

Redefine Green Economy and Sustainable Development: A Tradeoff Analysis Approach on Tasik Kenyir, Terengganu, Malaysia

Mohd Noor Afiq bin Ramlee^a, Muhamad Safiih bin Lola^b, Muhamad Na'eim Abdul Rahman^c, Mohd Fadli bin Hussin^d, Mohd Tajuddin bin Abdullah^e, Muhammad Syamsul Aznan bin Ariffin^f, Candryriila Vera Bartholomew^g.

^{*a,b,c,d*}School of Informatics and Applied Mathematics, Universiti Malaysia Terengganu Malaysia ^{*e,f,g*} Kenyir Research Institute, Universiti Malaysia Terengganu Malaysia

Outline

- Abstract
- Introduction
- Methodology
- Discussion
- Future Study and Recomendation
- •References



Abstract

This paper discusses the assessment of Green Economy in Tasik Kenyir area using trade-off analysis approach to uncover it's potential. Trade-off analysis is a statistical analytic method composed many tools for identifying optimal solutions to complex problems and are common is analyzing decision-making where a choice is presented; in consideration of using statistical formula to analyze and combining soft science, policies study and economics. Consider certain aspect and dynamic variables in Tasik Kenyir and its development policies, trade-off analysis should play an important role in the plan formulation for its "trading-path" and determine the most sustainable approach for development, ecology and other resources. Hence, using numerical research approach, this study aim is to develop numbers of suitable strategies or alternative for sustainable development that being created to meet stakeholder values, instead of presenting alternatives that have some inherent values benefits. This will assists stake-holders in terms of promoting conservational benefits of nature-based development activities without neglecting the balance of ecosystem, ecology and economic of Tasik Kenyir.

Keywords: Green Economy, Trade-off Analysis, Policy, Sustainable Development.



Introduction

- Green economy and sustainable development to counter the changes in the environment.
- we cannot continue to utilize the world's resources without considering its consequences (Ottman, 1998; Wasik, 1996; Lynn & Eda, 2013).
- Tourism industry are one of the most important activity to every country especially Malaysia.
- Realizing the importance of tourism industry in promoting economic growth, Malaysia government trough Ministry of Tourism pursue in promoting tourism in Malaysia via Visit Malaysia campaign.
- This especially true considering each and every state in Malaysia have their own tourism visiting campaign; especially in Terengganu.



Terengganu Tourism Industry

- Terengganu are one of the most abundance potential tourism site in East-cost of Malaysia.
- Places like Tasik Kenyir still have potential for growth (Zakaria et al., 2000;Ketengah¹, 2012; Ketengah², 2013; Ketengah³, 2014).
- However, tourism development especially ecotourism are difficult.







Total Economic Value; Concept and value in application (Munasinghe, 1993; Rusli et al., 2008)

Total Economic Value; general spillover effect for direct and indirect tourism expenditure

- Monetary valuation are the simplest example
- Some variable are hard to determine its value as the perception value change according to the condition of the variable (multi-dimensional).
- Eg: value of bees, drinking water, etc.

Trade-Off Situation

- Faster
- Better
- Safer
- Cheaper
- Greener

(Can't have all three)

Conditional Logit Model

- Estimator for choice modelling (McFadden, 1974; Train, 2003)
- Determine the preferences of subject n, towards J alternative (consider J is an alternative set of i)

$$P_{in} = f(X_{in}, X_{jn}; j \neq i, \beta)$$
⁽¹⁾

where;

- X_{in} = choice of alternative *i* over *n* respondent; where the alternative are mutually exclusive, and finite.
- P_{in} = probability of respondent *n* choose alternatives *i* depend on the objective alternative *i* compare to other alterative. (X_{in} related to all X_{jn} ; $j \neq i, \beta$ where all choice set exhaustive in all possible alternative are included).

 β = marginal value of each green economic attribute in respondent choice set.

In this case, the functionality of observer data, f are the function that relate all observer data with choice probability. Conditional Logit specified up to some vector of test parameter, β to be estimate.

Multi-criteria Analysis

- Trade-off analysis is to measure the weighing of corresponding respondents' preferences for various product features (Luce, 1959; François et al., 1991; McCullough, 1998).
- This method are suitable but only for simple decision analysis. However, in order to simulate multi criteria, the corresponding situation require the involvement of several decision tools.
- Consider linear programming basic problem, need to identify from all the (infinite) possible combinations of values of a set of decision variables, x_j; a set which maximizes a given linear objective function while also obeying a set of constraints which restrict the combinations of x_j values that are admissible (Community, 2009).



• The constraints are also all represented by linear functions and, in addition, the decision variables are required to take only non-negative values:

maximize
$$\sum_{j=1}^{n} a_i x_j$$

• Subjected to;

$$\sum_{j=1}^{n} a_{ij} x_j \le b_i (i = 1, \dots, m)$$
$$x_j \ge 0 (j = 1, \dots, n)$$

- Where;
- x_j decision variable where the stake holder hold control
- a_i numerical parameter whose relate and have reflect relative contribution

$$\sum_{j=1}^{n} a_i x_j \bullet$$
 objective function

 $x_j \ge 0$ • function constrain which express the value of are limited towards the environment of decision maker.

 $x_j \ge 0$ • non-negative constrain that require to not take negative value



• However, assuming the corresponding analysis consists of (1) and parts of all decision variant V_i) and a multidimensional option or scenario (S_j) ; i = 1, 2, ..., m and j = 1, 2, ..., nHence, a matrix consists of $m \times n$ evaluated criteria, the evaluation of the best scenario (R_{ij}) could be determine by formula (3):

$$R_{ij} = \max/\min \sum_{j=1}^{n} \alpha_i x_j = (V_i, S_j) \begin{bmatrix} C_{1,1} & \cdots & C_{1,j} \\ \vdots & \ddots & \vdots \\ C_{i,1} & \cdots & C_{i,j} \end{bmatrix}$$

Where each criteria ($C_{i,j}$) are determine using score based on evaluation of data collected (Rotărescu, 2011).





• By accessing Table 1, we could gather enough data material regarding trade off analysis that were needed in the study(Brown, Tompkins & Adger, 2001).

Type of stakeholder group	Example of group	Method of engagement
Cohesive organisation with	Village council	Focus group
formal structure		
Cohesive organisation	Informal trade group	Focus group
without formal structure		
Mobile individuals, time-	Tourists	Questionnaire
limited		
Mobile individuals, frequent	Informal sector worker	Individual interviews
users		
Leaders of hierarchical	Policy makers	Individual interviews
organisations		
Workers within hierarchical	Government departments	Structured group interviews
organisations		
Table 1: Suggested methods of engaging different types of stakeholder groups (Brown, Tompkins & Adger, 2001)		

UNIVERSITI MALAYSIA TERENGGANU

Variable	Expected Sign	Explanation
Ecological	+	Utilization of ecological management leads to
Management		expectation of higher sustainability of environmental entity. Green visitor preferences surplus and leads to higher tourism preferences.
Tourism Capacity	-	Expectation of overall utilities, physical attraction and other tourism preferences to decline to the congestion of visitors. This will lead to reduce in tourism preferences and Tourism Life Cycle (TLC) degradation.
Econ. Spill-over Eff	ects +	The expectation of tourism industry bloom leads towards higher growth of tourism related services, and contribute positively for local economic growth. Tourist believe that increase in employment could support the needs of tourism and sustainable development of economic.
Conservation Charg	ge -	Expectation that users unwilling to pay more for better services. This situation explained with reduce of marginal utilities, that indicate visitor pay if and only if the services are on par with the price or the price offered are lower.
Accessibility	+	The increase of roads and transportation leads towards greater effects for accessibility. Increase of information accessibility also could contribute towards the positive tourism development.
Fiscal Growth	+	Expected revenue towards government via taxes increase and tourism activities bloom.
UNIVERSITI MALAYSIA TERENGGANU Prelimi	tation of trade-o inary analysis	ff analysis for Tasik Kenyir based on

Discussion

by understanding the point of multi evaluation of Rotărescu (2011), we could determine that there are at least four (4) kind of probability of trade-off P_{in} that could be consider to be analyze later in the extensive study for Tasik Kenyir. Type of probability scenario involve in estimation and could be further analyze are:

A: Limited tourism development without complementary environmental management.

- B: Limited tourism development with complementary environmental management.
- C: Extensive tourism development without complementary environmental management.
- D: Extensive tourism development with complementary environmental management.
- E: Stagnant tourism development and environmental management.



- Four (4) probability represent the surface of green economy and tourism application trade-off analysis in Tasik Kenyir
- Choosing between scenario for tourist to determine the value of green economy and sustainable development
- However, Marginal Value (Ecological Management, tourism capacity, tourism life cycle evaluation, economic spillover, conservation, accessibility and fiscal growth) research should be cover.



Conclusion

- Apply a wider range of measures; research, policy and assorted application
- Trade-off analysis is a collection of standard statistical techniques that provide objective insight
- Trade-off analysis extend to informed policy planning, setting of fees and charges, understanding consumer behavior, and identifying values and priorities.



Future Study and Recomendation

- Preliminary study to develop full analysis for all variable involve for some reasons; (1) incapability of evaluating the environmental effects towards study area based on type of tourism preferences(Srinivasan, 1988), (2) the variables eg.; revenue and jobs are theoritical and did not reflect the current scenario of research location (Buchanan&Daellenbach, 1987), (3) evaluation are non-dynamics (Dwyer et al., 2010).
- Future recomendation needed; (1) develop a new sudy using more sophisticated methodology, (2) a more dynamical evaluation that could capture more cause and effects could be used, and (3) evaluation could be done seasonally.



Acknowledgement

This research study was financially support by Trans Disciplinary Research Grant Scheme (TRGS) (The Etno and Biodiversity of Kenyir to Safeguard Terengganu's Natural Resources), Kenyir Research Institute (IPK), Universiti Malaysia Terengganu and Universiti Sains Malaysia (USM) Research Grant (RUI 2015 under Vote No: 1001/PJJAUH1/8219). Appreciation and acknowledgement for those who participate and involved in this study.

References

• .<u>Redefine Green Economy and Sustainable Development.docx</u>

