Towards Developing Index for the Assessment of Sustainable Development: A Case Study of the Sultanate of Oman

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ABSTRACT

The Sultanate of Oman has devoted particular attention to promote sustainable development of the fisheries sector to ensure its long-term contributions to community welfare. Considering this strategically important initiative this study aimed at assessing the sustainability by developing a sustainability index based on appropriate criteria encompassing the key components of the ecologically sustainable development principles and indicators at the first stage. In the second stage sustainability index for each component was quantified based on the average score of each criterion. Finally, the Multi-Criteria Decision Analysis (MCDA) was carried out to appraise and evaluate of the progress toward sustainability.

The analytical results indicate that year 2001 (preferred year) experienced the best attainment of sustainability and the management measures adopted in 2001 favored environmental protection. The policy implication of this important finding is that it is consistent with the national conservation policy objective and thus provides further support to Oman's commitment towards environmental sustainability. It is hoped that the results from this study will provide insight into the design of further analysis on the sensitivity of the results and the assessment of sustainability indicators to ensure the validity of the present results and make unbiased decisions about the progress toward sustainability.

INTRODUCTION

The fisheries sector plays an important role in the socio-economic development program of the Sultanate of Oman (Bose et al. 2010). Fisheries are an integral part of the traditional way of life. The strategic importance of the sector is reflected in successive Five-year development plans and one of the major strategic goals, amongst others, has been to ensure sustainable utilization of fisheries resources to maximize socio-economic potentials from the sector.

Based on the fishing methods used and their scale of operations, the wild fisheries sector in Oman is divided currently into three segments namely; traditional, industrial (often called commercial), and coastal. The initiation of coastal fisheries sector in 2011 is an attempt not only to modernize and develop the traditional sector but also to create job opportunities for

Omani citizen under the nationalization program in the country. Oman's total landing in 2013 was 206,517 mt valued 166 Million OMR (431 Million US$). During the period 1985-2013, an average of about 86.5% of the total landing came from the traditional sector, 12.7% came from the industrial sector and the remaining 0.8% came from the coastal sector. The coastal fleet contributed to the total landing only during the period 2011-2013 (MAF, 2013).

Against the above-mentioned strategic importance of the sector, a genuine attempt for the assessment of the performance of the fisheries sector is essential to maintain and/or maximize the flow of benefits from the sector as stipulated in the development plans. To facilitate this rationale the main purpose of this paper is to develop an index for the assessment of sustainable development that has been a widely accepted guiding principle for the management of natural resources worldwide the World since the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in August 2002 (UN 2002).

To provide further specificity to the subject matter, the demersal trawl fishery has been selected as a case study. The fishery started in 1989 with the decision from the Ministry of Agriculture and Fisheries to allocate a harvesting quota of 28,000 mt of demersal fish species to five private Omani companies. These companies entered into contracts with foreign fishing companies to utilize the allocated quota using demersal trawling in return for a percentage (about 20%) of the landings.

 Since 2011 the fishery has become non-operational due to the prohibition of trawling. The choice of a non-operational fishery was made to avoid potentially sensitive issue as it became a much debated fishery in the country due to a number of socio-economic, environmental, and institutional concerns (for further details see Al-Masroori 2008). Furthermore, the methodological approach adopted in this case study is applicable to other fisheries both locally and globally.

METHODOLOGY

To assess the progress of sustainability, a system of references, often called Sustainable Development Reference System (SDRS) is required that develop a set of indicators and reference points covering different dimensions of sustainable development (FAO 1999). As stated by Garcia and Staples (2000), an SDRS is a referencing system used to study, assess and report on the sustainability of a sector. It is a system of developing, organizing and using a set of indicators to track progress with respect to sustainable development (FAO, 1999).

Although there are various definitions of the concept of indicators existing in literature (Garcia, 1996; Staples, 1996; FAO, 1999; Garcia *et al.*, 2000; UNDESA, 2001), the commonality lies in its legitimate role in performance monitoring (INDECO, 2004). As stated by Dahl (1995), "*one way to express the concept of sustainability without failing into value judgments about development will be to produce "vector" indicators* which *basically show the direction of movement towards or away from a goal and the speed of that movement*". This indicates that the evaluation of sustainable development will heavily depend on the indicators. It should be mentioned that an indicator is a variable or an index, related to a criterion, whereas a reference point is a target or a limit point within an indicator. There could be more than one reference point for each indicator and more than one indicator for each criterion. Usually, any set of indicators are developed based on a set of criteria (Charles, 2001) to provide a bridge between objectives and actions (FAO, 1999). They are normally developed from raw data (Potts, 2003), where the data is processed and condensed into smaller amount of meaningful information in a systematic way.

This paper follows a modified version of the ESD framework developed by Chesson and Clayton (1998) to analyze the case study. To facilitate the process of modifying the framework and specifying the objectives, discussions and consultation review with key stakeholder and field workers (Fletcher *et al.*, 2002) were conducted. A field observation was also carried out onboard a fishing vessel aimed mainly at gathering and clarifying new information about the Omani commercial trawling sector to facilitate the process of identifying the relevant components of the modified ESD framework. Hiview software ® version 3.1.0.5 (a Multi-Criteria Decision Analysis – MCDA) was used in the appraisal and evaluation of the progress along with Microsoft Excel software ® for basic calculations and statistics. To avoid space limitation specific examples are provided to guide the readers about the procedural steps involved.

RESULTS AND DISCUSSION

The hierarchal structure of the ESD framework was developed and the assessment was done following the steps identified by Chesson and Clayton (1998) following the MCDA (Communities 2000). Criteria, objectives, indicators, trends and reference points developed by Al-Masroori and Bose (2009) were involved in the assessment. Table 1 shows examples of three criteria identified under the ESD framework. Weight and scores for each criterion were then assigned and standardized using the formula provided by Chesson and Clayton (1998) and Communities (2000).

Table 1: Examples of criteria, objectives, indicators, trends and reference points identified under the ESD framework

Criterion (component)	Objective	Indicator	Preferred trend	Reference point
Domestic Market	To achieve subjective satisfaction and enhance the variety of seafood	Amount of catch retained by local fishing companies that is sold in the local markets	Positive	20% of total landed catch
Conflict with Traditional	To minimize the resource access conflict and to protect small scale fisheries interests (FAO Code of Conduct)	Number of conflict cases	Negative	0
Primary commercial species	To maintain a production quota of 28,000 mt	Proportion of accepted CPUE status	Positive	1

The weighted average figure for each year for the ESD components according to the criteria value tree presented in Figure 1 was calculated using the Hiview Software. Figure 2 and Figure 3 exhibit the examples of data standardization and scoring process relative to the preferred value of the nutrition sub-component. It can be seen that the highest score (100) is assigned the value (0.157 kg) corresponds to the year 2000 (Figure 2). The other preference values are relative to the year 2000. Similarly, it should be noted that the lowest value (0.017 kg) corresponds to the lowest preference value (10.828) in 2001[a]. The vertical scale in Figure 2 and Figure 3 represents the rank location of years (arranged as options). The third column in

Figure 2 (A) represents the data value associated with the corresponding year while the third column in Figure 2 (B) represents the linear transformation of those data values to a 0 to 100 preference scale. An alternative way of presenting values or scores of option is through the use of a bar chart as shown in Figure 3 where the y-axis and x-axis represent preference values and years respectively. Finally, the data, weight scores of food component and contribution of each criterion for every year for the 10 year study period are described in Figure 4. The same steps were followed to examine the performances of all other components at all level of the framework.
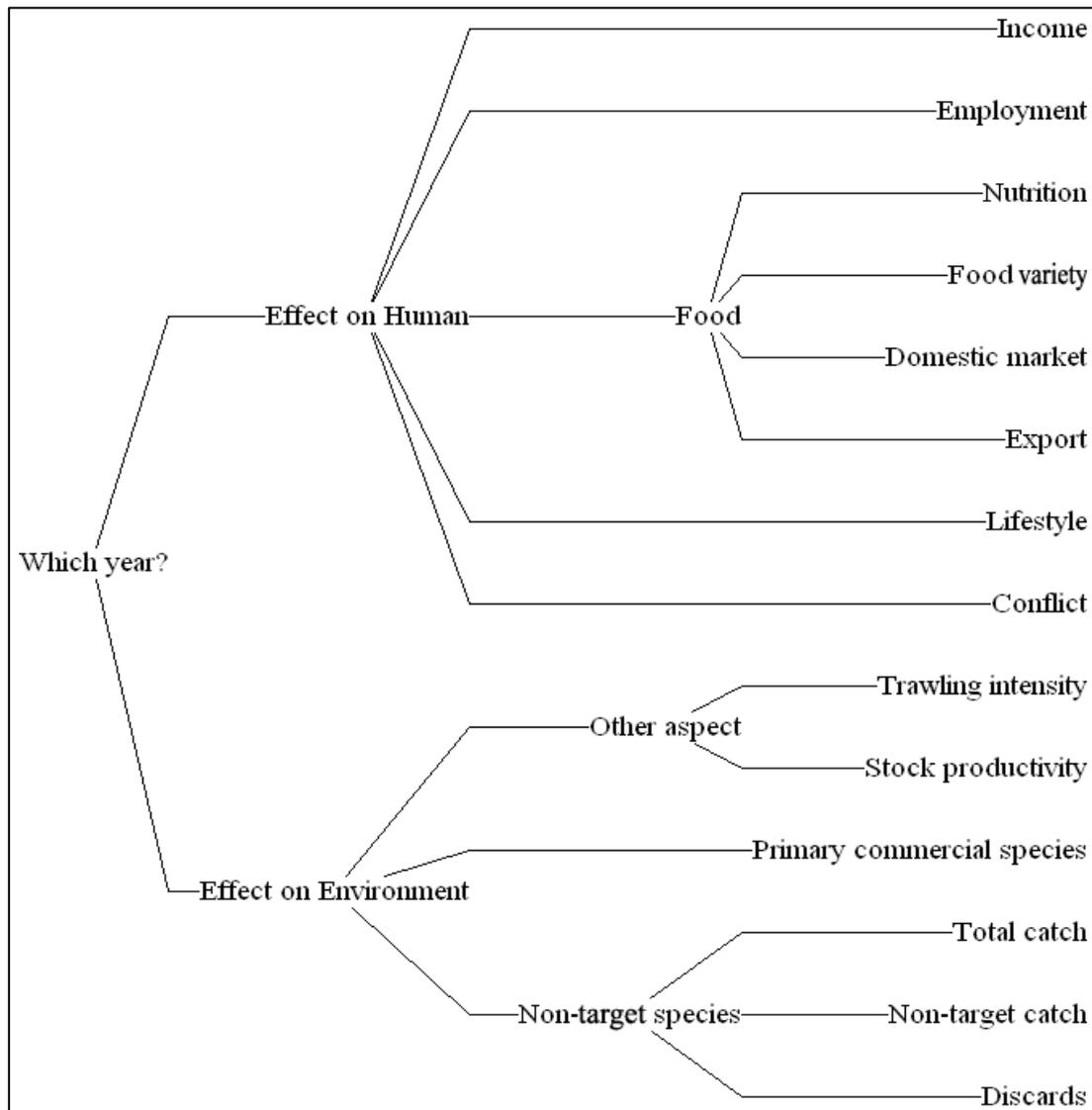
Fig. 1: Criteria value tree

The aggregated results presented by combining the human and environmental components of the ESD framework are shown in Figure 5. It can be seen that year 2001 (preferred year) experienced the best attainment of sustainability and the management measures adopted in 2001 favored environmental protection. The policy implication of this important finding is that it is consistent with the national conservation policy objective and thus provides further support to Oman's commitment towards environmental sustainability.

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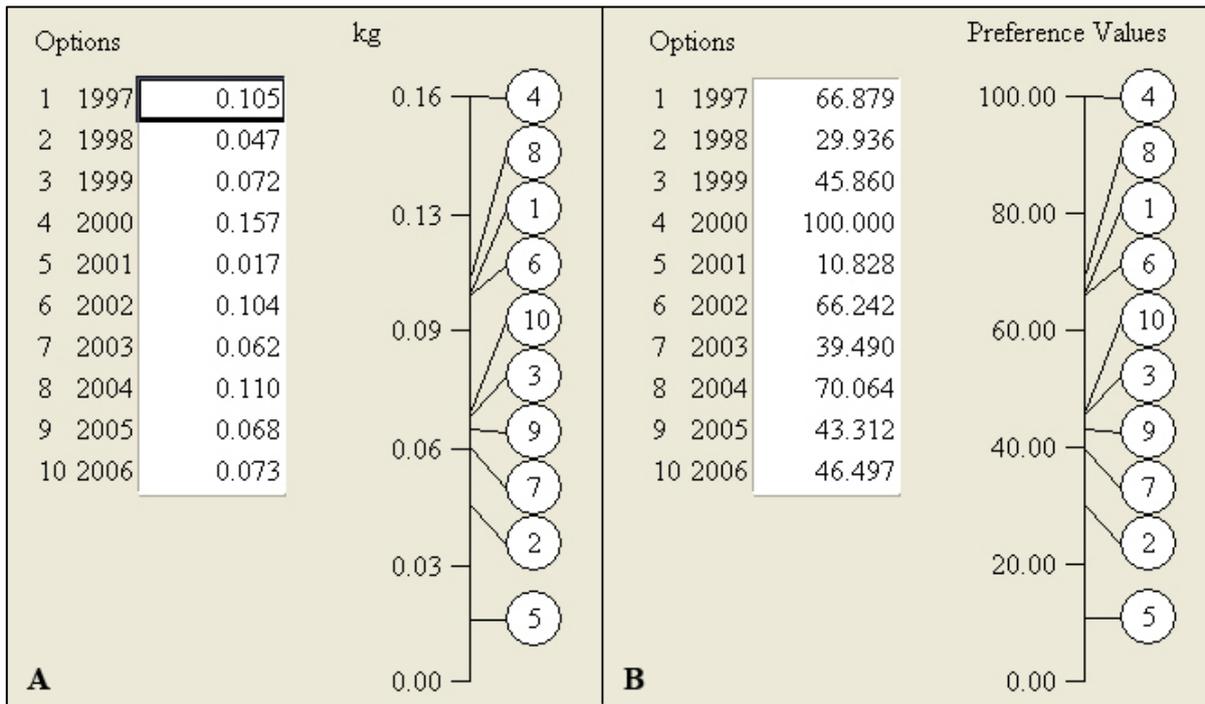
Fig. 2: Nutrition criterion data (A) and score (preference value) (B) for food component
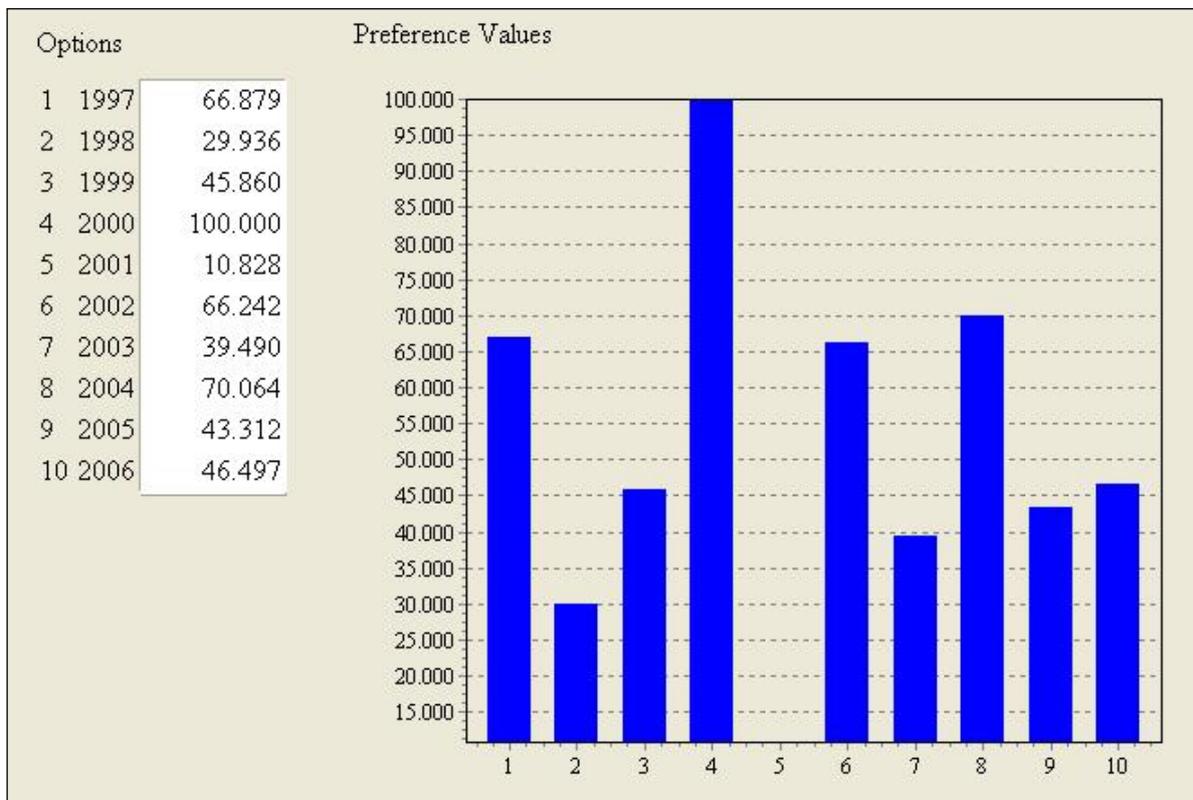
Fig. 3: Preference values (scores) of nutrition criterion of food component
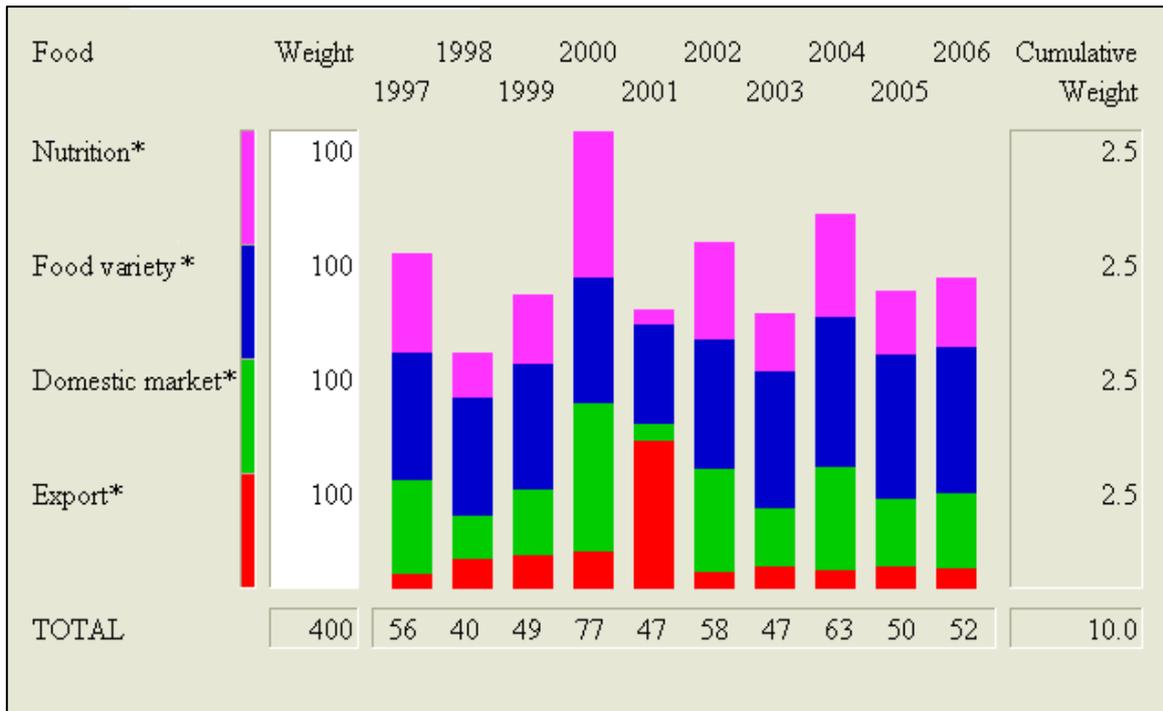
Fig. 4: Weight scores and criteria contributions of food component [b]

Fig. 5: Weight scores and criteria contributions from both human and environment components

CONCLUDING REMARKS

This paper attempted to develop an index for the assessment of sustainability in a fishery that is applicable to other fishery. It is hoped that the results from this study will provide insight into the design of further analysis on the sensitivity of the results and the assessment of

sustainability indicators to ensure the validity of the present results and make unbiased decisions about the progress toward sustainability.

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ENDNOTES

[a] A score of zero on a relative scale does not necessarily mean that the criterion has no value. This indicates that it is least preferred.

[b] It should be noted that the sum of the criterion weights is 400 as depicted in the last row of the above figure. This is because all criteria under the food sub-component were given equal weight (i.e. 2.5% each), which is listed in the last column of the figure. The calculation of the weighted average figure for each year for the food sub-component according to the criteria value tree presented in Figure 1 was conducted using Hivews. For example, the total figure (56) for the year 1997 is calculated as follows: [66.879 (nutrition criterion preference value, Figure 3) * 0.25] + [86.064 (food variety criterion preference value) * 0.25] + [62.755 (domestic market criterion preference value) * 0.25] + [10.109 (export criterion preference value) * 0.25] = 56.45.