responsibility.

1.1. The Evolution from Web 1.0 to Web 3.0

The technologies of World Wide Web have seen great improvements since early 1990s. With the introduction of Internet and their underlying networking technologies, users are able to obtain information easily by searching and browsing through the web. Search engines such as Google, Yahoo and Bing have been developed to facilitate user browsing for information. To present the data to the user, *HTML* language and its relevant technologies such as *Javascript*, and *CSS* have been developed to facilitate users' viewing. However, not all data are presented in a meaningful format, layout, and structure due to the ambiguities presented in *HTML* languages.

In the middle 1990s, World Wide Web Consortium (W3C) introduced other standards such as *SGML* and *XML* to represent and manipulate data more efficiently. On the other hand, server side technologies have also improved. In the early days, *PHP* has been used as a server tool to process data and present them to the users, using databases such as *MySQL*.

Recently, more complicated server side technologies such as *Java EE* and *ASP.NET* are used to handle complex processing such as "User Personalization", "Dynamic Content Generation", "Network Security", "Advanced User Session", "Web Services", "Transactions", "Concurrent Processing" and "Load Balancing/Clustering". With the introduction of wireless technologies, mobile based applications such as *Java ME* and *.NET*. "Compact Framework" are used to handle devices operating in wireless conditions over sparse and dense networks (Krishnamurthy & Cormod, 2008). All these evolution are defined as Web 1.0.

These web technologies are usually generated and developed by programmers and are deployed at the server level. With the introduction of social networking sites, blogs, forums, and wikis, it is crucial to have user involvements in generating the web content of a *HTML* page. Therefore, the page contents are no longer confined to the developers, but also to the users (Graham, 2005). Users are allowed to post their comments and feedbacks of particular products for a particular post, provided that they do not violate the rules provided by the host. The involvement of users in generating the contents of a web site is then termed Web 2.0 (O'Reilly, 2005).

Evolving further, websites such as Amazon.com and Yahoo provide features such as "Personalization" and "Semantic Web" for the users. With the support of the latest web technologies, new information is generated by the computer rather than from humans (Wolfman, 2010). These features can be categorized under Web 3.0 technologies (Aghaei *et al.*, 2012). They allow the users' preference to be set according to their viewing activity. With the introduction of "Semantic Web" in Web 3.0, contents in a web site are conceptualized and categorized into different terms, thus allowing greater processing capabilities to cater for the different user needs. These capabilities allow the technologies to be used as an integrated decision making tool. Hence, the development of "Rural Tourism 3.0" is the way forward in using the capabilities of Web 3.0 in measuring the 'health' of rural destinations in Malaysia.

1.2. Redefining Sustainable Tourism & Development Models

Over the last century, nations around the globe fuelled their economic growth using their abundance in natural resources. Tourism development was no different. Many developing nations mined their way to growth and development at a pace where natural regeneration was not possible. No thought was put on the consequences of over consumption or over exploitation of the natural resources that attracted tourist to visit in the first place. All of this requires rethinking on the various models of sustainable development that should have worked in theory but has failed in reality.

After the failed summit in Copenhagen, the hopeful Cancun conference and the ultimate Durban summit (in 2012), Mankind has to face the following reality as outlined by Chambers *et al.* (2000) a decade ago:

- a. Feeding global population predicted to be half as big again as at the turn of this century.
- b. Eliminating poverty and inequality whilst providing an acceptable quality of life for all.
- c. Harnessing sufficient energy to power our economies without damaging environmental consequences.
- d. Halting the decline in biodiversity and learning to leave in harmony with other species.

Under the umbrella term of "sustainable development", these four big questions raised by Chambers are indeed relevant today. As further added by Goore (2000), living beyond the ecological means will surely lead to the degradation of home and suffering of human well-being. Over the decade, many scholars have tried in vain to measure the ecological and environmental impact due to intense development. Datschefski (1999) outlined the "Six S's of Sustainability to Save the World" (see Figure 1).



Figure 1. Six S's to save the world.
Source: Datschefski (1999)

Ehrlich & Holdren (1990) in their earlier publication introduced the IPAT Model (see Figure 2).

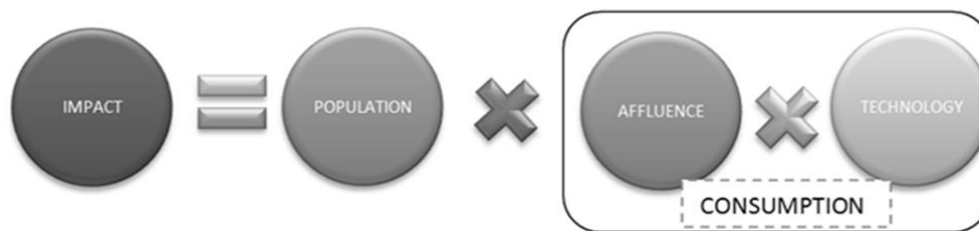


Figure 2. IPAT model.
Source: Ehrlich & Holdren (1990)

In this model, the relationship between environmental impact, the number of consumers, the affluence (or level of consumption) of each consumer and the technological efficiency in delivering a particular product/service, where consumption, is the product of affluence and technology, is outlined. In short, the amount of fuel used to travel a certain distance depends on both the mode of transport and the efficiency of that form of travel.

Many aspects of human quality of life are also a function of this consumption as indicated in Figure 3 by Chambers *et al.* (2000).

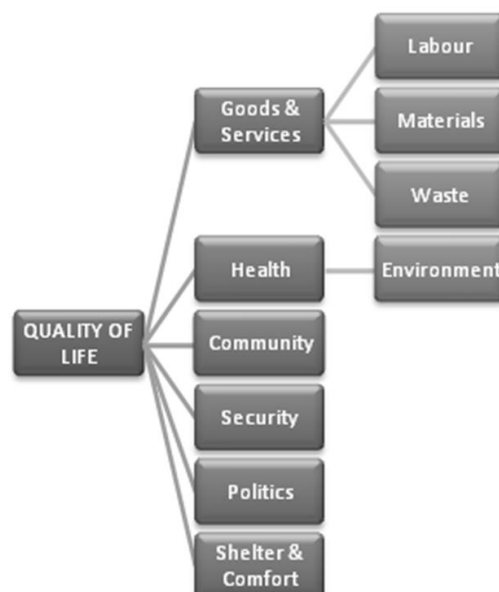


Figure 3. Human quality of life are a function of consumption.
Source: Chambers *et al.* (2000)

Many models of sustainable development tend to focus on the economy being treated as the sole 'bottom line' priority, in the belief that society and the environment exist to serve the economy rather than the other way around (see Figure 4a). On the contrary, the 'Russian Dolls' model of sustainability (O'Riordan, 1998), places the economy in a more supportive position with social and environmental factors taking a more leading role (see Figure 4b). This

model upholds the basic principle that all economic activity should be bent towards social progress and that this must be achieved within environmental limits.

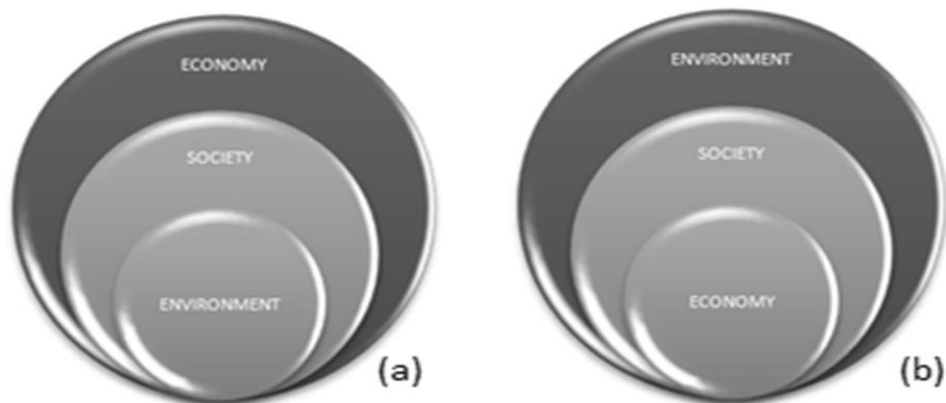


Figure 4. Environment, society & economy - (a)Traditional model; (b) 'Russian Dolls' model.
Source: O'Riordan (1998)

There is impact in all economic activities to the surrounding environment. Uncontrolled depletion of all tourism resources that are finite, will result in eventually there is nothing to draw upon to survive. No model in the world can save Mother Earth after that tipping point. Hence, despite the various evolutions of sustainable models across the globe and in spite of the mounting investments and awareness in the protection of the environment, pressures on the ecosystem and world's natural resources continue to increase rapidly.

1.3. Responsible Tourism and Carrying Capacity

The proposed framework to evaluate the "health" of rural tourism destinations can be segmented into two sections – (1) Responsible Tourism Framework, and (2) Carrying Capacity Framework. Under the umbrella of sustainable tourism, the concept of responsible tourism and carrying capacity is distinct. These two framework addresses the three pillars of sustainability - the economy, social and the environment (see Figure 5).



Figure 5. Three pillars of sustainable tourism.

Responsible tourism in essence provides quality travel experience that promotes conservation of natural environment and offers opportunities and benefits for local communities (Wild Asia, 2006). The concept of rural tourism looks at tourism operations that are managed in such a way that they preserve the local environment and culture so that they can continue to deliver the benefits for years to come (Nair & Azmi, 2008). The concept was first conceptualised in the 2002 Responsible Tourism Guidelines (DEAT, 2002) after the 1992 United Nations Conference on Environment and Development where it was recognised that tourism is an important tool for community development. Following that many studies were done relating responsible tourism in the way forward for sustainability. This includes the economics dimensions of responsible tourism (Frey, 2007; Van der Merwe & Wocke, 2007; Goodwin & Francis, 2003), the socio-cultural dimensions (Spenceley & Goodwin, 2007; Ottosson, 2004) and the environmental dimensions (Kaltenborn *et al.*, 2008; Leea & Jamal, 2008).

The knowledge extracted from the literature and via primary data on the economic, social and environmental responsibility will be used to develop the knowledge-base of the prototype. All stakeholder's perspectives are investigated both using quantitative and qualitative approaches. Based on this fundamental knowledge, a Web 3.0 based system to assess, advise and monitor the economic, socio-cultural and environmental impact of rural tourism can be structured. The new responsible Rural Tourism 3.0 model will ensure the optimal use of resources and simultaneously maintaining the balanced ecological processes that can help in the conservation of the natural heritage.

Within the concept of responsible tourism, the concept "carrying capacity" is essential. The concept of tourism carrying capacity serves as the main concept in seeking (and selecting) 'appropriate' (desirable, acceptable, and feasible) types of tourism development. Thus, carrying capacity in the rural tourism context basically means the ability for a rural tourism site to accommodate certain numbers of visitors in a particular time before it creates negative impact (Coccossis & Mexa, 2004). The visitor experience will be diminished when it exceeds a certain threshold. This has resulted in a number of management frameworks, including Limit of Acceptable Change (Stankey *et al.*, 1985); Visitor Impact Management (Graefe *et al.*, 1990); Visitor Experience and Resource Protection (Hof & Lime, 1997); Carrying Capacity Assessment (Shelby & Heberlein, 1984); and Visitor Activity Management (Environment Canada & Park Service, 1991).

In a rural setting there are four (4) major carrying capacity which can be used as guide on the sustainability of a destination that is sensitive to change in the environment, socio-cultural and economics. They include the following:

- a. Physical carrying capacity - maximum number of tourists that an area is actually able to support. In the case of an individual tourist attraction it is the maximum number that can fit on the site at any given time and still allow people to be able to move. This is normally assumed to be around 1 m per person. Thus, the physical carrying capacity per day = area (in metres squared) x visitors per metre x daily duration (Mowforth & Munt, 2003).
- b. Economic carrying capacity - level of acceptable change within the local economy of a tourist destination. It is the extent to which a tourist destination is able to accommodate tourist functions without the loss of local activities (Mathieson & Wall, 1982). Economic carrying capacity can also be used to describe the point at which the increased revenue brought by tourism development is overtaken by the inflation caused by tourism.
- c. Social carrying capacity - negative socio-cultural related to tourism development. The indicators of when the social carrying capacity has been exceeded are a reduced local tolerance for tourism (Shaw & Williams, 1997). Reduced visitor enjoyment and increased crime are also indicators of when the social carrying capacity has been exceeded.

- d. Biophysical carrying capacity - extent to which the natural environment is able to tolerate interference from tourists. In this case the carrying capacity is when the damage exceeds the habitat's ability to regenerate. Environmental carrying capacity is also used with reference to ecological and physical parameters, capacity of resources, ecosystems and infrastructure (Mexa & Coccossis, 2004).

Taking selected rural tourist destinations as main case studies, the carrying capacity framework investigated the physical environment and the socio-economic carrying capacity of tourist destinations. While increased tourism activities can bring economic benefits, it will also create pressure on the physical environment and socio-economy of the destination.

2. CONCEPTUALISING THE FRAMEWORK

The two frameworks with its sub-focus dimensions subsumed in the proposed Rural Tourism 3.0 can be outlined as indicated in Table 1:

Table 1. Sub-focus dimensions of rural tourism & carrying capacity

Sub-Framework	Sub-focus Dimensions
Sub-Framework 1: Responsible Rural Tourism Framework (RRTF)	1. Socio-Cultural Responsible Rural Tourism Framework
	2. Economic Responsible Rural Tourism Framework
	3. Environmental Responsible Rural Tourism Framework
Sub-Framework 2: Rural Tourism Carrying Capacity Framework (RTCCF)	1. Socio-Economic Rural Tourism Capacity Framework
	2. Physical & Environmental Rural Tourism Capacity Framework

As the study is conceptualising the concept of responsible tourism and carrying capacity in a rural setting, the three pillars of sustainability (socio-cultural, economic and environment) will be focussed as the dimensions of the framework.

The dimensions in the two sub-frameworks on Responsible Rural Tourism and Rural Tourism Carrying Capacity are further bridged accordingly as indicated in the conceptual framework in Figure 6. For the sub-framework responsible tourism, dimensions investigated include the environment, socio-culture and economics. For the framework under the sub-framework carrying capacity, dimensions investigated include socio-economic and physical environment. Rural Tourism 3.0 will be developed using the indicators conceptualised from these two frameworks.

Rural Tourism 3.0 will ideally be a real-time observatory centre that will monitor the changes in the environmental, socio-cultural and economics data for both the human aspect (feedback from tourist, local communities, operators and local governments) and the science (non-human) aspect (quality of the physical environment). Rural Tourism 3.0 can be pro-actively used by the enforcement unit in tackling any impact and degradation that is expected of any of these rural tourism sites. In short the system will produce the "sustainability report card" for each rural tourism sites in the country.

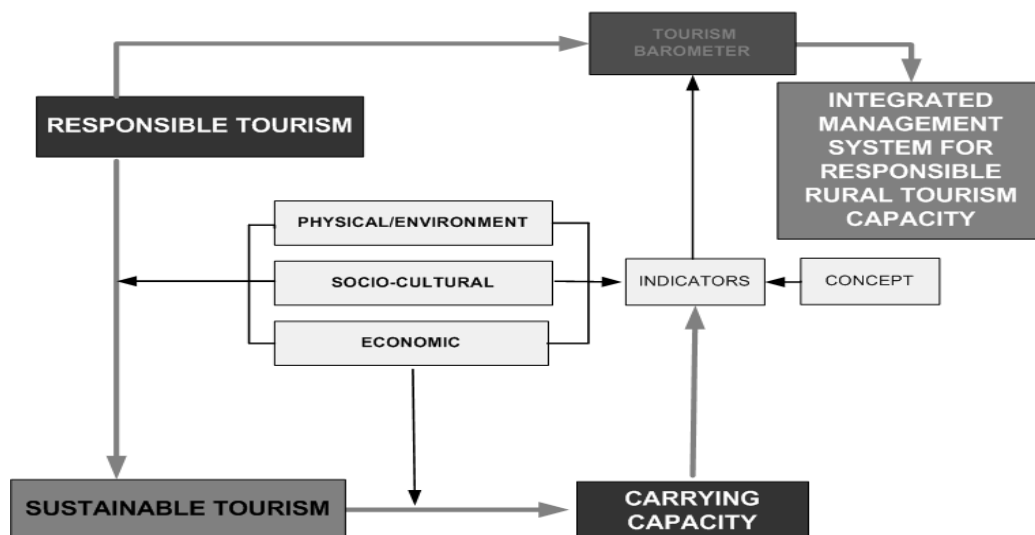


Figure 6. Conceptualising the dimensions of the framework.

The framework in Figure 7 will be used to develop Rural Tourism 3.0 which will eventually measure the health index for rural tourism destinations in Malaysia. The rural tourism health index will consist of the two sub-frameworks that will generate the responsible rural tourism index and the rural tourism capacity index. Both the indexes will be based on the five major stakeholders in rural destination management, namely tourist/visitors, local community, operators, the government (who will carry out enforcement activities) and non-governmental organisations (NGOs) and segmented into three groups of dimensions as outlined in the previous Figure 6. This will be followed by layers of information that will be generated from the dynamic knowledge-based system (see Figure 7).

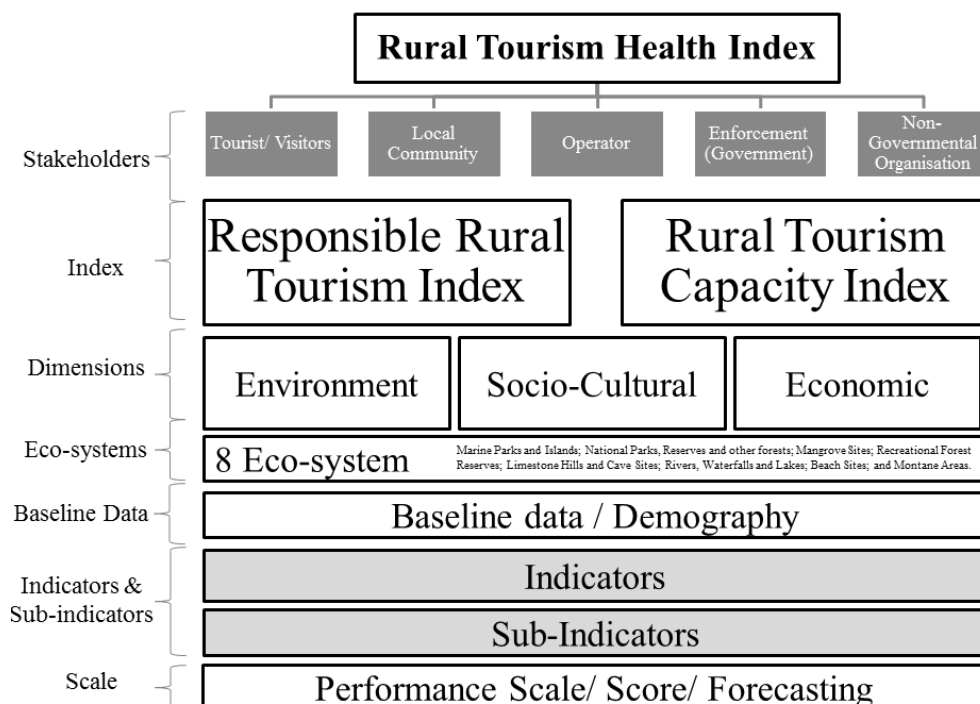


Figure 7. Knowledge layering in rural tourism 3.0.

The layers of information can be grouped into four levels of information. They include the following:

1. Eco-systems – as outlined by WWF (1996) in developing the National Ecotourism Plan, the Malaysian eco-system can be grouped into eight different types, i.e. marine parks and islands; national parks, reserves and other forests; mangrove sites; recreational forest reserves; limestone hills and cave sites; rivers, waterfalls and lakes; beach sites; and montane (highland) areas;
2. Baseline data – baseline data of all rural tourism destinations in Malaysia is essential for all purpose of forecasting. These include demographic and non-demographic information as shown in Table 2. Collection of information for the baseline day will be ongoing all throughout the project. Nonetheless, in year one of the project all baseline data will be collected (where possible). As all the information required in the baseline data is merely to analyze the current status of the rural destination, Research Officers will be assigned to gather these information directly from the local council that is managing the destination. The baselines data required will be grouped into five categories according to the stakeholders which include tourist/ visitors, local community operators, government and non-governmental organizations (NGOs). For each of the stakeholders, demographic and non-demographic information that is collected include number of tourist arrival and their expenditure, segmentation of tourist and the profile of the tourist, background information about the local community and how they are formally or informally organized, operational information about their business, the government plans and organisations, and the funding mechanism, structure and support for the NGOs.

Table 2. Essential baseline data for the framework

Tourist/ Visitors	Local Community	Operators	Government	NGOs
a.No. of tourist arrival b.Countries of origin c.Segmentation of tourist d.Expenditure e.Activities f. Time series - 10yrs g.Length of stay h.Group/ Individual i. Where they stay j. Info source k.Mode of travel l. Socio-eco background m. Point of interest	a. Participation b. No of household c. Ethnic group d. Income e. Employment f. Education background g. Level of involvement in tourism h. Location i. Entrepreneurship j. Organisation	a. How long operating b. Kind of business c. Workers d. Origin e. Income f. Capital g. Scale h. How many (type). i. Ownership j. Contact info	a.Policies, Master plan b.Guidelines c. Involvement d.Incentives e.Jurisdiction f. Contact info g.Officers/ Dept. in charge h.Federal/ State/ Local i. Political representatives	a. Local/ International b. Type c. Funding d. Membership e. Activities f. Scope/ Focus area g. Formation year

3. Indicators & Sub-indicators – All indicators and sub-indicators are developed from the series of qualitative and quantitative research analysis from the 16 rural tourism sites (see Table 3 and Figure 8) selected as representation of the eight ecosystems (as prescribed in the National Ecotourism Plan) in Peninsular Malaysia and East Malaysia (Sabah and Sarawak). A minimum of at least two sites are selected from each of these ecosystem.

Each of these sites will be different in terms of the phase of development. Hence, the study will be able to gauge the difference between a newly developed rural destinations compared to a destination that is well developed.

The phase 1 of the study called, the "Intelligent Phase" would extract in-depth stakeholders' perspective and based on literature review. This include search and scanning procedures; problem identification; determine problem ownership; and finally present the problem statement. In this phase, a qualitative approach will be adopted in stakeholders' consultation; collaborative group processes; participant interviews and participant group interviews; non-participant observation; participant observation; and key informant/group interviews.

Table 3. Study site versus eco-systems

Eco-systems in Malaysia (WWF, 1996)	A	B	C	D	E	F	G	H	TOTAL
Study Sites									
1. Bario, SARAWAK		1						1	1
2. Kinabatangan, SABAH		1	1	1	1	1			2
3. Taman Negara, PAHANG		1		1	1	1		1	3
4. Setiu Wetlands, TRENGGANU			1	1		1	1		1
5. Gopeng Ecoadventur, PERAK				1	1	1			1
6. Mabul/Sipadan Island, SABAH	1	1					1		2
7. Perhentian Island, TRENGGANU	1			1			1		2
8. Kilim, Langkawi Island, KEDAH	1		1	1	1	1			2
9. Belum, PERAK		1		1	1	1			3
10. K.Selangor, SELANGOR			1	1		1			2
11. Semporna, SABAH	1		1	1			1		2
12. Kinabalu Park, SABAH		1						1	2
13. Linggi, N.SEMBILAN			1			1			2
14. Pangkor Island, PERAK	1			1			1		2
15. Redang Island, TRENGGANU	1						1		2
16. Mulu National Park, SARAWAK		1			1				2
TOTAL	6	4	4	2	2	5	6	2	

Legend: A. Marine parks & islands; B. National parks, reserves & other forests; C. Mangrove sites; D. Recreational forest reserves; E. Limestone hills & cave sites; F. Rivers, waterfall & lakes; G. Beach sites; H. Montane areas

In the phase 2 called, the "Design Phase" of the study, based on the emerging qualitative data, sets of indicators for tracking responsible tourism are identified and selected. Data will be analysed using Data Envelopment Analysis (DEA) software to compute performance index and benchmarking. Hence, all qualitative data that emerged from phase 1 will be verified using the quantitative approach.

Finally, in phase 3 called, the “Choice Phase”, a multi-criteria decision approach would be used to carry out the evaluation using a structural equation model (SEM). Thus, an analytical framework will be developed to assess and monitor the performance of each of the study sites. Data created here will be used in developing the prototype Rural Tourism 3.0.

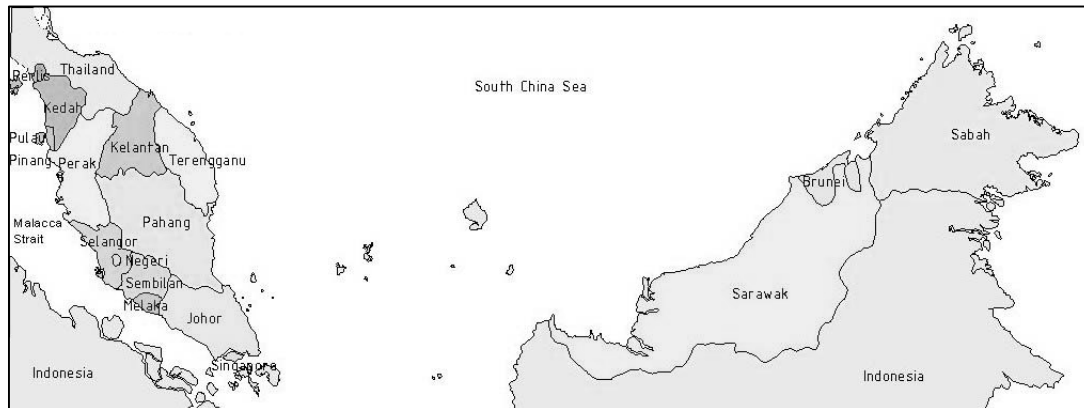


Figure 8. States in Peninsular Malaysia and East Malaysia.

The three phases of the systems development are further outlined in Figure 9.

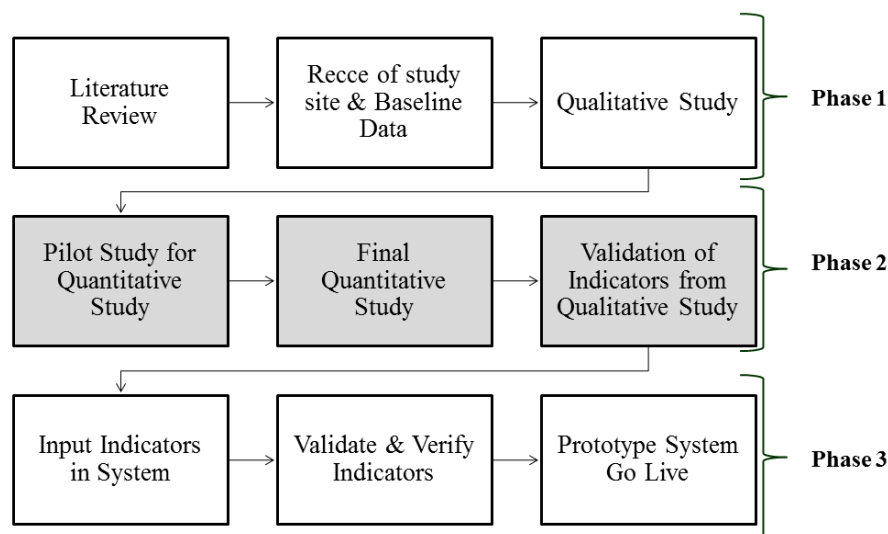


Figure 9. Three phases of the system development.

4. Scale – With the availability of baseline longitudinal data and the indicators/sub-indicators, Rural Tourism 3.0 is able to measure and forecast the ‘health’ (i.e. performance) index of each rural tourism destination by looking at the scale (total score) that has been determined based on the average mean of the indicators and the weights (priority/importance) (see Figure 10).

Average Mean, \bar{X}	=	$\frac{\sum_{i=1}^n X_i}{n}$	X_i = Means for n number of statement (X_1, X_2, \dots, X_n) n = total number of statements in an attribute
Total Score	=	$\sum_{i=1}^n \frac{W_i R_i}{W_i}$	W_i = weighted score for given question R_i = rated score for given question n = total number of questions

Figure 10. Average mean and total score computation.

For each indicators (statement in an attribute), the average mean of the score can be used to measure the importance of the indicator compared to the other indicators, hence determining the weights/priority level of the indicators. By multiplying the weighted score with the rated score for each of the attributes (statements/questions), the total score for a particular dimension can be ascertained and thus the scale can be developed to group the performance of the destination as critical or excellent.

5. User interface for the Rural Tourism 3.0 – For designing the user interfaces for the Rural Tourism 3.0 system, a tool called “persona” is used. Persona is a user model (fictitious, archetype) that is represented as a specific set of user characteristics, which is constructed based on direct observations of the needs and wants of real people. By using persona, the system it is able to identify who are the potential users, their expectations and goals toward the system. Four different groups of potential end users have been identified and categorised as the local community, entrepreneur (operators), decision makers (operators & government) and tourist. User background study is done to predict their competency in using computers, their environment to use the system, and what are the possible components they could expect from the system.

The holistic view of a sustainable rural tourism is integrated into local economies, socio-cultural and environment. However there exist differences in perceptions regarding change in each of the sectoral dimension. Benefits and impact of rural tourism development are viewed differently by various sectors and stakeholders. Often, the areas of agreement and disagreement in how the stakeholders see benefit and impact are not clearly specified and understood, hence, the underlying paradigm of sustainable rural tourism system seeks dynamic of all aspects of overall system thinking. Rationally, the system thinking approach is able to explore the complexities of rural tourism industry and its interaction, in addition to simplify and clarify problems associated with the industry and provide mechanism to probe potential solutions.

In order to develop the Rural Tourism 3.0 system, the research identified seven (7) systematic steps to follow:

- a. Understand the stakeholders view
- b. Develop the concept
- c. Develop a simulation model
- d. Data integration
- e. Build a model interface
- f. Establish causal tracking
- g. Develop learning environment

In the systemic steps above in developing the Web 3.0 systems, attention has been paid by understanding the stakeholders (decision makers) view and motivation. These

characteristics are to indicate the potential contribution of constituents to the system resources, which may be very helpful to describe the tasks and environment that the system is supposed to support. The followings are a set of sample questions how the Rural Tourism 3.0 system will probe:

- a. What is the name of the task?
- b. Why is the task important to stakeholders (what is the mission)?
- c. What other stakeholders are involved with performing this task (what is the state of stakeholder dynamics, conflicts)?
- d. Where the task is performed (what is the setting of the task)?
- e. What special resources are needed for this task?
- f. What sub-tasks are required to complete the task?

With task analysis, it can be easily translated into technical use cases for each rural tourism ecosystem. Use case describes a way in which a real-world actor interacts with the system. Hence, an accurate decision making can be made by system.

3. SYSTEM DEVELOPMENT OF RURAL TOURISM 3.0

The system development for Rural Tourism 3.0 encompasses three system: (1) Content Management System; (2) Central Tourism Model; (3) Opinion Mining; and (4) The System & Web Portal.

3.1.Content management system (CMS)

A content management system (CMS) is used manage the Rural Tourism 3.0 system. Joomla was selected as the a CMS that uses PHP programming language as its core language. Joomla is a free and open source platform. It can be installed on any computer regardless of operating systems used. It supports object-oriented programming where users can reuse existing code to support future enhancement of the system. It also consists of large set of extensions available to accelerate web development.

In addition, SmartFormer is chosen as part of the Joomla framework. SmartFormer is an extension that features "what you see is what you get" (WYSIWYG) form creation. In other words, it enables drag-and-drop of different form elements into one or multi-pages such as input box, password box, radio button and others. SmartFormer provides flexibility to interact with database where users can opt to which data will be used and displayed on the front-end. Saved data can be converted into PDF or CSV format.

There are two phases in the development of the Rural Tourism 3.0 system. The first phase will build an intelligent web page in which it allows users to upload data in the form of XML, CSV or SPSS and it will extract important keywords from the data to be used in the equation. Example of the equation is: $y' = \alpha x_1 + \beta x_2 + \dots + x_n$. α and β is the coefficient of equation while x is the data extracted from XML, CSV or SPSS file.

User can further adjust the weight or value of the equation accordingly to suit the needs. The equation will calculate the score based on the number of data input. Then, the score is inserted into phase two.

The second phase of the development involves developing an odometer system where it will indicate the impression stage of an event based on the score obtained. For instance, a high score sits in the green zone or safe zone indicates least attention is required for the event

while a lower score sits in the red zone or dangerous zone indicates much attention is required from the responsible parties.

3.2. Central Tourism Model

A need was found for a central tourism model to incorporate appropriate data (i.e. criteria or environmental factors) for planning, performance predictions, and treatment of real-world events - the data are biophysical, economic, and socio-cultural parameters obtained via an approach introduced as a process where multiple stakeholders have to invest time and mental efforts in order to provide desirable criteria. Cognitive map will be more suitable than storyline. Meanwhile multicriteria methods such as multi-actor multi-criteria analysis approach is used to obtain criteria in the form of objectives from different stakeholder groups. It will be necessary to ask the stakeholders to choose a preferred preference function for each criterion in order to obtain preference and indifference threshold to determine variation of alternatives on each criterion. Fuzzy linguistic preference relation with additive and reciprocal property and consistency to construct and obtain $n-1$ comparison judgements, which is a reduced matrix approximation method based on certain derived propositions. So instead of fuzzy number, fuzzy linguistic assessment variable will be used which has their corresponding triangle fuzzy number.

Thus, decision makers can express preferences by means of fuzzy linguistic assessment variable which represents triangle fuzzy numbers (TFN), where the distance between the fuzzy numbers in TFN has been chosen for the construction of collective dissensus measure. While based on studies researchers have deduced that extra degree of freedom associated with triangle fuzzy preference and combined with non linear nature of pairwise preference interactions can generate various interesting and suggestive dynamical patterns for decision making.

The numerical scale of the indicators will be fuzzified into triangle fuzzy numbers to enable decision-makers to evaluate criteria with fuzzy preference. In addition, $n \times r$ (where n is the number of alternative and r number of decision maker) matrix will be aggregated.

Hence, the system can be used to profile predefined set of criteria (without any definite) into hierarchy and in turn, generate $n-1$ pairwise comparison question that allow the additive and reciprocal property and consistency as proposed by Wang & Chen (2008).

3.3. Opinion Mining

Opinion Mining is used to identify and extract subjective information from sources. The problems in Opinion Mining has been explored i.e. the contextual problem, non representataion of neutral opinions, semantic orienatation of text, authority, credibility and spam analysis. The work on various sources from which the opinion arises also carried out and the sources of the opinions are identified and catagorised. The problems and shortcoming have been identified and the Tourism Opinion Mining framework has been formed which is based on the ontological representation of tourism data and to classify it into positive, negative and neutral opinions.

Various catagories of Opinion Mining with thier examples have been identified, which include the structured, unstructured and semi structured. Limited work has been carried out on structured data and semi structured data. The need of semantic treatment of the text is also important. Although syntactic analysis plays a key role in document classification but it is not sufficient to extract the concept from the text only through syntax. Information-theoretic measures and semantic knowledge plays a key role in opinion mining.

The study on various domains like product review, blogs, movie review and citations has been completed and they are classified into structured, unstructured and semi structured accordingly. Various phases of opinion mining have been worked out from the literature and a generalized model of phases has been presented in which preprocessing, subject detection, opinion identification and extraction, feature identification, opinion verification, sentiment analysis and visualization are included. The study of various tools used in opinion mining are also completed.

The model to solve the problem has also been presented. The model will provide solution to the treatment of neutral opinion and also the categorization of the opinions. The quality of the opinion is another aspect that is addressed in the framework and quality depends on credibility of the opinion. The opinion credibility is another problem lot of people making their opinions on different aspects on the World Wide Web and it is very difficult to have credible opinion and the opinion that one can trust on. For credibility many factors should be analysed. The most important is the source and opinion holder because the study shows that most of the opinions are the spams on the web. Another aspect that is covered in the model is semantic analysis of the text. The need of semantic treatment of the text is also important. Although syntactic analysis plays a key role in document classification but it is not sufficient to extract the concept from the text only through syntax. Information-theoretic measures and semantic knowledge plays a key role in opinion mining. Thus, a framework is proposed to cover the gap in the representation and classification of Opinions.

Rural Tourism 3.0 will also work on pattern-based feature extraction and preprocessing. The algorithm will be developed and tested accordingly. The proposed algorithm for sentiment extraction through target features is pattern based. Opinion target is the users' concern about which opinion holder expresses his opinion. When expressing opinion, it will be about an entity or about an attribute of an entity. The entity or the attributes are regarded as target of the opinion holder. Each opinionated sentence in document will consist of target about which opinion is expressed. Since Rural Tourism 3.0 is working on specific domain which is tourism, the target features are useful for sentiment analysis. The main focus in the feature extraction phase of the project is in identifying opinionated expressions through opinion targets. In addition, Rural Tourism 3.0 also covers Neutral Opinion Identification Matrix. This matrix will work on the features extracted from the tourism domain data and will identify which opinion can be termed as neutral opinion.

Rural Tourism 3.0 framework is based on ontologies for responsible rural tourism. The framework is based on the indicators of rural tourism which include economical, socio-cultural, environmental and physical aspects and presents them in ontological form to carry out semantic treatment of these ontologies. The Rule Engine and Semantic Matching Engine constitute a body of necessary middleware infrastructures that enables the framework with semantic web capabilities to read and process facts stored on ontologies. This process will provide a summarised report about the specific rural tourism site based on the indicators. The Ontological-Based Framework for responsible rural tourism will keep track of the site and also will rate, evaluate and monitor the site.

3.4. The System and Web-Portal

Finally, the systems architecture for Rural Tourism 3.0 (as outlined in Figure 11) comprises essentially of two parts, namely A and B. Part A is the web-portal while Part B is the framework that would support in decision making towards achieving responsible rural tourism. Initially, Part A and Part B of the systems architecture would be designed and functioning separately and over time they would be integrated into a single system. The web-portal would act as

the interface to access information, to monitor the “healthness” of a rural tourism site and over time would support in decision making to the stakeholders based on their needs.

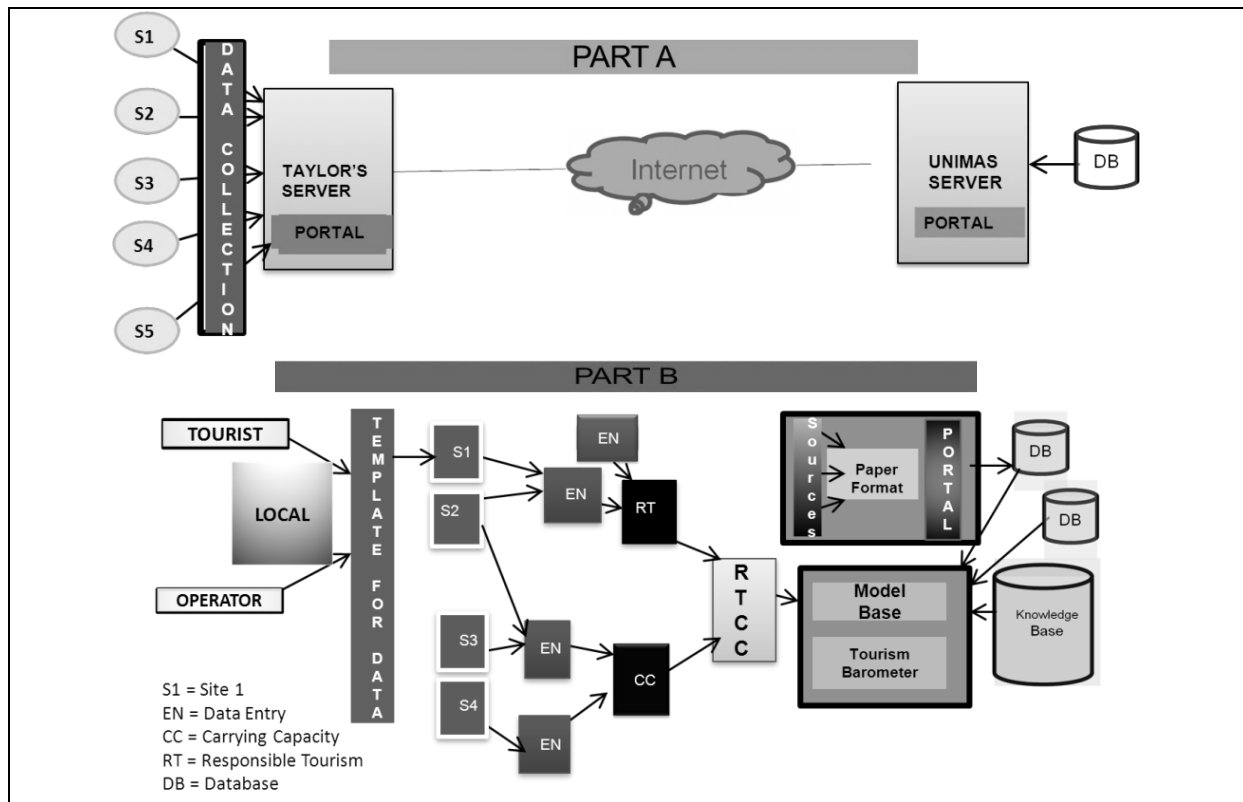


Figure 11. Systems Architecture of Rural Tourism 3.0.

The web-portal has different levels of access for different levels of users with varied access privileges. The end-users and researchers who are not directly involved in this project can also contribute to this system by posting relevant messages that could aid in decision making for a more responsible rural tourism. The web portal can be accessed via the URL at <http://www.r rtn.net.my>. Figure 2 shows a conceptual view of the evolution of the web-portal from an information portal to a system that can assist in decision making.

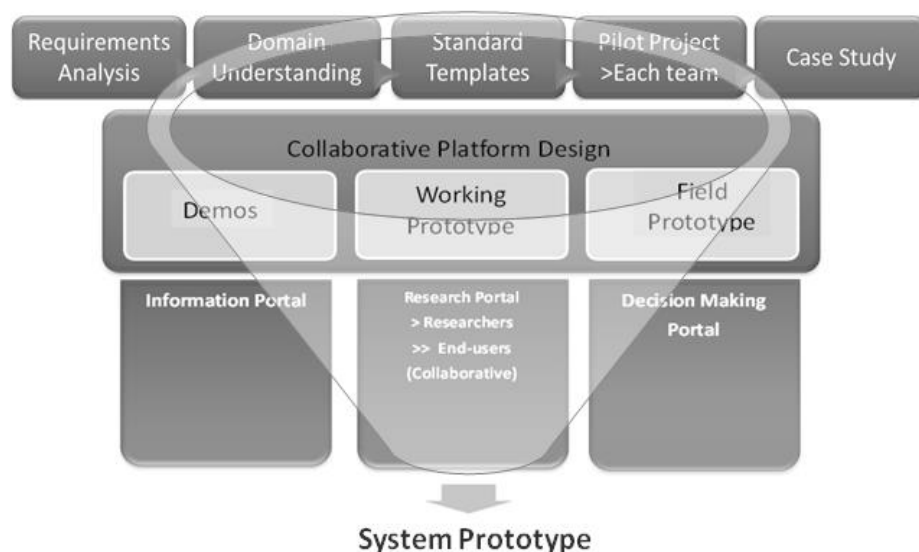


Figure 12. Information Web-Portal to Decision Support.

4. CONCLUSION

Rural Tourism 3.0 is developed to assess advice and monitor the economic, socio-cultural and environmental responsible impact within the carrying capacity and limit of the rural tourism destinations. The knowledge rich system can assist all the stakeholders proactively in better managing their resources in the rural destinations. The knowledge engine in this system will be able to identify the gaps between the current situation and the future state (that is aimed for) as well as the necessary solution to bridge that gap.

Hence, Rural Tourism 3.0 can be a tool for tourism industry players to rationalise their rural tourism activities and make intelligent decisions so that the destination on the whole can be sustainable economically, environmentally and socio-culturally. The relevant enforcement bodies will be able to better manage the fragile eco-systems in rural tourism destinations. The local communities will be able to voice their displeasure of the development that is taking place in their destination via phone texting (sms), social media sites and other online feedback system so that the enforcement bodies can immediately manage the situation more effectively. Tourist and visitors looking for authentic experience may have a better experience as the system would recommend sites that have adhered close to the principles of sustainability and responsibility.

ACKNOWLEDGEMENT

The funding for this project is made possible through the research grant obtained from the Ministry of Higher Education, Malaysia under the Long Term Research Grant Scheme 2011 [LRGS grant no: JPT.S (BPKI)2000/09/01/015Jld.4(67)].

REFERENCES

- Aghaei, S., Nematbakhsh, M.A. & Farsani, H.A. (2012). Evolution of the World Wide Web: From Web 1.0 To Web 4.0. *International Journal of Web & Semantic Technology (IJWesT)*. Vol. 3 (1).
- Chambers, N., Simmons, C. & Wackernagel (2000). *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability*. Earthscan Publication Ltd., London, UK.
- Coccossis, H. & Mexa, A. (2004). *The Challenge of Tourism Carrying Capacity Assessment: Theory and Practice*. Ashgate Publishing Ltd., England.
- Daniele, R. (2003). Guide in: ICT for Travel and Tourism. Learning and Teaching Support Network (LTSN). Hospitality, Leisure, Sports and Tourism. UK.
- Datschefski, E. (1999). Bio-thinking International. Retrieved 16 Dec. 2010 from <http://www.biothinking.com>.
- DEAT (2002). National Responsible Tourism Guidelines for South Africa. Department of Environmental Affairs and Tourism. Pretoria. May.
- Dlamini, W. (2013). Biological Diversity - The Spice of Life. Swaziland National Trust Commission. Retrieved 4 March 2013 from <http://www.sntc.org.sz>
- Ehrlich, P. & Ehrlich, A. (1990). *The Population Explosion*. New York: Simon and Schuster.
- Environment Canada & Park Service (1991). *Selected Readings on Visitor Activity Management Process*. Ottawa. Environment Canada.
- Frey, N. (2007). *The Effects of Responsible Tourism Management Practices on Business Performance in an Emerging Market*. M.A. Thesis. University of Cape Town, Cape Town, South Africa.
- Frochot, I. (2005). A Benefit Segmentation of Tourists in Rural Areas: A Scottish Perspective. *Tourism Management*. Vol. 26(3). 335–346

- Goodland, R. (1992). The Case that the World has Reached Limits: More Precisely that Current Throughput Growth in the Global Economy Cannot be Sustained. *Population and Environment*. Vol. 13(3). 167-182.
- Goodwin, H. & Francis, J. (2003). Ethical and Responsible Tourism. *Consumer Trends in the UK. Journal of Vacation Marketing*. Vol. 9(3). 271-284.
- Goore, A. (2000). *Earth in the Balance*. Earthscan Publication Ltd., London, UK.
- Graefe, A.R., Kuss, F.R. & Vaske, J.J. (1990). *Visitor Impact Management: The Planning Framework*. Vol. 2. Washington D.C., National Parks and Conservation Association.
- Graham, P. (2005). Web 2.0. Retrieved 25 February 2013 from <http://www.paulgraham.com/web20.html>, 2005.
- Hall, D. (2004). Rural tourism development in southeastern Europe: transition and the search for sustainability. *International Journal of Tourism Research*. Vol. 6(3). 165–176.
- Hof, M. & Lime, D.W. (1997). Visitor experience and resource protection framework in the National Park system: Rationale, current status, and future direction. In S.F.
- Irshad, H. (2010). *Rural Tourism - An Overview*. Rural Development Division, Alberta Publications.
- Jurowski, C. (2008). A Tool for Improving the Sustainability of Tourism Industries. Proceedings of BEST EN Think Tank VIII. Izmir, Turkey, June 24-27, 2008
- Kaltenborna, B.B., Andersena, O., Nellemanna, C., Bjerkeb, T. & Thraneb, C. (2008). Resident Attitudes Towards Mountain Second-Home Tourism Development in Norway: The Effects of Environmental Attitudes. *Journal of Sustainable Tourism*. Vol. 16(6).664-680.
- Krishnamurthy, B. & Cormode, G. (2008). Key differences between Web 1.0 and Web 2.0. *First Monday*, Vol. 13 (6).
- Lanea, B. (1994). What is Rural Tourism? *Journal of Sustainable Tourism*. Vol. 2(1-2). 7-21.
- Leea, S. & Jamalb, T. (2008). Environmental Justice and Environmental Equity in Tourism: Missing Links to Sustainability. *Journal of Ecotourism*. Vol 7(1). 44-67.
- Lifestyle Asia (2012). Top 5 Ecotourism Destinations in Asia. Retrieved 3 March 2013 from <http://www.lifestyleasia.com/>
- Lo, M.C, Mohamad, A.A., Songan, P. & Yeo, A.W. (2012). Rural Tourism Positioning Strategy: A Community Perspective. Proceedings of the 2012 International Conference on Economics Marketing and Management. IPEDR Vol. 28. IACSIT Press, Singapore
- Mathieson & Wall (1982). *Tourism: Economic, Physical and Social Impacts*. Longman, Harlow
- Mbaiwa, J.E. (2003). The Socio-economic and Environmental Impacts of Tourism Development on the Okavango Delta, North-Western Botswana. *Journal of Arid Environments*. Vol. 54: 447–467.
- Mexa, A. & Coccossis, H. (2004). *Tourism Carrying Capacity Assessment*. Ashgate, Surrey, UK
- Mowforth, M. Munt, I. (2003). *Tourism and sustainability: Development and new tourism in the third world*. Routledge, London.
- Nair, V. & Azmi, R. (2008). Perception of Tourists on the Responsible Tourism Concept in Langkawi, Malaysia: Are we up to it? *TEAM Journal of Hospitality & Tourism*. Vol. 5(1).
- O'Reilly, T. (2005). *What Is Web 2.0*. O'Reilly Network. USA
- O'Riordan (1998). Indicators for Sustainable Development. Proceedings of the European Commission (Environment and Climate Programme). Advanced Study Course. 5th - 12th July 1997, Delft, The Netherlands.
- Ottosson, C. (2004). The Rise of Community Based Tourism Approaches. Case Studies from Kabarole and Kisoro District, Uganda 2002. Publications of the School of Economics and Commercial Law, Gothenburg University, Gothenburg.
- Performance Management and Development Unit (PEMANDU) (2010). *Economic Transformation Programme: A Road Map for Malaysia*. PM's Office Publication. Kuala Lumpur.

- Sharpley, R. (2000). Tourism and Sustainable Development: Exploring the Theoretical Divide. *Journal of Sustainable Tourism*. Vol. 8(1). 1-19
- Shaw, G. & Williams, A. (1997). *Critical Issues in Tourism: A Geographical Perspective*. Blackwell, Oxford, UK.
- Shelby, B. & Heberlein, T.A. (1984). A Conceptual Framework for Carrying Capacity Determination. *Leisure Sciences* 6(4). 433-451.
- Siow, M.L., Abidin, Z. Z., Nair, V., & Ramachandran, S. (2011). Developing criteria and indicators for responsible rural tourism in Taman Negara National Park (TNNP), Malaysia. *Malaysian Forester*. 74(2). 143-155.
- Spenceley, A. & Goodwin, H. (2007). Nature-based Tourism and Poverty in South Africa. *Current Issues in Tourism*. Vol. 10(2/3). 255-277.
- Stankey, G.H., Cole, D.N. Lucas, R.C. Petersen, M.E. & Frissell, S.S. (1985). The Limits of Acceptable Change (LAC) System for Wilderness Planning. General Technical Report INT-176. Ogden, UT. USDA Forest Service Intermountain Forest and Range Experiment Station. 37pp.
- United Nations Environment Programme (UNEP) (2010). World Environment Day 2010. Retrieved 6 June 2011 from <http://www.unep.org/wed/2010>.
- Van der Merwe & Wocke, A. (2007). An Investigation into Responsible Tourism Practices in the South African Hhotel Industry. *South African Journal of Business Management*. Vol. 38(2). 1-15.
- Vehbia, B.O. & Doratlia, N. (2010). Assessing the Impact of Tourism on the Physical Environment of a Small Coastal Town: Girne, Northern Cyprus. *European Planning Studies*. Vol. 18(9). 1485-1505.
- Wang, T.C. & Chen, Y.H. (2008). Applying Fuzzy Linguistic Preference Relations to the Improvement of Consistency ff Fuzzy AHP. *Inf. Sci.* Vol.178. 3755-3765.
- Wild Asia (2006). Responsible Tourism in Asia - Wild Asia, Building Partnerships for Conservation Retrieved 15 March 2006 from <http://www.wildasia.net>.
- Wolfram, C. (2010). Communicating with Apps in Web 3.0. *IT PRO*. Issue 17 Mar 2010.
- WWF (1996). National Ecotourism Plan, Malaysia (Part 1-6): A Study Prepared for the Ministry of Culture, Arts and Tourism. Malaysia. WWF Malaysia Resource Centre.