

Whether Perception or Expert Paradigm? Assessing Scenic Beauty of Nature Based Landscape

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ABSTRACT

In general, studies on scenic beauty assessment observed to flourish tremendously, due to the advance of knowledge in science, technology and socio-politics. Since then, many and new theories on the issue have been rigorously established in the West. Among these are the expert and perception based paradigms. Both paradigms received positive acceptance over the last century. Looking at this, it is unlikely to say, whether the expert is better than the perception or vice versa. The former is found to dominate the environmental management practice, while the latter is highly accepted among the researchers in the studies of landscape preference. The assessment's procedure using the perception-based has solely relied on public's participation, while the expert based requires the trained professionals from the disciplines of art and design, landscape architecture, planning, architecture, ecology, psychology, geography and many more. In principle, both authorities recognise the biophysical features of a landscape (e.g. greenery, water element, landform and etc.) as attributes to assess scenic beauty of nature based landscapes. The major difference between the two can be detected in the scenic beauty assessment's procedures presented in the works of Clay and Daniel (2001) and Pierskalla & associates (2007). This paper describes the approach used in each paradigm having concentrated on the techniques of assessing scenic beauty of nature based landscapes. The insights provide a basic knowledge to young researchers with similar research interest and to the Malaysian authority that has concerned for preserving the natural beauty of its unique ecosystems.

Keywords: Perception Based, Expert Based, Scenic Beauty Assessment and Nature Based Landscape.

1. INTRODUCTION

In order to better understand of nature based landscape, perhaps, one should have a sense of making good judgment on issues of scenic quality assessment. The scenic judgement can be determined using landscape attributes such as landform, types of water features or density of vegetation. Based on these, one is able to justify why certain landscapes are more beautiful than others. In many cases, landscape has become a source of interest to various disciplines (Kaplan and Kaplan, 1989). Talking about scenic assessment, publics are the

relevant observers, whose judgements provide information on the characteristics of landscapes that they prefer the most. Such insight is useful for the implementation of sound landscape management practices (LMPs) with high ecological value. Perhaps, conflict in deciding whether a landscape has high scenic value or not may be reduced through their judgements. This is true because the public are the users of the landscapes. Unsurprisingly, several reviews indicate that landscapes with natural settings are more preferable than the landscapes with human intervention (Kaplan and Kaplan,

1989; Berg, Vlek and Coeterier 1998; Vries, Groot and Boers, 2012). Similar review explains that a landscape development that has concerned for natural elements received high preference as compared to over development landscape (Kearney et.al, 2008). Sullivan (1994) also indicates that a residential development with or adjacent to green areas and other open space receives high preference rates. This further explains that natural landscape features may also associate with monetary value. In the context of Malaysia, under the town and planning guidelines, it is mandatory for a residential development to provide at least 10% of the total built up area with open space. Policy alike is seen essential to provide better environment to the public. Similarly, more interventions from the authority observed may significantly help safeguarding the unique nature based landscapes in this country.

Coming back to the scenic beauty assessment, Arriaza and associates (2004) verify the importance of natural features of a landscape for visual impact. Their study explores the scenic beauty preferences of an agricultural landscape in the Southern Spain. Finding shows that scenic value of this landscape has high correlation to visible vegetation, water elements, natural views, and mountains on the horizon. In addition, the finding also agrees that the landscape sceneries with the presence of man-made elements such as roads, industries, and electric power lines received low scenic preferences. In relation to natural environments, Jamilah, (2011) and Manohar, Ahmad, Azizi, & Jamilah, (2008) also state that scenic beauty of such environments can implicate tourists' visitation. This explains the importance of a tourism industry to a country from the aspect of economy. It is further observed that among the challenges tasks of the professionals in the built environment of the 21st. century is to practise sustainable developments without compromising the visual value of the nature based landscapes. Again, support from the authorities may help realising the idea, since there have been increasing demands for scenic landscapes to be included in some landscape polices/acts, management and planning as well as landscape monitoring (Tress et al., 2001).

Scenic landscape assessment that considers inventory and evaluation of visible attributes (e.g. mount, river, lake, and etc.) of nature based landscapes for the purposes of planning, management, design and etc. should be strongly considered in

the making of some environmental policies. Here, the assessment should include the professionals. The assessment of scenic beauty preference must consider various means and approaches because beauty is a complicated subject to evaluate. Despite all that, studies on the issues have been rigorously conducted by various disciplines such as psychology, forestry, agriculture, geography, ecology, architecture, art and design, landscape architecture and many more. This is due to the advancement of knowledge in science, technology and socio-politics. Rigorous research may result to more and new concepts / theories been established in the issues of landscape preference. Among the theories, the objectivist (expert paradigm) and subjectivist (perception paradigm) authorities have become the most popular paradigms of the contemporary. Lothian (1999) provides comprehensive study on the approach of both paradigms. The objectivist postulates scenic beauty as inherent in the natural physical properties of the landscape observed, while the latter observes beauty as the product of a mind. Further, the objective paradigm is a long standing theory and found to be in existence since the classical era and has been widely accepted among the professionals from the art / design or ecological based background. In relation to that, this paper describes the method used to assess scenic beauty of nature based landscapes using the expert and perception based paradigms.

2. BACKGROUND OF SCENIC BEAUTY PARADIGMS

There has been a continuous contest between the expert and perception based paradigm. Under the expert paradigm, the assessment is based on the evaluation of a trained observer (e.g. expert in the disciplines of art and design, ecology and etc.). Scenic beauty is evaluated using landscape scenery qualities or attributes (Skrivanova and Kalivoda, 2010). These are tangible or intangible attributes that are presented as vegetation, water element, landform and etc. The attributes are variables that are defined in through shape, form, linearity, composition, structure, colour, scale, variety, unity, uniqueness, distinctness and etc. They are sometimes known as landscape properties, which evaluation requires the expert (Daniel, 2001). Importantly, the result of the assessment of the

expert paradigm is not necessarily relied from a collective group of observers. It is sometimes based on a single evaluation (Palmer and Hoffman, 2001), where the validity and reliability of the assessment can be questionable (Daniel, 2001). It suggests that a single evaluation that falls under the objectivist authority (expert paradigm) can be bias, lack of accuracy or integrity. Perhaps, this rejection is due to small sample size. However, the approach to the authority may have several advantages, in terms of cost and time because less time and minimal numbers of observers are required for the assessment. Review states that the expert based is widely utilised by the researchers in the environmental management (Daniel, 2001) and planning of the wilderness or any other outstanding nature based landscape. Further, the outcomes of the assessment can be translated as planning and management tools in the preservation of high ecological landscapes.

In contrast, the subjectivist authority (Perception based paradigm) has received high acceptance among the scenic beauty researchers. The technique has been around since the 18th century and firstly established in Europe. A German aesthetician, Emanuel Kant was among the pioneers, whose ideas fall under the authority. Perhaps, many have already known that Kant was the founder of the concept of *beauty as in the eye of the beholder*. So, the assessment using the subjectivist requires public's participation, whose knowledge in the art and design is not essential. In other words, they are untrained observers, unlike the objectivist. Interestingly, the results found believed to be more reliable because of the collective results; e.g. generalisation of results gathered from huge sample size considered more accurate. The authority defines scenic beauty in a landscape through various landscape attributes such as water elements, density of vegetation or types of landform, which is similar to the objectivist authority. Here, understanding on the basic theories of scenic assessment would not be complete, if the works of Ervin H. Zube failed to be discussed. Zube (1984) had contributed valuable knowledge on the foundation of scenic beauty assessment. His works inspire and gear many young researchers to clearer scenic theoretical framework. Significantly, he was among the prominent pioneers, whose works have become the impetus to the study of landscape preference. The author had suggested four major paradigms that have become the basis to the studies

of scenic beauty of the contemporary. Two of his are very much related to the objectivist and subjectivist paradigms as comprehensively described in Lothian (1999); e.g. expert (objectivist) and psychophysical (subjectivist). Beside Zube, Daniel (2001) also provides comprehensive explanation on the techniques of the paradigms. In summary, both paradigms are found relevant and unique in their own way, style, approach and technique. The following describes the detail characteristics of the expert and perception paradigms, where in some cases the former is addressed as an objectivist, while the latter is a subjectivist.

3. EXPERT BASED (OBJECTIVIST PARADIGM)

Jessel (2006) agrees that the methods of assessing scenic beauty using the expert paradigm are partly based on the description of the landscape attributes or characteristics. The method requires the trained observers to systematically inspect and evaluate the landscape using the attributes identified together with any abstract design parameter thought relevant (Daniel, 2001). Here, the process of interaction between the biophysical features of a landscape and the perception of the observers is firstly established. Then follow by the prescribed rules and guidelines. For instance, the sceneries observed should be ranked from low to high visual quality using scenic classes such as water element, landform, greenery and etc. In a typical practice, the trained expert such as landscape architect, planner or forest manager may use the results of the assessment to design and/or make recommendations on the environmental management activity. At the higher level, which involves the national policy or act, the results can be used to defend the protection of scenic value through multiple - resource decisions. Similarly, Jessel, (2006) suggests that the outcomes of the assessment can be in the forms of management and planning tools that emphasise the conservation of scenic areas or improvement of certain landscapes with low scenic beauty. The outcomes of the assessment can also be further refined and translated using tangible elements such as statements or scenic beauty maps.

The expert based agrees that several landscape attributes have significant contribution to determine the uniqueness and legibility of certain landscape sceneries (Skrivanova and

Kalivoda, 2010). Skrivanova and associate also suggest that the observation of a monotonous landscape can result to mentally tiring or discomfort, while an observation of a unique memorable landscape shall result to interest, understanding and comfort. So, what sort of landscape attributes thought to provide good implications to observers? Here, the authors suggest that, the attributes should be dominant landscape elements such as unusual terrain formation, lake, silhouette of a city/castle, or even a typical way of farming. Other features suggested may be related to the spatial formation attributes that underline or create dominant landscape features; e.g. vivid features of symmetry, asymmetry, gradation, rhythm, contrast or unity (Skrivanova and Kalivoda, 2010). The followings are the summaries of several conventional scenic values considered to associate with some unique memorable landscapes as explained by both authors:

- visible parts of landscape with natural settings (e.g. an indented wood edge, a watercourse with meanders and attendant greenery, a body of water framed by woods);
- valuable ecosystems (e.g. littoral zones of ponds, rocky cliffs covered with grass and bushes);
- natural character of dominant landscape features and horizons that delimit spaces (rocky or woody horizons, the significant shape of a dominant terrain feature);
- natural environment with traditional farming (typical segmentation of fields, vineyards; padi field);
- well-balanced relation between relatively natural and agriculture areas;
- landscape with a high proportion of dispersed greenery (attendant and line greenery, solitary trees);
- small-scale landscape structure;
- integration of natural environment with man-made structures (a house on a steep mountain slope, a farmhouse among ponds);

- unity of natural environment and settlements (dispersed settlements on hillsides, solitary farmhouses and buildings, compact estates of rural villages amid garden greenery and with a mosque as the dominant feature)

So, in short, the expert based, which assessment has concerned for the above spatial formation attributes can also be associated with the descriptive inventory technique. Further, it is observed that such attributes may have high contribution to the assessment of landscapes with high ecological implications. Secondly, the strength of the expert based paradigm is seen to lie on the relevant usage of these landscape attributes, which may lead to high validity and reliability results. Perhaps, this further clarifies the manner to establish the less subjective results, when assessing high ecological landscapes.

3.1 Case Study

This paper reviews the work of Clay and Daniel (2001) to further clarify the validity of engaging certain landscape attributes. The authors present the results of an assessed of scenic preferences of road corridor in the southern Utah, United States of America (U.S.A.) using the expert based paradigm. The landscape attributes recommended are; (1) depth of view, (2) proportion of road in view and (3) proportion of open meadow in view. The approach is an exemplar of the expert based with highly skilled of trained observers, who judged scenic beauty using the principles of art, design, ecology, and resource management. The outcome of the research was to generate a statement of the landscape quality of the area. The Reliability Test (Cronbach Alpha) was carried out to determine the level of internal consistency of the expert judgements based on the three attributes. Results indicate high levels of consistency among judgements with each of the coefficients exceeding 0.85. This shows that the attributes used have high reliability of measurement. Thus, the scenic beauty results can be accepted as having high internal consistency, since the value of alpha achieved the minimum measurement requirement of the conventional standard.

3.1.1. Method of Assessment

Clay and Daniel (2000) had adopted the approach of Brown and Daniel (1987), where images of landscape sceneries were shown to the experts using slide show. The experts consisted

of several professors from the departments of landscape architecture and architecture of California Polytechnic State University, U.S.A. A total of 36 slides were displayed to the experts for scenic judgements. Importantly, they were not informed on the nature of the assessment. In other words, not a single explanation was given to them, except for the instructions concerning the goals of the assessment and the scenic classification used. The experts had individually assessed each slides based on their knowledge and previous experience together with the landscape attributes mentioned.

3.1.2. Result

The result shows that the three landscape attributes (e.g. depth of view, proportion of meadow and road proportion) have significant correlation to landscape preferences, either individually or collectively. Thus, those are among the scenic variables suggested to be used to measure scenic beauty of a nature based landscape. Here, the expert judgement is essential, since the attributes have specifically focused on the subject of art and design, which requires high skilled observers.

4. PERCEPTION BASED (SUBJECTIVIST PARADIGM)

Review of Daniel (2001) justifies that the approach to the landscape assessment using perception -based paradigm has contested the expert based since the last half-century. The main difference between the two paradigms believed to be directed to the method of observing scenic beauty. The perception based has engaged the public to make scenic judgement, whose knowledge on the issues of art and design is zero. Secondly, the assessment represents the subjectivist authority and mostly utilised by the researchers in the disciplines of environmental perception and landscape assessment. On the other hand, the environmental practitioners and large management agencies are more interested in the expert based. Under the premise of the perception based, an observer shall perceive and assess the landscape using his/her feelings, needs and imagination. This may implicate good relationship between him and the landscape observed. Due to the nature of the observation, which includes emotion (*psycho*)

and landscape attributes (*physical*), the perception based is also recognised as a psychophysical based. The assessment's instruments are a set of photographs shown to the public for ranking or rating of scenic beauty together with questionnaire survey.

Daniel (2001) believes that the perception-based approach produces high reliability of measurement. Perhaps, this is influenced by large sample size in judging the landscape quality, in which generalisation of results is considered valid. Furthermore, the significant difference between the perception based and the expert based can be explained through the manner of observing a landscape and who the observers are. Brown, Richards, Daniel, and King, (1988) state that the perception based observes scenic beauty by reflecting the aesthetics philosophy of the subjectivist view, while the latter observes beauty through certain artistic principles. In summary, the perception based caters the publics' scenic preferences for various landscape sceneries and the outcomes of the research can be the preservation or improvement of scenic landscapes. Similarly, the perception-based assessments have also met the conventional standards of measurement systems (Daniel, 2001; Skrivanova and Kalivoda, 2010). Importantly, this approach suggests that the scenic beauty in a landscape is objectively and quantitatively measured.

4.1 Case Study

This paper has specifically taken the work of Pierskalla, Saunders, McGill, & Smaldone (2007) to further investigate the validity of using certain landscape attributes for perception based approach. Pierskalla and his associates conducted a pilot test to identify, whether there was a correlation between scenic beauty preference and pre-experience education. Both experiment and test were responded to the work of Leopold (1949). He suggested that ecological aesthetics would link natural landscape to scenic beauty. Coming back to Pierskalla and associates, they hypothesised that some outdoor recreation students who had undergone nature educational programs would respond better during the assessment activity. This true, if one's knowledge and awareness about nature were enhanced; e.g. understanding on landscape of forest, wetland, mountain and so forth.

4.1.1. Method of Assessing Nature Based Landscape

The pilot test was conducted at the West Virginia University Recreation, Parks and Tourism. The method had engaged with several training sessions, in which 32 numbers of students were asked to participate. They were systematically formed into four groups. The levels of “pre-experience” education on forest ecological matters among these groups were enhanced through several training sessions. Different levels of knowledge were delivered to three groups of students using six video clips. This was intentionally done for the evaluation purpose. The following lists four groups of students with several training levels. Only three groups (experimental groups) were exposed to the training sessions (experimental factors). On the other hand, one group was left with zero training.

- Group 1 - No Training given
- Group 2 - Training with lecture
- Group 3 - Training with lecture and video tape show
- Group 4 - Training with Lecture, video tape show, and a walk in the woods

4.1.2. Result

Result indicates that *Group 4* (lecture, video tape, and walk in the woods) scored the highest scenic beauty ratings. Findings of pilot test also shows that *Group 2* with an educational pre-experience had influenced the results of the perception of scenic beauty. Programs that included a walk in the wood had the greatest positive effect on perceptions with one exception; when zooming in on invasive species during video 5, *Group 4* had earned very low scores (Pierskalla et.al, 2007). In conclusion, the result shows that there is high correlation between preference and knowledge/experience when assessing a natural landscape of high ecological value. In addition, Gobster (1999) also suggests that the assessment of high ecological landscape would be better, if the assessment was done in situ. In other words, the consistency of visualisation can be high, if the observers are able to assess the scenic beauty in landscape on site. Secondly, the public can always be exposed to nature walks and other demonstration programs, if this may lead to better understanding of sustainability.

Importantly, ecological knowledge helps the public understanding the ecological processes of certain ecosystems and how the sustainable management practices works (Pierskalla et.al, 2007). In conclusion, the work of Pierskalla and associates can be accepted as significant for researchers, who are keen for saving endangered environment.

5. CONCLUSIONS

Currently, the most common approaches used to assess scenic beauty of high ecological landscapes are the Expert and Perception based paradigms. The basic description of each application/techniques is explained using case studies as practiced by some prominent researchers and pioneers of scenic beauty studies. Each approach carries its own weight and merit and thus, choice of selection must best fit to the theoretical framework of a research. The scenic beauty assessment methods suggest here are specifically concerned for nature based landscapes. Literature review also shows the importance of conducting a pre – testing or pilot test. Perhaps, this should be considered in all the studies of scenic beauty assessment of nature based landscapes. This explains that the results of the test can further improve and guide ones’ research instrument for establishing valid and reliability results. Several landscape attributes that associated with the nature based landscape assessment were highlighted in both paradigms. Importantly, the examples of attributes provided in the reviews show high correlation to the study of landscape preference with natural settings.

Most of the landscape attributes mentioned in the review have strongly required the experts from the disciplines of art and design or ecological background to assess the landscape with high ecological value. However, the public may also participate in the exercise. Interestingly, a case study suggests that the public with good ecological knowledge or education on the subject assessed would positively influence the result of assessing the nature based landscape. It is found that their preferences for natural environment received high scenic judgements. Nature walk is perhaps, a practical educational exposure, since the practice provides in situ environmental knowledge to observers with zero professional background. As the result they are able to assess nature based landscape as efficient as to those with trained background. Secondly, it is

evidenced that preference for natural beauty has significant correlation to the levels of environmental knowledge. Further, selection of relevant landscape attributes is also essential. Thus, future landscape preference research shall introduce more relevant attributes that can be associated with the preservation of scenic beauty of nature based landscapes in the context of Malaysia's ecosystems. Under the tropical rain forest climate, the country has plenty of unique ecological landscapes that require urgent protection from the authorities. In conclusion, rigorous studies on scenic beauty of sensitive ecosystems may protect these valuable landscapes through the establishment of environmental act or policy with relevant enforcement.

REFERENCES

- [1] Arriaza, M., Canas-Oertego, J.F., Canas-Madueno, J.A., & Ruiz-Aviles, P., "Assessing the visual quality of rural landscape". *Landscape and Urban Planning*, 69, 115-125.
- [2] Brown, T.C., and Daniel, T.C., "Context effects in perceived environmental quality assessment: scene selection and landscape rating". *Journal of Environmental Psychology*, 7 (3), 233-250.
- [3] Brown, T.C., Richards, M.T., Daniel, T.C., & King, D.A., Recreation participation and the validity of photo-based preference judgments. *Journal of Leisure Research*, 20 (4), 40-60.
- [4] Clay, G.R., and Daniel, T.C., (2000). "Scenic landscape assessment: the effects of land management jurisdiction on public perception of scenic beauty". *Landscape and Urban Planning*, 49, 1-13.
- [5] Clay, G. R., and Smidt, R. K., "Assessing the validity and reliability of descriptor variables used in scenic highway analysis". *Landscape and Urban Planning*, 66, 239-255.
- [6] Daniel, T.C., "Whither scenic beauty? Visual landscape quality assessment in the 21st century". *Landscape and Urban Planning*, 44, 267-281.
- [7] Dramstad, W.E., Sundli Tveit, M., Fjellstad, W.J., & Fry, G.L.A., "Relationships between visual landscape preferences and map-based indicators of landscape structure". *Landscape and Urban Planning*, 78, 465-474.
- [8] Gobster, P.H., "An ecological aesthetic for forest landscape management". *Landscape Journal*, 18, 54-64.
- [9] Jamilah, O. "Scenic Beauty Preferences of Cameron Highlands Malaysia: Local versus Foreign Tourists." *International Journal of Business and Social Science*, 2, 248-253.
- [10] Jessel B., "Elements, characteristics and character – Information functions of landscapes in terms of indicators". *Ecological Indicators*, 6, 153-167.
- [11] Kaplan, S., and Kaplan, R. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.
- [12] Kearney, A.R., Bradley, G.A., Petrich, C.H., Kaplan, R., Kaplan, S., & Simpson-Colebank, D., "Public perceptions as support for scenic quality regulation in a nationally treasured landscape". *Landscape and Urban Planning*, 87, 117-128.
- [13] Leopold, "A Sand County Almanac", New York: Oxford University Press, In Pierskella, C.D., Saunders, K.E., McGill, D.W., & Smaldone, D.A., "Forest Landscape Assessment: The effects of pre-experience education on public perception of scenic beauty". *Proceeding of the 2007 Northeastern Recreation Research Symposium*. 70-76.
- [14] Lothian, A., "Landscape and the philosophy of aesthetics: is landscape quality inherent in the landscape or in the eye of the beholder?" *Landscape and Urban Planning*, 44, 177-198.
- [15] Manohar, M., Ahmad, M. A., Azizi, M. And Jamilah O., "Assessing the Convergence of Scenic Preferences for Highland Scenes Using Photographic Survey and Interview Methodologies". *The International Journal of Interdisciplinary Social Sciences*, 3, 175-183.
- [16] Palmer, J. F., and Lankhorst J. R., "Evaluating visible spatial diversity in the landscape". *Landscape and Urban Planning*, 43, 65-78.
- [17] Palmer, J.F., and Hoffman, R.E., "Rating reliability and representation validity in scenic landscape assessments". *Landscape and Urban Planning*, 54, 149-161.
- [18] Pierskella, C.D., Saunders, K.E., McGill, D.W., & Smaldone, D.A., "Forest Landscape Assessment: The

effects of pre-experience education on public perception of scenic beauty”. Proceeding of the 2007 Northeastern Recreation Research Symposium. 70-76.

- [19] Ryan, R.L., “Comparing the attitudes of local residents, planners, and developers about preserving rural character in New England. *Landscape and Urban Planning*. 75, 5-22.
- [20] Skrivanova, Z., and Kalivoda, O., “Perception and assessment of landscape aesthetic values in the Czech Republic – a literature review”. *Journal of Landscape Studies*. 3,211 – 220
- [21] Sullivan, W.C., (1994). “Perception of the rural-urban fringe: citizen preferences for natural and developed settings”. *Landscape and Urban Planning*, 29, 85-101.
- [22] Tress, B., Tress G., Decamps, H., d’Hautserre, A.M., Bridging human and natural sciences in landscape research”. *Landscape and Urban Planning*, 57, 137-141.
- [23] Van den Berg, A.E., Vlek, C.A., & Coeterier, J.F., “Group differences in the aesthetics evaluation of nature development plans: A multilevel approach”. *Journal of Environmental Psychology*. 18, 141-157.
- [24] Vries, S., Groot, M., & Boers, J., “Eyesores in sight: Quantifying the impact of man-made elements on the scenic beauty of Dutch Landscapes”. *Landscape and Urban Planning*.105, 118-127. Zube, E. (1984). “Landscape Perception: Research, Application and Theory”. *Landscape Planning*. 9, 1-33.
- [25] Zube, E., “Themes in landscape assessment theory”, *Landscape Journal*, 3, 104-110.